

ESG Disclosure and Firm Leverage: Pillar-Level Evidence from Italian Firms

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Abstract

This study examines the association between Environmental, Governance, and Social (ESG) disclosure dimensions and Firm Leverage among Italian firms over the period 2014–2023. Using a quantitative panel-data design, the analysis draws on Eikon ESG scores for a final sample of 70 firms and measures Firm Leverage as Total Debt divided by Total Assets, with Firm Size included as a control variable. Four panel regression specifications are estimated to assess the individual and joint relationships between ESG disclosure dimensions and leverage. Fixed-effects estimation is adopted following the Hausman procedure. The findings reveal substantial heterogeneity across ESG pillars. Environmental Disclosure is positively and statistically significantly associated with Firm Leverage, supporting H3, while Governance Disclosure also exhibits a positive and statistically significant association, supporting H2. Social Disclosure has a positive but statistically non-significant association with leverage, and H1 is therefore not supported. The reported joint-significance test further indicates that the Environmental, Governance, and Social dimensions collectively contribute significantly to explaining Firm Leverage, supporting H4. Firm Size exhibits a consistently negative and statistically significant association with leverage across the reported specifications. The findings suggest that ESG disclosure should not necessarily be treated as a homogeneous financing construct. The study contributes pillar-level longitudinal evidence from Italy and highlights the potential relevance of environmental and governance information in creditor assessment, corporate financing analysis, and sustainability-reporting practice

Keywords: ESG Disclosure, Firm Leverage, Capital Structure, Environmental Disclosure, Governance Disclosure, Social Disclosure

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1. Introduction

Environmental, Social, and Governance (ESG) information has become increasingly relevant to corporate reporting, sustainable finance, and capital-market decision-making. Beyond equity investors, ESG disclosure may also inform creditors, banks, and bondholders by providing insight into firms' environmental exposure, governance quality, stakeholder relationships, and broader non-financial risks. Accordingly, ESG disclosure may influence how debt providers assess organizational transparency, risk, and financing capacity, making its relationship with corporate leverage an important issue in corporate finance and sustainability research. Debt-market research provides direct evidence that non-financial and sustainability information can enter creditors' assessments through bank-loan pricing, corporate-bond yields, and broader debt-financing conditions. Studies of CSR and ESG-related information document relationships with the cost and availability of debt, although the magnitude and direction of these relationships vary across borrowers and institutional settings (Goss & Roberts, 2011; Ge & Liu, 2015; Hamrouni et al., 2019a; Kordsachia, 2020; Fiorillo et al., 2025). The increasing integration of sustainability considerations into debt markets is also reflected in the development of green bonds, sustainability-linked loans, and green-finance policies, through which environmental and broader ESG characteristics can become contractually or economically relevant to financing conditions (Fatica et al., 2021; Auzepy et al., 2023; Li et al., 2024).

Several theoretical perspectives suggest that ESG disclosure may affect capital-structure decisions, although the expected direction is not uniform. Signaling Theory proposes that greater transparency may reduce information asymmetry and signal managerial quality and risk awareness (Spence, 1973). Agency Theory similarly suggests that stronger disclosure and governance mechanisms may reduce creditor concerns regarding managerial opportunism (Jensen & Meckling, 1976). Trade-Off Theory implies that lower perceived risk and financing frictions may increase debt capacity by reducing expected distress costs (Kraus & Litzenberger, 1973). Conversely, Pecking Order Theory suggests that reduced information asymmetry may improve access to alternative financing and thereby reduce reliance on debt (Myers & Majluf, 1984). Stakeholder and Legitimacy perspectives further indicate that ESG disclosure may strengthen external relationships and organizational legitimacy (Freeman, 1984; Suchman, 1995). Empirical evidence likewise remains mixed. Some studies associate stronger ESG disclosure with improved debt-market conditions, lower financing costs, or greater access to debt (Al Amosh & Khatib, 2021; Eliwa et al., 2021; Raimo et al., 2021), whereas others report negative, insignificant, nonlinear, or institutionally contingent relationships (Fang & Parida., 2022; Apergis et al., 2022; Sharfman & Fernando, 2008). This inconsistency suggests that aggregate ESG measures may conceal important differences across Environmental, Governance, and Social dimensions, each of which may convey distinct information to capital providers. At the same time, ESG information is not necessarily interpreted uniformly. Substantial disagreement exists across ESG-rating providers because of differences in measurement scope, weighting, and methodological choices, potentially

affecting how investors and creditors interpret aggregate ESG indicators (Berg et al., 2022; Christensen et al., 2021; Chodnicka-Jaworska, 2021; Liu, 2022; Chen & Liu, 2025). This measurement heterogeneity provides an additional rationale for examining Environmental, Governance, and Social dimensions separately rather than assuming that an aggregate ESG score represents a homogeneous financing construct.

This study addresses this gap by examining the separate and joint associations of Environmental, Governance, and Social disclosure with corporate leverage among Italian firms. A pillar-level approach allows the analysis to identify whether the three ESG dimensions exhibit homogeneous or heterogeneous financing relationships. The Italian setting also provides a common national institutional environment, reducing cross-country heterogeneity while permitting longitudinal analysis of firm-level variation over time. Evidence from a fragile-economy setting further indicates that ESG implementation is highly contingent on regulatory enforcement, institutional capacity, and organizational resource constraints, reinforcing the need to interpret the economic relevance of ESG information within its national institutional environment rather than assuming uniform effects across jurisdictions (Aljarrah, 2026). The Italian context further warrants focused examination. Evidence from Southern Italian businesses using Eikon-based ESG indicators illustrates the relevance of non-financial sustainability characteristics to financing-cost analysis, while research on Italian capital structures demonstrates that financing choices may also reflect distinctive domestic and regional financial conditions (Arru et al., 2024; di Pietro et al., 2019). Consequently, pillar-level longitudinal evidence concerning ESG disclosure and leverage within a common Italian institutional environment remains comparatively underexplored.

Accordingly, the study asks: To what extent are Environmental, Governance, and Social disclosure dimensions individually and jointly associated with Firm Leverage among Italian firms? H1 examines the association between Social Disclosure and Firm Leverage, H2 examines Governance Disclosure, H3 examines Environmental Disclosure, and H4 assesses the joint contribution of the three ESG dimensions to explaining Firm Leverage.

The empirical analysis employs panel data for 70 Italian firms over 2014–2023, with the number of observations varying according to data availability. Environmental, Governance, and Social disclosure are measured using their respective Eikon scores. Firm Leverage is measured as Total Debt divided by Total Assets, while Firm Size, measured as the natural logarithm of Total Assets, is included as a control variable. Four regression specifications are estimated, with the Hausman procedure supporting fixed-effects estimation. Given the observational research design, the estimated coefficients are interpreted as statistical associations rather than causal effects.

The study contributes to the literature in three ways. First, it extends capital-structure and information-based perspectives by examining ESG at the pillar level rather than treating it as a single aggregate construct. Second, it provides longitudinal evidence from Italian firms using disaggregated ESG measures and panel-data

estimation. Third, it offers practical implications for managers, boards, lenders, investors, and policymakers by demonstrating the value of evaluating the informational content of individual ESG dimensions rather than relying exclusively on aggregate ESG assessments.

The remainder of the paper is organized as follows. Section 2 reviews the theoretical and empirical literature and develops the hypotheses. Section 3 presents the research design, sample, variables, and model specifications. Section 4 reports the empirical results, Section 5 discusses the findings, Section 6 presents the conclusions and implications, and Section 7 outlines the study limitations and directions for future research.

2. Literature Review and Hypothesis Development

2.1 *Theoretical framework*

The relationship between Environmental, Social, and Governance (ESG) disclosure and corporate leverage can be understood through three complementary theoretical perspectives: Signaling Theory, Trade-Off Theory, and Behavioral–Governance Fit Theory (BGFT). Together, these perspectives explain how ESG disclosure conveys information to external capital providers, how such information may affect firms' debt capacity, and why the financing relevance of ESG disclosure may differ across environmental, governance, and social dimensions. Rather than assuming that ESG operates as a homogeneous construct, the integrated framework recognizes that individual ESG pillars communicate distinct forms of non-financial information and may therefore generate heterogeneous creditor responses.

Signaling Theory provides the primary informational foundation of the framework. According to Spence (1973), organizations can reduce information asymmetry by communicating credible signals concerning otherwise difficult-to-observe characteristics. In the context of corporate financing, ESG disclosure can signal managerial quality, transparency, risk awareness, and organizational preparedness to banks, bondholders, and other providers of debt capital. Environmental disclosure may communicate firms' exposure to climate, regulatory, and operational risks and their capacity to manage such risks; governance disclosure may signal the quality of oversight, internal controls, accountability, and monitoring; and social disclosure may convey information regarding employee relations, stakeholder stability, reputation, and broader social-risk management. To the extent that these disclosures improve creditors' information environment and reduce uncertainty regarding firm-specific risks, they may influence credit assessments and financing conditions. However, because the informational content of each ESG pillar differs, creditors need not assign equal financing relevance to environmental, governance, and social signals.

Trade-Off Theory provides the capital-structure mechanism through which these informational effects may translate into leverage. The theory proposes that firms balance the benefits of debt, particularly the tax advantages of borrowing,

against expected financial-distress and related financing costs (Kraus & Litzenberger, 1973). Within this framework, credible ESG disclosure may affect leverage indirectly by altering creditors' perceptions of firm risk. Where environmental or governance transparency reduces uncertainty regarding regulatory exposure, managerial opportunism, monitoring quality, or future cash-flow risk, expected financing frictions and perceived distress costs may decline, thereby expanding debt capacity. Consequently, stronger ESG disclosure may be positively associated with leverage when its informational benefits improve access to debt or reduce risk-related financing constraints. This mechanism does not imply that all ESG information necessarily increases leverage; rather, its effect depends on whether the information disclosed is sufficiently relevant and credible to alter creditors' assessment of financing risk.

Behavioral–Governance Fit Theory (BGFT) provides a complementary explanation for why ESG dimensions may exhibit different financing relationships. BGFT proposes that organizational outcomes arise not merely from individual behavioral or governance attributes in isolation, but from the degree of alignment between internal organizational dynamics and governance quality (Alslaibi et al., 2026). Although BGFT was originally developed in the context of behavioral dynamics, corporate governance, and bank profitability, its underlying fit logic provides a useful conceptual lens for interpreting pillar-level ESG heterogeneity. Applied cautiously to the present setting, the theory suggests that the economic relevance of ESG information depends on how effectively particular disclosure signals align with the governance, monitoring, and risk-assessment mechanisms through which creditors evaluate firms. Governance and environmental information may therefore have stronger financing relevance when they correspond closely to creditor concerns regarding oversight, compliance, risk exposure, and financial resilience, whereas social information may generate stakeholder or reputational benefits without producing an equally direct effect on debt capacity. The present study does not constitute a direct empirical test of BGFT; rather, it extends its alignment principle to interpret why ESG disclosure dimensions may differ in their association with leverage.

The three theories provide an integrated explanation of the ESG–leverage relationship. Signaling Theory explains how ESG disclosure communicates firm-specific information to creditors; BGFT explains why the relevance of that information may differ across ESG pillars according to its alignment with governance and creditor-evaluation mechanisms; and Trade-Off Theory explains how reductions in perceived financing risk may ultimately affect firms' debt capacity and leverage. This integrated perspective therefore supports examining Environmental, Governance, and Social disclosure both individually and jointly, while allowing their estimated relationships with Firm Leverage to remain heterogeneous rather than assuming a uniform ESG effect

2.2 Social Disclosure

Social disclosure encompasses labor relations, employee health and safety, human

rights, community engagement, and product responsibility. Based on Stakeholder Theory (Freeman, 1984) and Resource Dependence Theory, strong social performance and transparent disclosure build "moral capital" and goodwill. This moral capital acts as an insurance-like mechanism during operational crises or legal litigation, safeguarding firm cash flows. Consequently, credit risk is reduced, elevating the firm's debt capacity and encouraging higher leverage.

Empirical studies support the positive association between social disclosure and leverage. Attig et al. (2013) find that social responsibility disclosures improve firm credit ratings, which directly lowers borrowing constraints and increases debt capacity. Bae et al. (2019) show that firms demonstrating high social commitment benefit from lower bank loan spreads, enabling higher leverage, particularly in economies with strong legal protection for stakeholders. On the other hand, extensive social expenditures are sometimes viewed through an agency cost lens as managerial "entrenchment" or waste of corporate resources (Barnea & Rubin, 2010). Lenders perceiving social expenditures as uncompensated cash outflows may demand higher interest premiums, thereby dampening firm leverage. Garcia et al. (2017) note that social disclosure has a weaker and often statistically insignificant direct impact on capital structure compared to environmental and governance pillars, particularly in emerging market settings where social reporting remains voluntary or unstandardized. Debt-market evidence supports a more qualified expectation than a uniformly positive financing effect. CSR disclosure has been associated with debt access and lending conditions, but creditors' responses depend on borrower quality, information asymmetry, and the nature of the social activities being evaluated (Goss & Roberts, 2011; Hamrouni et al., 2019a, 2019b; Kordsachia, 2020).

Related evidence indicates that stronger social responsibility can be associated with lower corporate-bond financing costs or greater access to public debt, consistent with reputation and information-asymmetry channels, although these benefits are not necessarily uniform across firms or debt markets (Ge & Liu, 2015; Chang et al., 2025). This mixed evidence supports retaining a directional hypothesis while recognizing ex ante that the empirical relationship may be attenuated by heterogeneous creditor valuations of social information.

Notwithstanding concerns regarding non-capital expenditure costs, the moral capital and cash-flow stabilization benefits derived from positive social disclosure mitigate lender risk perceptions, thereby exerting a positive net impact on firm leverage.

H1: Social Disclosure has a positive and statistically significant association on Firm Leverage.

2.3 Governance Disclosure

Governance disclosure details board composition, executive compensation, shareholder rights, internal controls, and audit mechanisms. Evidence from Jordanian industrial firms further indicates that particular board characteristics including board size, financial expertise, meetings, and independence can exhibit distinct associations with audit-quality measures, highlighting the informational relevance of the specific governance mechanisms underlying broad governance assessments (Aljarrah & Alsiaibi, 2025). Rooted in Agency Theory (Jensen & Meckling, 1976), governance

disclosures mitigate agency conflicts between managers, shareholders, and bondholders. By demonstrating robust internal oversight, firms reassure debtholders against wealth-expropriation risks, asset substitution, and managerial opportunistic behavior. Related evidence from Palestinian banks shows that COSO-based control dimensions are positively associated with fraud prevention and detection, while their effectiveness varies with employee tenure, illustrating that substantive internal-control quality depends not only on formal structures but also on the organizational conditions under which those controls operate (Alslaihi et al., 2026). Reduced agency costs of debt encourage debtholders to provide financing on more favorable terms, supporting higher financial leverage.

Strong governance disclosures are consistently linked with favorable debt capital outcomes. Jiraporn et al. (2012) and Guizani, M (2020) show that superior corporate governance disclosures lead to higher credit ratings and lower debt borrowing costs, enabling firms to maintain higher target leverage ratios. Similarly, Lehman (2019) finds that governance transparency reduces bond yield premiums, facilitating greater leverage utilization among non-financial firms. Creditor-oriented corporate-governance research provides substantial support for these mechanisms. Board structure, monitoring quality, institutional ownership, and broader governance arrangements have been associated with the cost of debt, bond ratings, and credit ratings because such mechanisms can affect both managerial agency risk and the reliability of information available to creditors (Anderson et al., 2004; Bhojraj & Sengupta, 2003; Ashbaugh-Skaife et al., 2006; Klock et al., 2005).

Nevertheless, governance–debt relationships remain institutionally contingent. Evidence from Canada, Oman, and the United Arab Emirates indicates that governance mechanisms can influence debt pricing and capital-structure outcomes, but their effects differ according to ownership structures, monitoring arrangements, and institutional environments (Ghouma & Ben-Nasr, 2018; Hashim & Amrah, 2016; Hussainey & Aljifri, 2012). Accordingly, stronger governance disclosure may facilitate debt capacity through lower information and agency risk without implying that all governance mechanisms mechanically increase leverage.

Conversely, strong corporate governance mechanisms (e.g., board independence, shareholder rights) can act as a disciplinary force that restrains managers from maintaining excessively high debt levels. Detthamrong et al. (2016) find a negative relationship between governance quality and leverage, arguing that powerful boards enforce conservative capital structures to prevent financial distress. Abor and Biekpe (2007) observe that the governance-leverage nexus varies depending on firm size and board characteristics, finding neutral or weak effects in smaller firms where informal governance mechanisms predominate. While governance oversight deters excessive risky borrowing, its primary role in financial markets is the reduction of bondholder agency costs and default premiums. The resulting decrease in debt costs facilitates greater financial leverage for transparent firms.

H2: Governance Disclosure has a positive and statistically significant association on Firm Leverage.

2.4 Environmental Disclosure

Environmental disclosure informs stakeholders about a firm's carbon footprint, waste management, regulatory compliance, and climate risk mitigation strategies. Under Resource-Based View (RBV) and Signaling Theory, high environmental disclosure signals superior operational efficiency and proactive climate risk management. Because climate risk is increasingly viewed by financial regulators and rating agencies as a systemic financial risk, transparent environmental disclosures alleviate credit default concerns, allowing firms to secure larger debt volumes, including specialized green financing instruments. Empirical literature shows strong support for a positive relationship between environmental disclosure and leverage, particularly through green credit channels. Caragnano et al. (2020) demonstrate that European firms with high environmental disclosure experience lower yield spreads on debt, directly facilitating higher leverage levels. Li et al. (2022) analyze Chinese listed firms and confirm that environmental information disclosure significantly increases access to bank loans, particularly after the implementation of green credit policies. Contradictory evidence suggests that rigorous environmental compliance and detailed disclosures require substantial capital expenditures (CapEx). Fonseca et al. (2019) observe that in energy-intensive industries, extensive environmental liabilities highlighted in disclosures lead risk-averse lenders to restrict credit, thereby reducing firm leverage. Giannopoulos et al. (2022) find that the impact of environmental disclosure on capital structure is highly industry-contingent, exhibiting significant positive coefficients in high-polluting sectors but insignificant effects in services or light manufacturing sectors. Environmental characteristics have become directly relevant to debt-market risk assessment. Empirical studies show that carbon emissions, environmental regulation, air-pollution exposure, and physical climate risk can influence borrowing costs, credit conditions, and firms' leverage choices, indicating that creditors price both environmental exposures and firms' ability to manage them (Kumar & Firoz, 2018; Palea & Drogo, 2020; Fard et al., 2020; Tan et al., 2021; Huang et al., 2022; Ginglinger & Moreau, 2023).

The financing implications of environmental information are nevertheless multidimensional. Stronger corporate environmental responsibility can improve bank-loan contracting conditions, whereas selective environmental disclosure may increase creditor concerns when disclosure credibility is questionable; the cost-of-debt implications of environmental practices also vary with firm-level contingencies (Cai & He, 2022; Attig et al., 2024; Karaman et al., 2024). Environmental disclosure can therefore support debt capacity when it credibly reduces uncertainty, while underlying environmental exposure may operate in the opposite direction.

Despite the potential exposure of environmental liabilities, the rapid growth of green banking, ESG-linked debt, and institutional requirements for climate risk reporting ensure that proactive environmental disclosure enhances debt capacity and capital access.

H3: Environmental Disclosure has a positive and statistically significant association on Firm Leverage.

2.5 Joint Contribution of ESG Dimensions

Considered jointly, the Environmental, Governance, and Social dimensions of ESG disclosure capture complementary aspects of corporate sustainability, transparency, and non-financial risk management. Their joint consideration may reduce information asymmetry between managers and debt markets, decrease perceived non-financial risk, and improve financing conditions.

Empirical research across diverse geographic contexts demonstrates a positive association between aggregate ESG disclosure/performance and firm leverage. Raimo et al. (2021) examine international evidence and demonstrate that ESG disclosure reduces the cost of debt, allowing firms to support higher leverage ratios. Al Amosh and Khatib (2021) find a statistically significant positive effect of ESG disclosure on leverage among Jordanian listed firms, arguing that transparent disclosure increases bank credit access. Similarly, Eliwa et al. (2021) observe across EU countries that credit markets reward ESG disclosure with favorable lending terms, leading to higher debt ratios. Conversely, some studies find a negative relationship between ESG disclosure and leverage. Fang & Parida (2022) argue that high-ESG firms face lower equity issuance costs due to reduced information asymmetry, prompting them to issue equity rather than debt, thereby reducing leverage (consistent with Pecking Order Theory). Sharfman and Fernando (2008) show that enhanced environmental/ESG performance allows firms to reduce capital risk, which can lead to lower leverage if firms choose to maintain conservative financial policies. Such findings often vary according to regulatory context and the level of financial-market development. Recent debt-market research reinforces the importance of distinguishing between the overall financing relevance of ESG information and the contribution of particular dimensions. ESG disclosure and ratings have been associated with debt-financing structures, credit assessments, and borrowing costs, while uncertainty surrounding ESG measurement can itself affect debt pricing (Feng & Wu, 2021; Chodnicka-Jaworska, 2021; Li et al., 2024; Chen & Liu, 2025; Fiorillo et al., 2025).

Accordingly, statistical significance of the ESG dimensions when evaluated jointly need not imply that Environmental, Governance, and Social disclosure exert identical individual relationships with leverage. Aggregate ESG measures may obscure both pillar-level heterogeneity and disagreement embedded in the measurement process, making simultaneous examination of the separate dimensions analytically preferable for the present research question (Berg et al., 2022; Christensen et al., 2021; Liu, 2022). Apergis et al. (2022) note that the ESG-leverage relationship is contingent on the institutional framework, showing non-linear or statistically insignificant effects in weakly regulated emerging markets compared to strongly regulated developed markets. While lower equity costs can incentivize equity issuance, the predominant mechanism operating through modern credit markets is the substantial reduction in debt financing costs and increased credit supply from institutional lenders favoring compliant borrowers. Accordingly, this study examines whether the Environmental, Governance, and Social dimensions of ESG disclosure jointly contribute significantly to explaining corporate leverage.

H4: *The Environmental, Governance, and social dimensions of ESG disclosure jointly contribute significantly to explaining Firm Leverage.*

3. Methodology

3.1 Research Design

This study adopts a quantitative panel-data research design to examine the relationship between Environmental, Social, and Governance (ESG) disclosure and firm leverage among firms in Italy for the period of 2014-2023. Panel data are appropriate for this research setting because they permit the analysis of observations across firms and over time, thereby allowing the empirical models to account for variation within the panel structure rather than relying exclusively on cross-sectional differences. The design is observational and is therefore used to identify statistical associations between ESG disclosure characteristics and corporate leverage rather than to establish causal effects.

3.2 Study Context population and Sample

The empirical analysis is restricted to firms from Italy. The final firm sample comprises 70 firms, while 10 firms were omitted because the information required for the principal study variables was unavailable. The use of a single-country setting provides a comparatively consistent national context within which the ESG–capital structure relationship can be examined. The 2014–2023 period was selected based on the availability of the required financial and ESG data over the study period. Because the Environmental, Governance, and Social indicators are obtained from Eikon, the variables should be interpreted as provider-specific operationalizations of ESG characteristics rather than universally standardized measures. Research comparing ESG-rating providers documents substantial differences in measurement scope and methodology, including for Refinitiv-related ratings, reinforcing the importance of identifying the database and retaining the three pillars separately in the empirical analysis (Berg et al., 2022; Christensen et al., 2021).

3.3 Variable Definition and measurement

Table 1 summarizes the variables employed in the empirical analysis, their roles in the regression models, and their conceptual definitions.

Table 1. Definition and Measurement of Study Variables

Variable	Symbol	Variable Type	Definition	Measurement / Operationalization
Firm Leverage	lev	Dependent variable	Represents the firm's capital-structure outcome and its use of debt financing. The	Total Debt/ Total Assets

			study examines whether ESG disclosure dimensions are associated with variations in firm leverage.
			Represents the environmental dimension of ESG disclosure, including information
Environmental Disclosure/Score	EnvScore	Independent variable	relating to environmental risk, carbon emissions, waste management, regulatory compliance, and climate-risk mitigation. Eikon Score
			Represents the governance dimension of ESG disclosure, including information
Governance Disclosure/Score	GovScore	Independent variable	concerning board structures, executive compensation, shareholder rights, internal controls, audit mechanisms, and corporate oversight. Eikon Score
			Represents the social dimension of ESG disclosure, including labor
Social Disclosure/Score	SocScore	Independent variable	relations, employee health and safety, Eikon Score

			human rights, community engagement, and product responsibility.
Joint ESG Dimensions Specification	Environmental, Governance, and Social Scores jointly	Main explanatory specification – Model 1	Represents the joint inclusion of the Environmental, Governance, and Social disclosure dimensions in Model 1 to assess their joint contribution to Firm Leverage.
Firm Size	Firmsize	Control variable	Controls for differences in firm scale that may be systematically associated with firms' financing capacity and capital-structure decisions.
			Environmental, Governance, and Social Eikon scores entered simultaneously
			Log of Total Assets

3.4 Empirical Model Specification

Four panel regression specifications are used to examine the hypotheses. The empirical specifications can be represented as follows:

Model 1 — Joint ESG Dimensions Specification / H4

$$Lev_{it} = \beta_0 + \beta_1 EnvScore_{it} + \beta_2 GovScore_{it} + \beta_3 SocScore_{it} + \beta_4 FirmSize_{it} + \epsilon_{it}$$

Model 1 evaluates the joint contribution of the Environmental, Governance, and Social dimensions through their joint inclusion in the regression specification.

Model 2 — Environmental Disclosure / H3

$$Lev_{it} = \beta_0 + \beta_1 EnvScore_{it} + \beta_2 FirmSize_{it} + \epsilon_{it}$$

Model 3 — Governance Disclosure / H2

$$Lev_{it} = \beta_0 + \beta_1 GovScore_{it} + \beta_2 FirmSize_{it} + \epsilon_{it}$$

Model 4 — Social Disclosure / H1

$$\text{Lev}_{it} = \beta_0 + \beta_1 \text{SocScore}_{it} + \beta_2 \text{FirmSize}_{it} + \varepsilon_{it}$$

Where:

Lev_{it} = Firm leverage for firm *i* in period *t*

EnvScore_{it} = Environmental Disclosure/Score for firm *i* in period *t*

GovScore_{it} = Governance Disclosure/Score for firm *i* in period *t*

SocScore_{it} = Social Disclosure/Score for firm *i* in period *t*

FirmSize_{it} = Firm Size for firm *i* in period *t*

β₀ = Intercept or constant term

β₁, β₂, β₃, β₄ = Regression coefficients associated with the respective explanatory variables

ε_{it} = Error term for firm *i* in period *t*

i = Firm identifier

t = Time-period identifier

This ordering preserves the hypothesis–model correspondence specified in the empirical results: H1 relates to Social Disclosure in Model 4, H2 to Governance Disclosure in Model 3, H3 to Environmental Disclosure in Model 2, and H4 relates to the joint ESG dimensions specification in Model 1. Panel regression analysis was used to estimate the four specifications. The model-selection results identify the fixed-effects estimator as the selected specification for Models 1–4 based on the Hausman procedure. Conceptually, the Hausman test is used in panel-data analysis to evaluate the appropriateness of fixed-effects relative to random-effects estimation by assessing whether the assumptions required for the random-effects estimator are consistent with the data-structure. The Hausman test favored the fixed-effects estimator for all four models, with p-values below .05. The estimator-selection procedure follows Hausman's (1978) specification-testing framework, under which systematic differences between estimators provide evidence concerning whether the assumptions required for the random-effects specification are tenable. Given the reported Hausman-test results, the fixed-effects estimator is therefore retained consistently across Models 1–4.

4. Results

This section reports the empirical findings concerning the relationship between ESG disclosure and firm leverage. The analysis proceeds from descriptive statistics to the correlation matrix and then to the fixed-effects regression specifications used to assess the four hypotheses. Statistical significance follows the convention reported with the results: *** ($p < .01$), ** ($p < .05$), and * ($p < .10$).

4.1 Descriptive Statistics

Table 2 summarizes the distributions of Firm Leverage, Firm Size, and the three ESG dimensions.

Table 2: Descriptive Statistics

Variable	Observations	Mean	Std. Dev.	Minimum	Maximum
Firm Leverage (lev)	547	.10	.05	.06	.21
Firm Size (Firmsize)	689	9.872	.851	7.835	12.029
Environmental Score (EnvScore)	681	58.459	23.104	2.912	98.907
Governance Score (GovScore)	689	53.246	21.405	5.481	97.116
Social Score (SocScore)	689	66.115	18.456	12.144	96.308

The mean value of Firm Leverage is .10, with a standard deviation of .05 and values ranging from 0.06 to .21. Firm Size has a mean of 9.872 and comparatively limited dispersion around this value, with a standard deviation of .851. Among the ESG dimensions, Social Score records the highest mean at 66.115, followed by Environmental Score at 58.459 and Governance Score at 53.246. Environmental Score exhibits the greatest dispersion among the ESG dimensions (SD = 23.104), followed by Governance Score (SD = 21.405) and Social Score (SD = 18.456). These distributions indicate substantial variation in the ESG dimensions across the observations, particularly for environmental disclosure. The observation counts are not identical. Firm Size, Governance Score, and Social Score each contain 689 observations, Environmental Score contains 681 observations, and leverage contains 547 observations. These differences indicate incomplete availability across variables or an otherwise non-uniform panel structure.

4.2 Correlation Analysis

Table 3 reports the bivariate correlations among the variables. Firm Leverage is negatively correlated with Firm Size (($r=-.549$)), Environmental Score (($r=-.376$)), Governance Score (($r=-.135$)), and Social Score (($r=-.246$)). Thus, at the unconditional bivariate level, higher values of each explanatory variable are associated with lower leverage. The strongest of these correlations is observed between Firm Size and leverage. Positive correlations are observed among the three ESG dimensions. Environmental and Social Scores have the strongest pairwise relationship (($r=.642$)), followed by Governance and Social Scores (($r=.528$)). Environmental and Governance Scores are positively correlated at ($r=.326$). Firm Size is also positively correlated with Environmental (($r=.564$)), Governance (($r=.429$)), and Social (($r=.494$)) Scores.

The sign of a simple correlation may differ from that obtained from a multivariate fixed-effects regression because the regression coefficient reflects the relationship conditional on the other variables in the specification and on the variation exploited by the panel estimator. Variance inflation factors were examined to assess multicollinearity. All VIF values were below the adopted threshold of 5, indicating no evidence of problematic multicollinearity among the explanatory variables.

Table 3 : Matrix of correlations

Variables	(1)	(2)	(3)	(4)	(5)
(1) lev	1.000				
(2) Firmsize	-0.549	1.000			
(3) EnvScore	-0.376	0.564	1.000		
(4) GovScore	-0.135	0.429	0.326	1.000	
(5) SocScore	-0.246	0.494	0.642	0.528	1.000

4.3 Regression Results

Table 4 presents the four fixed-effects regression specifications. The Hausman decision reported for each model favors fixed effects. All four models are statistically significant overall, with Prob > F = .000. The explanatory power is relatively similar across specifications, with R² values ranging from .409 to .430.

Table 4: Regression results

	Model 1		Model 2		Model 3		Model 4	
Lev	Coef	p-value.	Coeff	p-value	Coeff	p-value	Coef	p-value
Firmsize	-.038	0***	-.034	0***	-.042	0***	-.038	0***
EnvScore	0.034	.028**	0.04	.017**				

GovScore	0.23	.002***			0.07	0***		
e	3							
SocScore	0.12	.928					0.004	.642
							5	
Constant	.412	0***	.396	0***	.44	.498***	.425	.486***
R-squared		0.430		0.418		0.423		0.409
F-test		29.986		33.754		35.082		33.108
Akaike crit. (AIC)		-1977.781		-1969.774		-2004.953		-1991.775
SD dependent var		0.050		0.050		0.050		0.050
Number of obs		539		539		547		547
Prob > F		0.000		0.000		0.000		0.000
Bayesian crit. (BIC)		-1917.72		-1918.29		-1953.30		-1940.12
Hausman		Fixed		Fixed		Fixed		Fixed

*** $p < .01$, ** $p < .05$, * $p < .1$ -1953.300

Model 1: Joint ESG Dimensions Specification / H4. Model 1 simultaneously includes Environmental, Governance, and Social Scores together with Firm Size. Environmental Score is positive and statistically significant (coefficient = .034, ($p=.028$)), while Governance Score is also positive and significant (coefficient = .233, ($p=.002$)). In contrast, Social Score is positive but statistically non-significant (coefficient = .12, ($p=.928$)). Firm Size is negative and statistically significant (coefficient = $-.038$, ($p<.01$)). The model reports ($R^2=.430$), ($F=29.986$), Prob > F = .000, and 539 observations.

The findings from Model 1 therefore indicate heterogeneous pillar-level relationships: Environmental and Governance Scores are statistically related to leverage, whereas Social Score is not.

Model 2: Environmental Disclosure / H3. Environmental Score has a positive coefficient of .04 and is statistically significant at the 5% level (($p=.017$)). Firm Size remains negative and statistically significant (coefficient = $-.034$, ($p<.01$)). Model 2 reports ($R^2=.418$), ($F=33.754$), $\text{Prob} > F = .000$, and 539 observations. Thus, after accounting for Firm Size within the selected panel specification, greater Environmental Disclosure is positively and significantly associated with Firm Leverage. Because the coefficient direction and statistical significance are consistent with the prediction, H3 is supported.

Model 3: Governance Disclosure / H2. Governance Score has a positive coefficient of .07 and is statistically significant at the 1% level (($p<.01$), reported as .000). Firm Size has a negative coefficient of $-.042$ and is likewise statistically significant at the 1% level. Model 3 reports ($R^2=.423$), ($F=35.082$), $\text{Prob} > F = .000$, and 547 observations. The positive and statistically significant Governance coefficient is consistent with the predicted relationship; accordingly, H2 is supported.

Model 4: Social Disclosure / H1. Social Score has a positive coefficient of .0045 but is not statistically significant (($p=.642$)). Firm Size remains negative and statistically significant (coefficient = $-.038$, ($p<.01$)). Model 4 reports ($R^2=.409$), ($F=33.108$), $\text{Prob} > F = .000$, and 547 observations. Although the point estimate for Social Disclosure is positive, H1 specifically predicts a positive **and statistically significant** relationship. The high p-value therefore indicates that H1 is not supported. The joint significance Wald/F joint-significance statistic and p-value rejected the null hypothesis that the Environmental, Governance, and Social coefficients are simultaneously equal to zero, $p = 0.001$, thereby supporting H4. Table 5 summarizes the results in terms of the hypothesis used in this research.

Table 5: Hypothesis Summary

Hypothesis	Model	Predicted Relationship	Key Statistical Evidence	Decision
H1	Model 4	Social Disclosure → (+) Firm Leverage	Coef. = .0045; ($p=.642$)	Not supported
H2	Model 3	Governance Disclosure → (+) Firm Leverage	Coef. = .07; ($p<.01$)	Supported
H3	Model 2	Environmental Disclosure → (+) Firm Leverage	Coef. = .04; ($p=.017$)	Supported
H4	Model 1	E,S,G Disclosure → (+) Firm Leverage	Environmental: .034, ($p=.028$); Governance: .233, ($p=.002$); Social: .12, ($p=.928$).	Supported

Overall, the regression results provide support for the Environmental and Governance hypotheses but not for the Social Disclosure hypothesis. Model 1 further demonstrates that the three ESG pillars do not display uniform relationships with leverage when estimated jointly.

5. Discussion

The findings reveal a differentiated relationship between ESG disclosure and firm leverage among the Italian firms examined. Environmental Disclosure is positively and significantly associated with leverage in Model 2, while Governance Disclosure exhibits a positive and statistically significant association in Model 3. In contrast, Social Disclosure does not demonstrate the statistically significant positive relationship predicted by H1. The joint ESG specification reinforces this heterogeneous pattern: Environmental and Governance disclosures remain significant, whereas Social Disclosure does not. Firm Size, meanwhile, shows a consistently negative and statistically significant relationship with leverage across all four specifications. These findings indicate that the financing relevance of ESG disclosure may depend on the particular information conveyed by each ESG pillar rather than ESG information operating uniformly. This distinction is important for interpreting H4. Model 1 jointly includes the Environmental, Governance, and Social dimensions and therefore provides evidence on their joint contribution to Firm Leverage.

H1 predicted that Social Disclosure would have a positive and statistically significant relationship with Firm Leverage. Although the estimated coefficient is positive, the relationship is statistically non-significant ($p=.642$), and H1 is therefore not supported. This finding qualifies the Stakeholder Theory and Resource Dependence reasoning developed in the manuscript, under which stronger social disclosure was expected to generate moral capital, stakeholder goodwill, and cash-flow protection that could reduce lenders' risk perceptions and increase debt capacity. The result differs from the positive financing mechanisms discussed by Attig et al. (2013), who associate corporate social responsibility with improved credit ratings, and Bae et al. (2019), who link stronger social commitment with more favorable bank-loan conditions. At the same time, the non-significant result is compatible with the mixed evidence already recognized in the manuscript. Garcia et al. (2017), for example, is presented as showing that the direct capital-structure relevance of the social dimension can be weaker or statistically insignificant relative to environmental and governance dimensions. Barnea and Rubin (2010) further provide an agency-based counterargument under which extensive social expenditures may be interpreted as managerial resource allocation that does not necessarily enhance financing capacity. One plausible interpretation is therefore that social disclosure conveys stakeholder and reputational information without necessarily translating directly into changes in firms' leverage ratios. Creditors may also assign greater immediate financing relevance to information linked to environmental exposures or governance controls than to the broader stakeholder information contained in social disclosure. These mechanisms remain interpretive rather than directly tested explanations. The

Italian evidence consequently does not imply that social disclosure lacks economic value; rather, it indicates that the regression results do not establish a statistically reliable direct relationship between Social Disclosure and Firm Leverage. The failure to support H1 is consistent with the broader conclusion that creditor responses to social and CSR information are conditional rather than uniform. Although some studies associate CSR with improved bond or loan-market conditions, others demonstrate that lending effects vary with borrower characteristics, information asymmetry, and how creditors evaluate discretionary social expenditure (Goss & Roberts, 2011; Ge & Liu, 2015; Hamrouni et al., 2019a, 2019b; Chang et al., 2025). The present non-significant coefficient can therefore be interpreted as evidence that social disclosure does not translate reliably into leverage variation within the examined Italian firms rather than as evidence that social information has no economic relevance.

H2 is supported by the positive and statistically significant Governance Disclosure coefficient. This finding is consistent with the Agency Theory mechanism developed in the theoretical framework. Governance disclosure provides information about monitoring arrangements, internal controls, shareholder rights, board structures, and other mechanisms that may reduce information asymmetry and managerial opportunism. From the perspective of creditors, greater visibility into such governance mechanisms may reduce perceived agency costs of debt and uncertainty surrounding managerial actions, thereby facilitating access to debt financing. Complementary evidence from listed firms in Jordan, Egypt, and Palestine indicates that governance credibility is strengthened when assurance systems are substantively integrated into internal audit, risk-management, and board-oversight structures and are supported by credible external verification (Costantini, 2026). The result is consistent with the literature synthesized in the manuscript that associates stronger governance transparency with favorable credit-market outcomes. Jiraporn et al. (2012) and Guizani, M(2020) are presented as linking governance quality with improved credit conditions and borrowing capacity, while Lehman (2019) associates governance transparency with lower bond yield premiums. The present result therefore reinforces the argument that governance-related information can have financing relevance through the mitigation of agency and information risks. However, the result does not imply that governance mechanisms necessarily encourage greater leverage in every institutional setting. Detthamrong et al. (2016) provide a contrasting explanation in which effective boards constrain excessive borrowing as part of prudent financial oversight, while Abor and Biekpe (2007) indicate that governance-leverage relationships can vary with firm characteristics. Against this mixed background, the Italian evidence contributes to the strand of the debate emphasizing governance transparency as a mechanism associated with greater debt capacity rather than exclusively as a constraint on borrowing. The positive Governance result is consistent with creditor-oriented evidence showing that stronger monitoring, board structures, institutional oversight, and governance quality can improve credit ratings or reduce debt-financing costs by mitigating agency and information risks (Anderson et al., 2004; Bhojraj & Sengupta, 2003; Ashbaugh-Skaife et al., 2006; Klock et al., 2005). At the same time, cross-country evidence

demonstrates that governance effects are conditional on institutional and ownership arrangements (Ghouma & Ben-Nasr, 2018; Hashim & Amrah, 2016; Hussainey & Aljifri, 2012), supporting a context-specific rather than universal interpretation of the Italian coefficient. A similarly contingent pattern emerges from Palestinian banking evidence, where corporate governance moderates some relationships between internal organizational dynamics and profitability but not others, reinforcing the interpretation of governance as a context-dependent mechanism rather than a uniformly operating organizational attribute (Alslaibi et al., 2026). The positive and statistically significant Environmental Disclosure coefficient supports H3. This finding is consistent with the theoretical expectation that environmental transparency can provide creditors with information concerning environmental exposures, regulatory compliance, climate-risk management, and firms' capacity to address non-financial risks. Under Signaling Theory, more extensive environmental disclosure may communicate stronger risk-management capability and transparency to capital providers. Within the broader Trade-Off logic of the manuscript, information that reduces perceived risk can potentially expand debt capacity by lowering the expected financing consequences of environmental and regulatory uncertainty. The finding is consistent with Caragnano et al. (2020), which the manuscript identifies as evidence that stronger environmental disclosure is associated with lower debt yield spreads among European firms, and with Li et al. (2022), who associate environmental information disclosure with improved access to bank lending. Such findings support the interpretation that environmental information can be relevant to creditors through risk assessment and financing channels. The result nevertheless contrasts with the alternative mechanisms represented by Fonseka et al. (2019), where disclosed environmental liabilities may increase creditor concern in environmentally intensive settings, and Giannopoulos et al. (2022), where the environmental disclosure–leverage relationship varies across industries. These contrasting studies demonstrate why a positive coefficient should not be interpreted as universal across firms or institutional environments. An important feature of the present results is that Environmental Score has a negative simple correlation with leverage ($r = -.376$) but a positive coefficient in the fixed-effects regression. This difference is not contradictory. The correlation represents an unconditional bivariate association, whereas the panel regression estimates the environmental relationship conditional on Firm Size and the relevant model specification while exploiting the variation captured by the selected fixed-effects estimator. The regression result therefore indicates that the conditional panel relationship differs from the raw cross-variable association observed in the correlation matrix. The positive Environmental coefficient should not be interpreted as evidence that greater environmental risk itself increases debt capacity. Prior research generally indicates that carbon exposure, stringent environmental regulation, pollution, and physical climate risk can increase borrowing costs or reduce leverage (Kumar & Firoz, 2018; Palea & Drogo, 2020; Fard et al., 2020; Tan et al., 2021; Huang et al., 2022; Ginglinger & Moreau, 2023). The present result is instead compatible with a disclosure and risk-management channel in which greater transparency regarding environmental practices may reduce uncertainty regarding how such risks are identified and managed. This distinction is reinforced by evidence that creditors respond not merely to the quantity of environmental

information but also to the underlying environmental practices and credibility of disclosure. Corporate environmental responsibility can affect bank-loan contracting, whereas selective or potentially misleading environmental disclosure may carry adverse credit implications (Cai & He, 2022; Attig et al., 2024; Karaman et al., 2024).

H4 proposed that the Environmental, Governance, and Social dimensions of ESG disclosure would jointly contribute significantly to explaining Firm Leverage. This finding indicates that ESG-related disclosure has collective explanatory relevance for firms' capital-structure decisions, although the individual pillar results reveal considerable heterogeneity. Environmental and Governance Disclosure exhibit positive and statistically significant relationships with leverage, whereas Social Disclosure is statistically non-significant. The findings therefore suggest that the collective financing relevance of ESG disclosure is driven more strongly by environmental and governance information than by the social dimension within the examined Italian firms. The theoretical framework supports this proposition through several complementary mechanisms. Greater ESG transparency may reduce information asymmetry between managers and creditors, lower perceived non-financial risks, and improve financing conditions. These mechanisms are consistent with Signaling and Information Asymmetry perspectives and with the Trade-Off Theory argument that reductions in financing risk can increase debt capacity. Conversely, the manuscript also recognizes the Pecking Order possibility that reduced information asymmetry may improve access to equity and thereby reduce dependence on debt. It suggests that creditors may respond differently to the distinct information channels contained within ESG disclosure. This differentiated pattern is relevant to the literature already reviewed in the manuscript. Raimo et al. (2021), Al Amosh and Khatib (2021), and Eliwa et al. (2021) are presented as supporting favorable debt-market implications of stronger ESG disclosure. In contrast, Fang & Parida (2022) and Sharfman and Fernando (2008) provide mechanisms through which stronger ESG characteristics may instead encourage lower leverage, while Apergis et al. (2022) emphasizes institutional contingency in the ESG–capital structure relationship. The heterogeneous findings observed here are therefore consistent with the broader proposition that ESG-related financing effects need not be uniform across constructs or contexts. The statistically significant joint contribution of the ESG dimensions alongside heterogeneous individual coefficients is consistent with the proposition that aggregate sustainability information contains multiple financing-relevant information channels. Complementary evidence from EU-listed firms finds that higher ESG performance is associated with larger corporate cash holdings and that board gender diversity strengthens this relationship, suggesting that ESG may also be relevant to corporate liquidity and financial-resilience choices beyond debt financing alone (Samara et al., 2026). Evidence linking ESG information to debt financing and borrowing costs supports its collective relevance (Feng & Wu, 2021; Li et al., 2024; Fiorillo et al., 2025), while documented ESG-rating disagreement demonstrates why an aggregate indicator should not automatically be interpreted as a homogeneous construct (Berg et al., 2022; Christensen et al., 2021; Chen & Liu, 2025; Liu, 2022).

Firm Size is not a primary hypothesis in the study, but its consistent result

warrants brief consideration. The coefficient is negative and statistically significant in Model 1 ($-.038$), Model 2 ($-.034$), Model 3 ($-.042$), and Model 4 ($-.038$), with all reported at the 1% significance level. Thus, conditional on the respective ESG specification, larger values of the reported Firm Size measure are associated with lower leverage.

This finding indicates that differences in firm scale are systematically related to the capital-structure outcome and confirms the empirical relevance of retaining Firm Size as a control variable. One possible capital-structure interpretation is that firms represented by higher values of the size measure may have financing characteristics that reduce reliance on leverage. However, because the manuscript does not develop a specific hypothesis for Firm Size, stronger theoretical interpretation would exceed the available evidence. The size result should therefore be treated as an important control-variable association rather than elevated to the status of a separately tested study hypothesis. Although Firm Size is retained as a control rather than a separately hypothesized variable, its significant coefficient can be situated within established capital-structure research, where firm scale is routinely identified as an important leverage determinant alongside profitability, asset tangibility, growth opportunities, and industry characteristics (Rajan & Zingales, 1995; Frank & Goyal, 2009; Graham & Leary, 2011). The negative coefficient observed here should therefore be interpreted as a sample-specific conditional association rather than as evidence of a universally negative size–leverage relationship. The principal theoretical implication is therefore not simply that ESG disclosure is associated with capital structure, but that the financing relevance of sustainability disclosure appears to depend on the specific information channel conveyed to creditors. Environmental information may communicate risk-management and regulatory exposure, governance information may communicate monitoring quality and agency-risk mitigation, and social information may carry stakeholder value without exhibiting an equally direct association with leverage. This interpretation extends the manuscript's theoretical framework by showing that the competing capital-structure mechanisms are more informative when applied at the ESG-pillar level than when ESG is assumed to operate as a single homogeneous construct.

6. Conclusion and Implications

This study examined the relationship between Environmental, Governance, and Social disclosure and Firm Leverage among Italian firms during the period 2014–2023. The analysis was motivated by the proposition that the different pillars of ESG disclosure may communicate distinct forms of information to creditors and other capital providers and therefore need not exhibit uniform relationships with corporate financing outcomes. Using a quantitative panel-data design, Eikon Environmental, Governance, and Social scores were examined in relation to Firm Leverage, measured as Total Debt divided by Total Assets, while Firm Size was incorporated as a control variable. Four empirical specifications were estimated, and fixed-effects estimation was selected following the Hausman procedure. The observational nature of the

research design means that the results identify statistical associations and should not be interpreted as evidence of causal effects.

The principal theoretical implication is that ESG disclosure should not necessarily be conceptualized as a homogeneous financing construct. Environmental information may carry financing relevance because it provides capital providers with information regarding environmental exposures, regulatory compliance, climate-related risks, and firms' approaches to managing such risks. The positive Environmental Disclosure association is consequently consistent with signaling mechanisms under which greater transparency may reduce uncertainty regarding non-financial risk (Spence, 1973). It is also compatible with the Trade-Off perspective insofar as lower perceived financing risk may be associated with greater debt capacity (Kraus & Litzenberger, 1973). The result is broadly consistent with the financing mechanisms discussed by Caragnano et al. (2020) and Li et al. (2022), while the contrasting evidence identified by Fonseka et al. (2019) and Giannopoulos et al. (2022) reinforces the need to avoid treating the observed relationship as universal.

The Governance Disclosure result is particularly consistent with the agency-cost and creditor-monitoring mechanisms developed in the theoretical framework. Governance disclosure provides information concerning board structures, shareholder rights, internal controls, audit mechanisms, managerial oversight, and related governance arrangements. Such information may reduce uncertainty about managerial opportunism and the agency costs facing providers of debt capital (Jensen & Meckling, 1976). The positive and statistically significant governance coefficient is therefore compatible with the argument that greater transparency regarding monitoring and control structures can be associated with improved creditor confidence or financing capacity. However, because prior studies also identify circumstances in which stronger governance restrains excessive borrowing, the present findings should be interpreted as evidence from the examined Italian firms rather than as confirmation of a universally positive governance-leverage relationship. The statistically non-significant Social Disclosure result provides an equally important theoretical insight. Stakeholder Theory suggests that social disclosure may communicate information about employee relations, human rights, community engagement, product responsibility, and broader stakeholder relationships (Freeman, 1984). Such information may contribute to reputation, stakeholder trust, and organizational legitimacy without necessarily translating directly into observable changes in leverage. The failure to support H1 therefore does not imply that social disclosure lacks economic or stakeholder value. Rather, it indicates that the present fixed-effects estimates do not establish a statistically reliable direct association between Social Disclosure and Firm Leverage. The result is consistent with the mixed evidence acknowledged in the literature review and reinforces the proposition that different ESG dimensions may operate through different financial and non-financial channels. Taken together, the findings illustrate why competing theoretical perspectives can coexist within the ESG-capital structure literature. Trade-Off Theory suggests that reductions in perceived risk may support debt capacity, while Pecking Order Theory recognizes that reduced information asymmetry may facilitate other financing channels and reduce reliance on debt (Myers

& Majluf, 1984). Agency Theory is particularly relevant to governance information, whereas Stakeholder and Legitimacy perspectives offer stronger explanations for the broader relational consequences of social and sustainability disclosure (Freeman, 1984; Suchman, 1995). The results do not prove any of these theories. Instead, they suggest that their explanatory relevance may differ according to the ESG pillar under consideration. Applying these perspectives at the pillar level may therefore provide greater analytical precision than treating ESG as an undifferentiated construct.

The findings also have implications for corporate managers and boards. ESG reporting strategy should not be approached solely as a uniform exercise in increasing the overall volume of sustainability disclosure. Different categories of information may have different relevance for different capital-market users. The positive Environmental and Governance associations suggest that information concerning environmental risk management and governance quality may be particularly relevant in creditor-facing communication. Managers should therefore focus on the credibility, consistency, comparability, and decision usefulness of ESG information rather than assuming that greater disclosure quantity by itself will improve financing outcomes. Related European evidence shows that ESG performance and ESG controversies carry contrasting associations with firm performance and that executive gender diversity conditions their performance implications, further indicating that the economic relevance of sustainability information depends on both the nature of the ESG signal and its surrounding governance context (Qawasmeh et al., 2026). The non-significant Social Disclosure finding further indicates that firms should avoid interpreting all ESG pillars as mechanically interchangeable from a financing perspective. A particularly important measurement limitation is that Eikon represents one provider-specific ESG architecture. Comparative research documents substantial rating disagreement arising from differences in scope, measurement, and weighting, meaning that results obtained using one commercial ESG database may not necessarily replicate under alternative providers or researcher-constructed measures (Berg et al., 2022; Christensen et al., 2021; Liu, 2022). Recent evidence further indicates that ESG-rating uncertainty can itself be economically relevant to debt financing (Chen & Liu, 2025). Future studies should therefore test whether the reported pillar-level relationships remain robust across alternative ESG data providers and disclosure- versus performance-oriented measures.

For lenders, banks, bondholders, financial analysts, and institutional investors, the findings support the use of pillar-level ESG information as one component of broader borrower and investment assessment. Environmental information may assist in evaluating exposures and risk-management practices, while governance information can provide insight into oversight, monitoring structures, and managerial accountability. Social disclosure may remain relevant for stakeholder, reputational, and operational analysis even where its direct association with leverage is statistically weaker. ESG scores should nevertheless complement rather than substitute for conventional financial analysis, credit assessment, cash-flow evaluation, collateral considerations, industry analysis, and other relevant information. Related evidence on digital accounting systems indicates that information quality is strongly associated with financial decision-making effectiveness, including risk assessment and strategic

financial planning, reinforcing the importance of reliable and decision-useful information infrastructures when ESG data are incorporated into creditor analysis (Abbasi, 2026). The study does not provide evidence that ESG scores alone should determine lending or investment decisions. For creditors and regulators, the findings support retaining disaggregated Environmental, Governance, and Social information because rating-provider disagreement can make a single composite ESG measure an imperfect representation of the underlying sustainability characteristics relevant to financial decision-making (Berg et al., 2022; Christensen et al., 2021).

The results also carry implications for regulators, standard setters, sustainability-reporting policymakers, and financial-market institutions. The observed differences among ESG dimensions reinforce the value of disclosure systems that preserve meaningful pillar-level information rather than relying exclusively on composite ESG indicators. Comparable, credible, and decision-useful reporting can help users distinguish environmental, governance, and social information and evaluate their potentially different financial relevance. At the same time, the single-country observational setting requires policy conclusions to remain proportionate to the evidence. The findings support the informational value of transparent and disaggregated sustainability reporting but do not establish that any particular disclosure requirement will cause changes in corporate leverage. For the Italian context, the findings are also consistent with the need to evaluate sustainability information within the financing environment in which firms operate. Evidence based on Italian firms confirms the relevance of ESG/non-financial information to financing-cost analysis, while Italian capital structures remain sensitive to characteristics of the domestic financing environment (Arru et al., 2024; di Pietro et al., 2019).

The central contribution of the study is therefore not simply the conclusion that ESG disclosure is related to capital structure. More importantly, the evidence demonstrates that which ESG dimension is examined matters. Environmental and Governance Disclosure display statistically significant positive associations with Firm Leverage, while Social Disclosure does not exhibit a statistically reliable direct relationship. The three dimensions nevertheless contribute significantly when considered jointly. Within the boundaries of the Italian sample and the 2014–2023 period, the study therefore adds to the ESG–capital structure literature by showing that the financial relevance of sustainability information is differentiated across disclosure pillars and is better understood through a disaggregated rather than exclusively aggregate perspective.

7. Limitations and Future Research

The findings should be interpreted within several boundaries that also provide opportunities for further research. First, the empirical setting is restricted to Italian firms. This single-country design offers the advantage of examining ESG disclosure and capital structure within a comparatively consistent national environment, but institutional structures, financial systems, ownership patterns, creditor relationships,

sustainability-reporting practices, and regulatory conditions may differ across jurisdictions. The findings should therefore not be assumed to apply automatically to firms operating in other European or non-European settings. Future studies could replicate the pillar-level analysis across multiple countries or compare countries with different institutional and financing environments to assess the extent to which the observed relationships remain stable across contexts.

Second, the final sample comprises 70 firms, with 10 firms excluded because the information required for the principal study variables was unavailable. The number of usable observations also differs across variables and regression specifications. Firm Leverage contains 547 observations, whereas Firm Size, Governance Score, and Social Score contain 689 observations and Environmental Score contains 681 observations. This non-uniform availability defines the empirical coverage of the current study but does not, in itself, establish why observations are missing. Future research could employ larger firm samples where data availability permits, construct more balanced panels where methodologically appropriate, and explicitly examine the patterns and consequences of missing ESG and financial observations under alternative sample constructions.

Third, the measurement of ESG is based on Eikon Environmental, Governance, and Social scores. ESG assessments can depend on the definitions, data architecture, weighting systems, disclosure inputs, and methodological choices embedded in a particular data source. The findings may therefore partly reflect the measurement framework represented by the Eikon variables employed in the study. Future research could examine whether similar relationships emerge when ESG dimensions are measured using alternative commercial databases, researcher-constructed disclosure indices, textual measures derived from corporate reports, or indicators designed to capture underlying sustainability outcomes. Comparing disclosure-oriented and performance-oriented measures would be particularly useful for determining whether financing relationships differ according to how ESG characteristics are operationalized. A particularly important measurement limitation is that Eikon represents one provider-specific ESG architecture. Comparative research documents substantial rating disagreement arising from differences in scope, measurement, and weighting, meaning that results obtained using one commercial ESG database may not necessarily replicate under alternative providers or researcher-constructed measures (Berg et al., 2022; Christensen et al., 2021; Liu, 2022). Recent evidence further indicates that ESG-rating uncertainty can itself be economically relevant to debt financing (Chen & Liu, 2025). Future studies should therefore test whether the reported pillar-level relationships remain robust across alternative ESG data providers and disclosure- versus performance-oriented measures.

Fourth, Firm Leverage is measured as Total Debt divided by Total Assets. This is a widely interpretable measure of firms' use of debt financing, but capital structure is multidimensional. Alternative measures may capture different aspects of financing behavior and creditor exposure. Future studies could therefore examine long-term and short-term debt ratios, debt-to-equity measures, market leverage, debt maturity structure, or the cost of debt. Such extensions would help determine

whether Environmental, Governance, and Social disclosure exhibit comparable relationships across different dimensions of corporate borrowing rather than only with the leverage measure employed in the present study.

Fifth, Firm Size is the principal control variable included in the reported models. Its coefficient is consistently negative and statistically significant, confirming that firm scale is systematically associated with leverage within the specifications examined. Nevertheless, capital-structure theory identifies several additional firm characteristics that may be relevant to financing outcomes. Future studies could incorporate theoretically justified measures of profitability, asset tangibility, liquidity, growth opportunities, tax characteristics, business risk, ownership structure, and industry-related differences where suitable data are available. The absence of such variables in the current specification should not be interpreted as proof of omitted-variable bias; rather, broader specifications would allow future studies to evaluate whether the reported ESG associations remain similar under alternative sets of theoretically motivated controls. Future specifications should also consider a broader set of established capital-structure determinants. Profitability, asset tangibility, growth opportunities, industry leverage, tax considerations, and related firm characteristics have been repeatedly identified as relevant to leverage decisions (Rajan & Zingales, 1995; Frank & Goyal, 2009; Graham & Leary, 2011). Their inclusion, where data permit, would help determine whether the present ESG associations remain stable under richer model specifications.

Sixth, the research design is observational. The fixed-effects approach allows the analysis to exploit the panel structure and account for time-invariant unobserved firm characteristics within the selected estimator, but it does not establish causal effects of ESG disclosure on leverage. The coefficients should therefore be interpreted as conditional statistical associations. Future research seeking stronger causal identification could examine natural experiments, regulatory or reporting shocks, difference-in-differences designs, instrumental-variable approaches, or appropriately specified dynamic panel techniques when their identifying assumptions are defensible. Such methods should not be viewed as automatic solutions to endogeneity; their value depends on the availability of credible sources of identification and the validity of the relevant statistical assumptions.

Seventh, the finding that Environmental and Governance Disclosure are statistically significant while Social Disclosure is not suggests that further research should move below the broad ESG-pillar level. Environmental scores may combine several forms of climate, resource-use, emissions, and environmental-management information, while governance and social scores similarly aggregate multiple underlying components. Future work could disaggregate these dimensions to determine which specific subcomponents are most closely associated with corporate borrowing. Researchers could also investigate nonlinear relationships, interaction effects, threshold effects, differences across industries, creditor types, and financing instruments. Sector-specific inquiry is particularly warranted because evidence from EU energy firms indicates that ESG controversies are negatively associated with environmental innovation while governance attributes, including board size and

gender diversity, are positively associated with innovation, demonstrating that sustainability-related outcomes may vary materially with industry-specific risk and governance conditions (Aljawarneh et al., 2026). Such analysis may help explain why particular ESG dimensions exhibit stronger financing associations than others.

Eighth, the 2014–2023 study period provides a longitudinal basis for examining ESG disclosure and leverage but may also encompass changes in firms' sustainability-reporting environments, capital-market conditions, and the financial relevance assigned to ESG information. The current study does not explicitly model structural changes across subperiods. Future research could investigate whether the ESG–leverage relationship changes over time, whether the relative importance of individual ESG pillars evolves, and whether financing associations differ across periods characterized by changing sustainability-reporting or sustainable-finance conditions. Specific institutional events should be incorporated only where their timing, relevance, and identification implications can be verified. Finally, the Italian evidence should not be generalized mechanically across countries or industries. Italian financing conditions exhibit meaningful contextual variation (di Pietro et al., 2019), while ESG-related debt effects likewise vary with institutional, environmental, and firm-level conditions. Future research could therefore employ cross-country designs, industry interactions, dynamic panel estimators, instrumental-variable strategies, or natural experiments to improve identification and distinguish association from causal effects.

A broader research agenda therefore emerges from the present findings. Future studies should seek to determine when, where, and through which mechanisms different ESG disclosure dimensions become relevant to corporate financing decisions. Cross-country comparisons, alternative ESG and leverage measures, more extensive control structures, disaggregated ESG components, and research designs better suited to mechanism and causal analysis could deepen understanding of the relationship. The differentiated results reported for Environmental, Governance, and Social Disclosure indicate that the next stage of ESG–capital structure research should focus less on whether ESG matters in the aggregate and more on identifying the conditions under which specific dimensions of sustainability information become financially relevant.

8. Declarations

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Conflict of Interest

The authors declare that they have no competing interests.

Ethics Approval

Not applicable.

Consent to Participate

Not applicable.

Consent for Publication

Not applicable.

Data Availability

The data used in this study were obtained from Eikon under a commercial license and cannot be publicly redistributed. Access to the underlying data is subject to the data provider's licensing conditions.

Authors' Contributions

The author contributed to: Conceptualization; Methodology; Data collection; Formal analysis; Writing original draft; Writing – review and editing

Clinical Trial Number

Not applicable.

Use of Artificial Intelligence

The authors declare that generative artificial intelligence (AI) tools were used only to assist with language editing and clarity of expression during the preparation of the manuscript. The authors reviewed and edited all AI-assisted outputs and take full responsibility for the content, interpretation, and conclusions of the manuscript. No AI tools were used to generate, manipulate, or analyze the research data or to produce the scientific results of the study.

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