

Article

Evaluating the ESG Ratings of Global Firms: An Empirical Study

Sarah Jinhui Wu *  and Wullianallur Raghupathi 

Gabelli School of Business, Fordham University, 140 W. 62nd Street, New York, NY 10023, USA;
raghupathi@fordham.edu

* Correspondence: jiwu@fordham.edu

Abstract

This empirical study examines differences in environmental, social, and governance (ESG) ratings across global firms. We investigate whether ESG ratings vary across three critical dimensions: geographic location, industry type, and firm size. Using Refinitiv ESG ratings for 1982 firms across four continents over the 2015–2025 period, with cross-validation against S&P Global ESG scores for the subset of 1397 firms covered by both providers over the same period, we test three primary hypotheses and a set of pillar-specific subsidiary hypotheses through ANOVA, MANOVA, and multivariate regression. Our findings reveal significant variation in ESG ratings across continents (joint MANOVA: $F = 51.73$, $p < 0.001$, partial $\eta^2 = 0.074$), with European firms exhibiting the highest ratings, followed by a near tie between North American and Asian firms, and Australian firms in the lowest position. Industry classification shows a significant manufacturing > services pattern in environmental and social pillar ratings but no difference in the governance rating, consistent with the pillar-specific reformulation of the industry hypothesis. Firm size has the largest effect ($F = 191.74$, $\eta^2 = 0.247$), with larger firms receiving systematically higher ratings across all three pillars. Multi-provider validation indicates substantial agreement between Refinitiv and S&P Global (Pearson $r = 0.738$), with the central findings replicating across providers. These results contribute to understanding the institutional, geographic, and organizational factors associated with corporate ESG ratings and have implications for how researchers and practitioners interpret cross-provider rating differences and pillar-level versus aggregate reporting.

Keywords: ESG ratings; corporate sustainability; institutional theory; stakeholder theory; multi-provider validation; Refinitiv; S&P Global



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1. Introduction

Environmental, social, and governance (ESG) factors have become increasingly central to corporate strategy and investment decision-making in the 21st century [1,2]. As stakeholders demand greater corporate accountability and sustainability [3,4], understanding the factors that influence ESG ratings across different contexts has become critical for academics, practitioners, and policymakers alike. The rapid growth of sustainable investing, which now represents trillions of dollars in managed assets globally [5], underscores the practical importance of ESG metrics in capital allocation decisions.

Despite the growing prominence of ESG considerations, significant questions remain regarding how ESG ratings vary across different organizational and institutional contexts [6,7]. Do firms operating in different geographic regions demonstrate different levels of ESG commitment? Are there systematic differences between manufacturing and service

industries or among firms of different sizes? These questions are not merely academic; they have profound implications for investment strategies, regulatory approaches, and corporate best practices. Prior research has explored various determinants of corporate social performance [8,9], yet important gaps remain in our understanding of how geographic, industry, and size factors interact to shape ESG outcomes.

This study addresses these questions through an empirical analysis of 1982 global firms using Refinitiv ESG ratings data, with cross-validation against S&P Global ESG scores for the subset of 1397 firms covered by both providers. We focus on three key dimensions of variation: (1) geographic location, examining firms incorporated across four continents; (2) industry classification, comparing manufacturing and service sectors with pillar-specific hypotheses; and (3) organizational size, analyzing small, medium, and large companies. By employing ANOVA, MANOVA, and multivariate regression, we provide descriptive evidence on ESG rating patterns across these critical dimensions, computed as firm-level averages over the eleven-year 2015–2025 Refinitiv panel.

Our research makes four specific contributions to the existing empirical literature. First, we provide the first joint analysis of geographic, industry, and size effects on ESG ratings using both Refinitiv and S&P Global ratings on a global panel of 1982 firms over the eleven-year (2015–2025) period. Second, we test pillar-specific industry hypotheses (H2a, H2b, H2c) that predict differential effects of industry classification across the environmental, social, and governance pillars, rather than treating ESG as a single aggregate measure. Third, we document substantial within-continent heterogeneity through a country-level decomposition of the Asia category. Fourth, we provide multi-provider validation by replicating all primary results using S&P Global ESG scores for the firms covered by both providers.

The remainder of this paper is organized as follows. Section 2 presents the theoretical framework and reviews relevant literature on the determinants of ESG ratings. Section 3 describes our methodology. Section 4 presents our analysis and results. Section 5 discusses the findings and their implications. Section 6 offers concluding remarks, acknowledges limitations, and outlines future research directions.

2. Theoretical Basis and Literature Review

2.1. Theoretical Framework

This study integrates three complementary theoretical perspectives, namely institutional theory, stakeholder theory, and resource-based view, to develop a comprehensive framework for understanding variations in ESG ratings across firms.

Institutional Theory: DiMaggio and Powell [10] argue that organizations become similar through isomorphic processes: coercive (regulatory pressures), mimetic (imitation), and normative (professionalization). Scott [11] identifies three institutional pillars, namely regulative, normative, and cultural-cognitive, that shape organizational behavior. European markets exemplify strong regulative pressures through comprehensive ESG requirements [6]. Matten and Moon [12] show that European systems emphasize implicit CSR embedded in institutions, whereas American systems emphasize explicit, voluntary CSR approaches. Whitley [13] demonstrates that national business systems fundamentally shape corporate environmental approaches through distinctive institutional configurations. Firms operating in stronger institutional environments face greater pressure to adopt ESG practices to maintain legitimacy [14]. Campbell [15] further argues that institutional conditions, including regulation, industry self-regulation, and stakeholder monitoring, determine whether corporations behave in socially responsible ways.

Stakeholder Theory: Freeman [3] and Mitchell, Agle, and Wood [4] argue that firm success depends on effectively managing diverse stakeholder relationships. Stakeholders vary

in power, legitimacy, and urgency [4], creating different pressures across contexts. European stakeholders possess greater power and organizational capacity [16], with strong labor unions, active civil-society organizations, and engaged institutional investors. Manufacturing firms face concentrated environmental scrutiny from local communities, regulators, and environmental groups [17], while service firms face different social and governance pressures from customers, employees, and investors [9]. Larger firms face greater scrutiny due to their visibility [18] and depend on multiple stakeholder groups for legitimacy and continued operations [19]. Donaldson and Preston [20] emphasize that stakeholder management is not merely instrumental but reflects normative commitments to treating stakeholders as ends in themselves.

The Resource-Based View: Barney [21] and Hart [22] argue that sustained competitive advantages arise from valuable, rare, and inimitable resources. Hart's (1995) [22] paper conceptualized pollution prevention, product stewardship, and sustainable development as firm-level capabilities that form the basis of environmental strategies. ESG practices require substantial financial resources, specialized capabilities, and organizational infrastructure [23]. Large firms possess slack resources that enable ESG investments without compromising core operations [24,25]. Waddock and Graves [8] demonstrate that financial performance enables ESG investments, creating a virtuous cycle. Larger firms employ specialized sustainability personnel [26,27], achieve economies of scale in ESG programs [28], and develop dynamic capabilities for sustainability [29,30]. Aragón-Correa and Sharma [31] argue that proactive environmental strategy depends on organizational capabilities that vary systematically with firm characteristics.

All three theories indicate descriptive associations between geographic locations, industry types, firm size, and ESG ratings. The underlying mechanisms are not directly measured in this study and are presented as plausible interpretations of the observed patterns.

2.2. Regulatory and Institutional Context

The post-2017 regulatory environment differs substantially from the period covered by earlier ESG ratings studies. The European Union has implemented a multi-layered ESG disclosure architecture consisting of the SFDR (2019) [32], the EU Taxonomy Regulation (2020) [33], and the CSRD (2022) [34], the last of which substantially expanded the scope of mandatory non-financial reporting and introduced the European Sustainability Reporting Standards (ESRS). At the global level, the International Sustainability Standards Board issued IFRS S1 (general sustainability disclosure) and IFRS S2 (climate-related disclosure) in 2023 [35], providing a global baseline that several jurisdictions have incorporated into national disclosure regimes. In the United States, the SEC adopted final climate-related disclosure rules in March 2024 [36], though their implementation has been subject to litigation and partial suspension. Recent empirical research has documented the effects of these instruments on firm-level disclosure and capital allocation [37–39]. The analytical window adopted in this study (2015–2025) spans both the pre- and post-regulatory-wave periods, allowing the analysis to reflect both legacy practices and the contemporary regulatory environment.

2.3. Geographic Variations

Europe has established the world's most comprehensive ESG frameworks [40]. The EU's Non-Financial Reporting Directive (2014) requires large companies to disclose environmental, social, and governance information, while the Corporate Sustainability Reporting Directive (2021) substantially expands the scope of these requirements and the associated reporting standards [41,42]. The EU Emissions Trading System creates direct financial incentives for carbon reduction [43]. Beyond regulation, European stakeholders demon-

strate stronger sustainability preferences rooted in cultural values that emphasize collective responsibility [44]. The European Social Model emphasizes stakeholder capitalism, with co-determination systems giving employees board representation and influence over corporate strategy [45,46]. Hall and Soskice's [47] varieties-of-capitalism framework distinguishes coordinated market economies (prevalent in continental Europe) that institutionally support stakeholder orientation from liberal market economies (UK, US), which emphasize shareholder primacy. Empirical evidence consistently confirms European ESG leadership across multiple rating systems and time periods [6,48,49].

North American systems emphasize shareholder primacy and market-based governance [16], with ESG practice evolving primarily through voluntary initiatives and investor pressure rather than regulatory mandates [50]. The Business Roundtable's 2019 statement on stakeholder capitalism suggests evolving norms, but legal frameworks still prioritize shareholder interests [51]. Recent SEC climate disclosure rules suggest convergence toward European approaches [52], though political polarization creates inconsistent pressures across states and administrations [53]. Institutional investors increasingly engage on ESG issues, but their influence varies according to ownership concentration and investment horizon [54,55].

Asian markets show substantial institutional diversity [56], with development priorities sometimes conflicting with sustainability goals [57]. Japan demonstrates mature ESG practice reflecting its coordinated market economy traditions [58,59], while China reflects state-directed sustainability priorities with enforcement challenges [60,61]. Emerging Asian economies face fundamental tensions between rapid development and sustainability [62]. Holtbrügge and Dögl [63] note that multinational corporations may transfer ESG practices to Asian operations, but local institutional contexts moderate adoption. Rootes [64] and Vandenbergh [65] highlight weaker civil-society pressure in many Asian contexts than in Europe.

Australia combines British institutional traditions with a resource-dependent economy, creating distinctive tensions between economic interests centered on mining and fossil fuels and growing environmental concerns [66]. Strong environmental activism coexists with powerful extractive-industry lobbying, producing inconsistent policy signals.

Institutional theory predicts that geographic location shapes ESG through regulatory, normative, and cognitive pressures [10,11]. European mandatory disclosure, environmental standards, stakeholder governance, and civil-society pressure generate higher ESG ratings [6,40]. North American voluntary approaches suggest intermediate performance [16]. Asian development priorities and institutional diversity create variable pressures [56]. Prior research confirms European leadership [6,48]. As such, we formulate H1 related to geographic location.

H1. *Significant differences in firms' ESG ratings exist across the continents of firms' countries of incorporation, with firms incorporated in European countries receiving higher ESG ratings than firms incorporated in other continents.*

2.4. Industry Considerations

Traditional perspectives suggest that manufacturing faces greater environmental impacts requiring substantial mitigation investments [17,67,68], while services face different social and governance challenges, including labor practices, data privacy, and executive compensation [69,70]. Manufacturing industries with visible environmental footprints, such as chemicals, mining, and heavy industry, face concentrated stakeholder pressure and regulatory scrutiny [71,72]. Service industries, particularly financial services, face

governance pressures from sophisticated institutional investors and regulators concerned with systemic risk [73].

However, several factors may reduce overall industry differences in ESG performance. First, some rating methodologies adjust scores for sector-specific materiality, enabling meaningful cross-sector comparisons while accounting for different ESG priorities [37,74]. Second, the professionalization of sustainability has diffused common ESG management practices across sectors as consulting firms, reporting frameworks, and professional networks create industry-agnostic best practices [75–77]. Third, supply-chain integration increasingly blurs traditional sector boundaries, as service firms face pressure regarding their suppliers' environmental practices while manufacturing firms emphasize service components [78]. Fourth, institutional investors apply uniform ESG criteria across portfolio companies regardless of sector, creating convergent pressures [5,73,79].

Overall, empirical evidence on industry effects is mixed. Some studies find significant sectoral variations [9,80], while others report smaller or inconsistent effects [7]. Yet, pillar-specific arguments motivate three subsidiary hypotheses. The environmental and social pillars capture impacts that vary systematically by industry type: manufacturing operations involve direct material throughput, energy use, and large operational workforces, which create larger and more salient environmental footprints and worker-safety concerns than the activities of most service firms. Governance, in contrast, is shaped primarily by listing regimes, ownership structures, and board composition, which are largely independent of industry classification. We therefore expect industry differences to emerge in the environmental and social pillars but not in the governance pillar:

H2a (Environmental). *Manufacturing firms receive higher environmental pillar ratings than service firms.*

H2b (Social). *Manufacturing firms receive higher social pillar ratings than service firms.*

H2c (Governance). *Manufacturing and service firms do not differ significantly in governance pillar ratings.*

2.5. Firm Size

Resource-based theory predicts that larger firms possess greater resources for ESG investments. Waddock and Graves [8] demonstrate that financial performance, correlated with size, enables ESG investments, suggesting a virtuous cycle in which resources enable sustainability, which enhances performance. Large firms possess organizational slack, i.e., uncommitted resources available for discretionary initiatives [24,25]. They employ dedicated sustainability personnel with specialized expertise [26,27], achieve economies of scale in ESG programs by spreading fixed costs across larger revenue bases [28,81], and develop sophisticated management systems for tracking and improving ESG performance [82]. In contrast, Jenkins [83] and Battisti and Perry [84] document that small firms face distinct resource constraints that limit ESG investments despite potentially genuine sustainability commitments. Udayasankar [85] argues that size effects may be curvilinear, with both very large and very small firms showing strong CSR, although most evidence supports monotonic positive relationships.

Stakeholder salience theory predicts that larger firms face greater scrutiny and accountability pressures. Mitchell et al. [4] argue that stakeholder salience depends on power, legitimacy, and urgency, attributes that increase with firm visibility. Larger firms attract more media attention, analyst coverage, and activist campaigns [18,71]. Reputational concerns motivate substantial ESG investments to protect brand value and market position [1,86,87]. Institutional investors concentrate holdings in large-cap stocks, subjecting

these firms to more intensive ESG engagement [54]. Proxy advisors evaluate larger firms more systematically, creating additional governance pressures [88].

Institutional theory emphasizes that larger organizations face greater legitimacy demands from diverse constituents. Deephouse [89] and Deephouse and Carter [90] show that organizational legitimacy requires conforming to institutional expectations, which intensify with visibility. Large firms must maintain social licenses to operate across multiple jurisdictions with varying stakeholder expectations [72,91]. Bansal and Clelland [92] demonstrate that environmental legitimacy reduces firm risk, with the strongest effects observed for highly visible firms. Hannan and Freeman [93] argue that large organizations face both structural inertia and greater institutional pressures.

Extensive empirical research documents positive size-ESG relationships across diverse contexts, time periods, and measurement approaches [8,69,94–98]. Drempetic et al. [49] specifically examine how firm size is associated with Refinitiv (Thomson Reuters ASSET4) ESG scores, finding significant positive effects. Dang et al. [99] recommend employee count as a measure of firm size for socially oriented research, given its direct relevance to workforce-related ESG dimensions. In line with these arguments, we formulate H3:

H3. *Significant differences exist in firms' ESG ratings among firms of different sizes, with larger firms receiving higher ESG ratings than smaller firms.*

Table 1 summarizes the three theoretical perspectives that motivate our hypotheses, mapping each theory to its focal variable, predicted pattern, and underlying mechanism.

Table 1. Theoretical framework: mapping of theories to focal variables, predictions, and unmeasured mechanisms.

Theory	Focal Variable	Predicted Pattern	Unmeasured Mechanism
Institutional theory (DiMaggio and Powell, 1983 [10]; Scott, 2008 [11])	Continent of incorporation	European firms > Asian, North American, and Australian firms	Coercive, mimetic, and normative regulatory pressure
Stakeholder salience theory (Freeman, 1984 [3]; Mitchell et al., 1997 [4])	Industry classification	Manufacturing > services in environmental and social pillars; no difference in governance pillar	Salience and power of environmental and social stakeholders
The resource-based view (Barney, 1991 [21]; Hart, 1995 [22])	Firm size	Large > medium > small firms across all three pillars	Organizational slack, dedicated ESG capacity, disclosure-cost amortization

3. Methodology

During the preparation of this manuscript, the authors used ChatGPT 4.0 and Claude Sonnet 4.0 for the purposes of drawing Figure 1, checking references for authenticity and completeness, and copyediting. The authors have reviewed and edited the output and take full responsibility for the content of this publication.

The primary objective of this study is to explore differences in firms' ESG ratings across geographic locations, industry classifications, and organizational size using Refinitiv ESG ratings for 1982 global firms across four continents over an eleven-year period spanning 2015–2025. While extensive research examines the determinants of ESG performance, most studies treat ESG as a unidimensional construct or assume that the environmental, social, and governance pillars move in parallel across firm characteristics. This assumption may be problematic for several reasons.

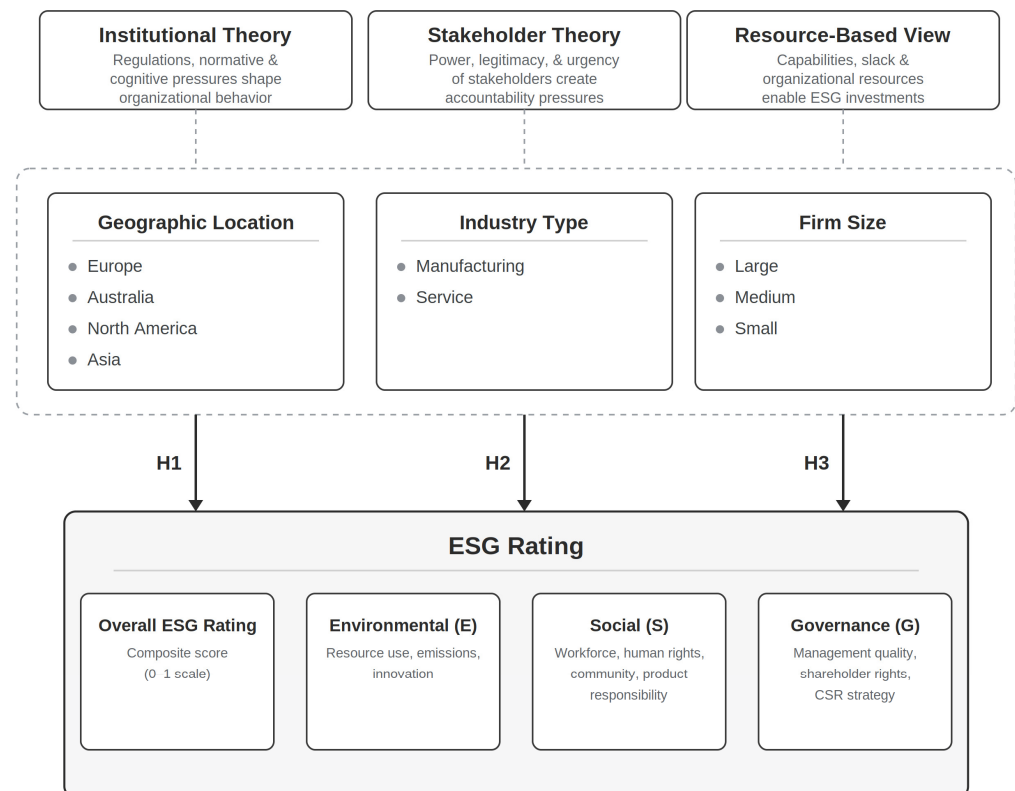


Figure 1. Conceptual model: theoretical framework and hypotheses.

First, stakeholder salience theory suggests that different stakeholders prioritize different ESG dimensions [4]. Employees and communities may prioritize social performance, while institutional investors emphasize governance [73]. If stakeholder configurations vary systematically across industries, pillar-level performance should also vary systematically. Second, the materiality literature demonstrates that ESG issues differ in relevance across industries [100]. Environmental issues are material in extractive industries; governance issues are material in financial services. If firms respond to material issues, industry-specific pillar patterns should emerge. Third, measurement research documents substantial disagreement among ESG ratings providers [37,101]. However, less attention has been paid to whether aggregation within providers obscures meaningful variation. If pillar-level effects oppose each other, aggregate scores may mask economically significant patterns.

We address such concerns by examining the overall ESG rating as both a one-dimensional and multidimensional construct, as well as assessing ESG ratings at the pillar level. Our analysis responds to calls for more granular ESG research [7] and contributes to understanding how stakeholder configurations shape dimension-specific sustainability outcomes. Figure 1 illustrates our conceptual model, showing the theoretical foundations underlying the hypotheses.

3.1. Data Source

ESG ratings were obtained from Refinitiv (now LSEG Data & Analytics), which provides firm-year ESG ratings drawn from publicly available company disclosures and assessed against over 600 ESG metrics across ten themes. The Refinitiv ESG score is a composite measure ranging from 0 to 1 (re-scaled from a 0–100 percentile distribution) that reflects a firm’s relative ESG profile, commitment, and effectiveness based on company-reported information. The score decomposes into three pillar scores—environmental, social, and governance—reported on the same 0–1 scale. The Refinitiv methodology applies pillar-level weighting rather than a sector-relative materiality adjustment.

To assess whether the documented patterns were robust to rating-provider choice, we also obtained S&P Global ESG scores for the subset of firms covered by both providers over the same period. The S&P Global ESG score is on a 0–100 scale and reflects a similar conceptual approach but with different indicator selection and aggregation choices.

Firm characteristics (employees, sales, total assets, country of incorporation, NAICS classification) were obtained from Compustat for the matched panel. The Refinitiv database returned 2311 unique firms with ESG ratings during the 2015–2025 period. We averaged each firm’s ESG scores across the eleven-year period, requiring at least two valid yearly observations for inclusion. After applying the inclusion criteria (valid country, valid industry classification, and location in one of the four primary continents), the analytical sample for testing H1 and H2 contained 1982 firms. For the firm-size analyses, the sample was further restricted to firms with valid Compustat employee data, yielding 1174 firms. Sample construction is detailed in Table 2.

Table 2. Sample selection.

Step	Number of Firms
Step 0: Initial firms in 2015–2025 period	2311
Step 1: With at least 2 years of ESG data	2311
Step 2: With all three ESG measures	2311
Step 3: With valid continent and industry	2111
Step 4: Restricted to 4 continents (primary sample)	1982
Step 5: With employee data (size analysis subsample)	1174

Note. Step 0: Initial Refinitiv-covered firms in the 2015–2025 period. Steps 1–4 were applied progressively to derive the primary analytical sample. Step 5 derives the size-analysis subsample for testing H3.

3.2. Variables

Overall ESG Rating: The Refinitiv ESG score, a continuous variable on a 0–1 scale (re-scaled from a 0–100 percentile distribution) reflecting a firm’s relative ESG profile, commitment, and effectiveness based on company-reported information across over 600 ESG metrics.

Environmental score: Refinitiv environmental pillar score on a 0–1 scale, measuring firm environmental management, including resource use, emissions, and innovation [100,102].

Social score: Refinitiv social pillar score on a 0–1 scale, evaluating workforce, human rights, community, and product responsibility dimensions [103,104].

Governance score: Refinitiv governance pillar score on a 0–1 scale, assessing management quality, shareholder rights, and CSR strategy [1,105].

All three ESG pillar scores share the same 0–1 scale, enabling direct comparability in the MANOVA framework. All ESG scores were averaged at the firm level across the 2015–2025 period to improve stability and to reflect each firm’s typical ESG profile over the period, following the long-window averaging approach used in prior cross-sectional ESG research [1,7].

Continents: Categorical variable indicating the continents of firms’ countries of incorporation, derived from Compustat’s country-of-incorporation field (fic) with ISIN-prefix fallback for missing values. Countries were categorized into four continents: (1) North America (United States, Canada, Mexico, plus tax-haven incorporations in Bermuda and Cayman Islands), (2) Asia (East, Southeast, South, and West Asia, including the Gulf states), (3) Europe (the EU plus the United Kingdom, Switzerland, Norway, and other non-EU European countries), and (4) Australia (Australia and New Zealand). This corresponds more closely to the regulatory and institutional environment that the institutional-theory

framing invokes than the stock-exchange-listing classification used in the prior version of this paper [6,10,98].

Industry Class: We constructed industry classifications from the NAICS 2-digit sector code (with SIC fallback where NAICS is missing). For the binary specification used in H2, we categorized NAICS sectors 21, 23, and 31–33 as manufacturing, and the remaining sectors as services. Sector-level analyses using the NAICS 2-digit codes directly are reported as a robustness check in Section 4.8 [9,106–108].

Company Size: Employee count (in thousands) was log-transformed, yielding three categories: small ($\log < 1.0$, i.e., fewer than 10,000 employees), medium ($1.0 \leq \log < 1.5$, i.e., 10,000 to ~31,600), and large ($\log \geq 1.5$, i.e., 31,600 or more). These cutoffs correspond approximately to the small/mid/large-cap thresholds used in equity-index construction. This classification was available for 1174 firms with employee data. As a robustness check, we re-estimated the firm-size analysis using continuous log-employees in Model C of the multivariate regression (Section 4.5) [90,101].

Regarding measurement and language, throughout this paper, we treat the Refinitiv and S&P Global scores as ESG ratings, that is, vendor-assigned signals of the respective ESG profiles that combine substantive firm actions with the firm’s disclosure footprint. Because these ratings are constructed largely from disclosed information, they should not be considered direct measures of underlying environmental, social, or governance performance. We therefore use “ESG ratings” when referring to our measured outcomes and reserve “ESG performance” for conceptual statements or for references to the prior literature in which that term is standard.

3.3. Sample Characteristics

Table 3 summarizes the distribution of our sample across continents, industries, and firm-size categories. Manufacturing firms represent 44.7% of the sample and service firms 55.3%. Geographically, North America contributes the largest share of firm observations (35.4%), followed by Asia (28.9%), Europe (26.5%), and Australia (9.2%). For the size analysis (1174 firms with valid employee data), small firms predominate (47.3%), followed by medium (27.5%) and large (25.2%) firms.

Table 3. Sample distribution.

Category	Firms	Percentage
Panel A: Industry		
Manufacturing	885	44.7%
Services	1097	55.3%
Panel B: Geographic location		
Europe	525	26.5%
North America	702	35.4%
Asia	572	28.9%
Australia	183	9.2%
Panel C: Size		
Small	555	47.3%
Medium	323	27.5%
Large	296	25.2%

4. Analysis and Results

We employ two complementary approaches to examine each hypothesis. First, treating the three ESG pillar scores as a joint profile, we apply MANOVA to test whether group means differ simultaneously across the environmental, social, and governance pillars. Second, we follow the omnibus MANOVA with separate one-way ANOVAs on each pillar score to identify which pillars drive the multivariate effect. This MANOVA—ANOVA structure is appropriate when the three dependent variables are correlated and theoretically

interrelated, as they are here. All inferences below are accompanied by partial eta-squared (MANOVA) or eta-squared (ANOVA) effect sizes. Section 4.5 then provides the multivariate regression models, including continent, industry, and size simultaneously, as predictors of the overall ESG rating, and Sections 4.6–4.9 report a series of robustness analyses.

4.1. Testing H1: Geographic Differences

We begin our formal hypothesis testing by examining geographic differences in ESG ratings. Table 4a reports the standard MANOVA test statistics, all of which indicate that firms located in the four continents exhibit substantial differences when the environmental, social, and governance pillar scores are considered simultaneously (Pillai's Trace = 0.218, $F = 51.73$, $p < 0.001$, partial $\eta^2 = 0.074$). The joint multivariate test result supports H1.

Drilling down to the individual pillars, Table 4b reports the one-way ANOVAs for each pillar score. All three pillars show significant continental differences, with the largest effect on the environmental pillar ($F = 81.33$, $p < 0.001$, $\eta^2 = 0.110$), followed by social ($F = 66.97$, $p < 0.001$, $\eta^2 = 0.092$) and governance ($F = 21.80$, $p < 0.001$, $\eta^2 = 0.032$). The pattern is consistent with the institutional theory prediction that regulatory differences across continents matter most for environmental disclosure. Descriptively, European firms achieve the highest mean ESG rating ($M = 0.636$), followed by a near tie between North American firms ($M = 0.542$) and Asian firms ($M = 0.538$), with Australian firms in the lowest position ($M = 0.466$). Post hoc Tukey HSD comparisons confirm that all pairwise contrasts are statistically significant, except the Asia versus North America contrast ($p = 0.97$). Figure 2 illustrates these pillar means by continent.

Table 4. MANOVA and ANOVA results by continent (H1).

(a) Multivariate test (MANOVA).							
Factor: Continents		Value	F	DF	Error df	Sig.	Partial η^2
Pillai's Trace		0.2182	51.73	9	5934	<0.001	0.074
Wilks' Lambda		0.7931	53.40	9	4809	<0.001	0.074
Hotelling's Trace		0.2466	54.12	9	3101	<0.001	0.074
(b) Univariate tests (ANOVA) on individual pillar ratings.							
		Sum of Squares	df	Mean Square	F	Sig.	η^2
Environmental_Score	BG	13.095	3	4.365	81.33	<0.001	0.110
	WG	106.155	1978	0.0537			
Social_Score	BG	7.425	3	2.475	66.97	<0.001	0.092
	WG	73.093	1978	0.0370			
Governance_Score	BG	2.172	3	0.724	21.80	<0.001	0.032
	WG	65.685	1978	0.0332			

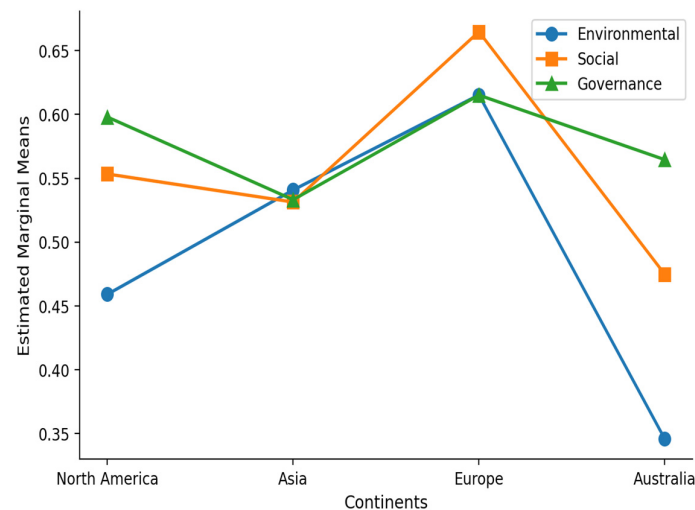
Note: BG stands for between groups; WG stands for within groups, same for Tables 5 and 6.

Table 5. MANOVA and ANOVA results by industry (H2).

(a) Multivariate test (MANOVA).							
Factor: Industry		Value	F	DF	Error df	Sig.	Partial η^2
Pillai's Trace		0.0262	17.71	3	1978	<0.001	0.026
Wilks' Lambda		0.9738	17.71	3	1978	<0.001	0.026
Hotelling's Trace		0.0269	17.71	3	1978	<0.001	0.026
(b) Univariate tests (ANOVA) on individual pillar ratings.							
		Sum of Squares	df	Mean Square	F	Sig.	η^2
Environmental_Score	BG	2.7372	1	2.7372	46.52	<0.001	0.023
	WG	116.513	1980	0.0588			
Social_Score	BG	1.0941	1	1.0941	27.28	<0.001	0.014
	WG	79.424	1980	0.0401			
Governance_Score	BG	0.0170	1	0.0170	0.49	0.482	0.000
	WG	67.839	1980	0.0343			

Table 6. MANOVA and ANOVA results by company size (H3).

(a) Multivariate test (MANOVA).							
Factor: Firm Size	Value	F	DF	Error df	Sig.	Partial η^2	
Pillai's Trace	0.2914	66.53	6	2340	<0.001	0.157	
Wilks' Lambda	0.7098	72.83	6	2338	<0.001	0.157	
Hotelling's Trace	0.4069	79.25	6	1556	<0.001	0.157	
(b) Univariate tests (ANOVA) on individual pillar ratings.							
	Sum of Squares	df	Mean Square	F	Sig.	η^2	
Environmental_Score	BG	17.287	2	8.643	220.50	<0.001	0.274
	WG	45.901	1171	0.0392			
Social_Score	BG	10.467	2	5.234	164.54	<0.001	0.219
	WG	37.246	1171	0.0318			
Governance_Score	BG	2.441	2	1.221	38.91	<0.001	0.062
	WG	36.734	1171	0.0314			

**Figure 2.** Mean differences in ESG pillar score by continent.

4.2. Testing H2: Industry Differences

The same procedure was followed to test the second hypothesis, which compares the ESG ratings between the manufacturing and service industries. Table 5a reports the MANOVA statistics, testing whether manufacturing and service firms differ when the environmental, social, and governance pillar scores are considered simultaneously (Pillai's Trace = 0.0262, $F = 17.71$, $p < 0.001$, partial $\eta^2 = 0.026$). The omnibus multivariate test is significant, indicating a joint industry effect on the pillar profile.

Drilling down to the individual pillars, Table 5b reports the one-way ANOVAs for each pillar score. Manufacturing firms score significantly higher than service firms in the environmental pillar ($F = 46.52$, $p < 0.001$, $\eta^2 = 0.023$; $M = 0.555$ vs. 0.480) and the social pillar ($F = 27.28$, $p < 0.001$, $\eta^2 = 0.014$; $M = 0.596$ vs. 0.548), supporting H2a and H2b. The governance pillar shows no significant difference ($F = 0.49$, $p = 0.482$; $M = 0.584$ vs. 0.578), failing to reject the null hypothesis in H2c. Figure 3 illustrates these pillar means by industry. Taken together, H2 is partially supported in the pillar-specific form: the predicted higher-manufacturing pattern holds for the environmental and social pillars but not for the governance pillar, consistent with the theoretical reasoning that industry-specific exposures shape E and S outcomes, while governance is determined primarily by listing regime and ownership structure.

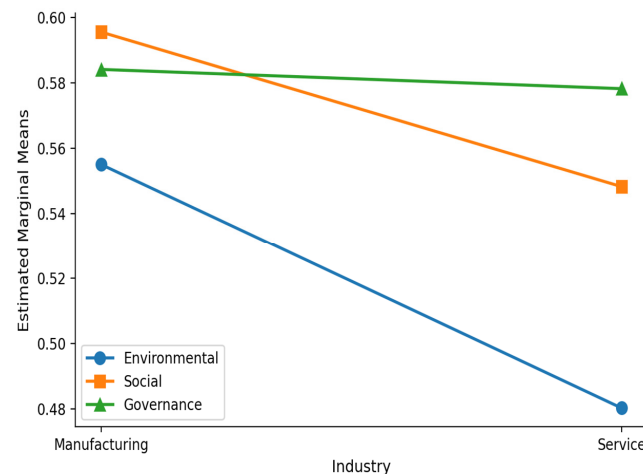


Figure 3. Mean differences in ESG pillar scores by industry.

4.3. Testing H3: Size Differences

This section presents the statistical results examining differences in ESG ratings across our three size categories. Table 6a reports the MANOVA statistics, testing whether firms of different sizes differ when the environmental, social, and governance pillar scores are considered simultaneously (Pillai's Trace = 0.2914, $F = 66.53$, $p < 0.001$, partial $\eta^2 = 0.157$). The omnibus multivariate test is highly significant, indicating that size has a substantial joint effect on the pillar profile. Size explains approximately 16% of the variance in the combined ESG dimensions, the largest single effect documented in this study. H3 is strongly supported.

Drilling down to the individual pillars, Table 6b reports one-way ANOVAs for each pillar score. The size effect is most pronounced on the environmental pillar ($F = 220.50$, $p < 0.001$, $\eta^2 = 0.274$) and substantial on the social pillar ($F = 164.54$, $p < 0.001$, $\eta^2 = 0.219$), with a smaller but still significant effect on the governance pillar ($F = 38.91$, $p < 0.001$, $\eta^2 = 0.062$). Across all three pillars, smaller firms consistently receive less favorable ratings, with the gap most pronounced on the environmental pillar. Post hoc Tukey HSD comparisons (computed on the overall ESG mean) identify three homogeneous groups: small firms exhibit the lowest mean ESG score ($M = 0.495$), medium firms occupy an intermediate position ($M = 0.620$), and large firms achieve the highest scores ($M = 0.700$); all pairwise differences are statistically significant. Figure 4 illustrates these pillar means by company size.

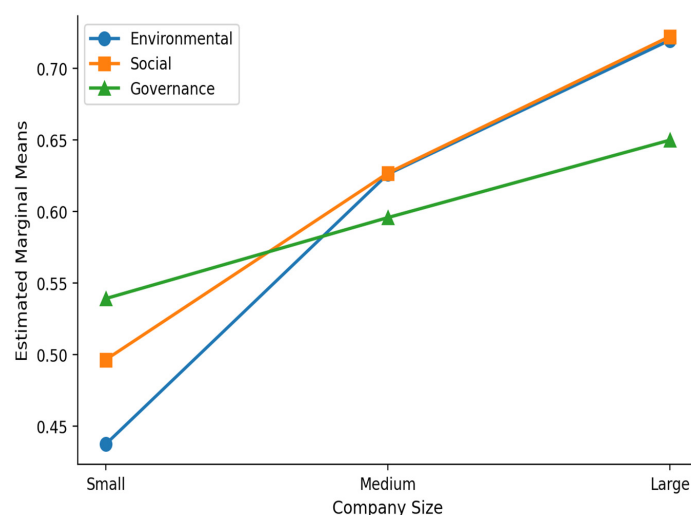


Figure 4. Mean differences in ESG pillar scores by company size.

4.4. Summary of Primary Hypotheses Tests

The three univariate tests above provide initial support for the primary hypotheses. H1 is supported: ESG ratings vary significantly across the four continents, with European firms clearly leading. H2 is partially supported in the pillar-specific form: manufacturing firms exceed service firms in the environmental and social pillars (supporting H2a and H2b) but not in the governance pillar (failing to reject H2c). H3 is strongly supported: firm size exhibits the largest effect among the three variables, with larger firms receiving systematically higher ratings across all three ESG pillars. The next subsection extends these univariate tests by introducing multivariate models with simultaneous controls for the other two factors, and the subsequent subsections address concerns through within-continent decomposition, multi-provider validation, sector-level robustness, and assumption diagnostics.

4.5. Multivariate Models

The univariate ANOVAs above test each of the three explanatory variables in isolation, which leaves open the question of whether each effect survives the inclusion of the other two as covariates. We address this concern with a series of OLS regression models. Model A includes continent and industry as predictors of the overall ESG, using the primary sample of 1982 firms. Model B adds the firm-size category, restricting the sample to the 1174 firms with valid employee data. Model C replaces the categorical size variable with continuous log-employees, providing a robustness check on the categorical specification. Model D returns to the primary sample of 1982 firms and adds the continent $\times$ industry interaction to test whether the industry effect varies systematically across continents. Coefficients and fit statistics for all four models are reported in Table 7.

Model A shows that continent and industry are both independently associated with ESG ratings after mutual control ($R^2 = 0.095$). Taking Asia as the baseline category, European firms score significantly higher ($b = 0.101, p < 0.001$), Australian firms score significantly lower ($b = -0.068, p < 0.001$), and North American firms score similarly to Asian firms ($b = 0.007, p = 0.455$). Service firms score significantly lower than manufacturing firms ($b = -0.041, p < 0.001$). Model B adds size, increasing R^2 to 0.347. With size controlled, the North American coefficient turns significantly negative relative to Asia ($b = -0.060, p = 0.007$), suggesting that the Asia–North America near tie in Model A partly reflects compositional differences in firm size. Size coefficients are large: medium firms score 0.080 points below large firms ($p < 0.001$), and small firms score 0.197 points below large firms ($p < 0.001$). Model C substitutes continuous log-employees for the size category, increasing R^2 further to 0.376, with each one-unit increase in log-employees associated with a 0.120-unit increase in the ESG rating ($p < 0.001$). Model D adds the continent $\times$ industry interaction ($F = 11.43, df = 3, p < 0.001$), confirming that the industry effect varies across continents, while both main effects remain significant.

To address the omitted firm-level controls and potential reverse causality, we estimate two additional specifications, which are reported in Table 7b. Model E extends Model C by adding two Compustat-derived firm-level controls that the literature has linked to ESG ratings: profitability, measured as the firm-mean gross margin (sale-cogs)/sale, winsorized 1%/99%, and leverage, measured as the firm-mean total debt (DLC + DLTT) divided by total assets, winsorized 1%/99%. The sample shrinks to 927 firms, with non-missing values on all controls.

Adding profitability and leverage increases the model R^2 from 0.376 (Model C) to 0.471 (Model E), and the size coefficient on log(employees) increases from 0.120 to 0.147 ($p < 0.001$), indicating that the size effect is not an artifact of these omitted controls. Profitability enters positively and significantly ($b = 0.075, p < 0.001$), consistent with the literature in which more profitable firms invest more in disclosure-intensive ESG activities; leverage

is positive but not significant ($b = 0.043$, $p = 0.147$). Critically, the continent and industry effects estimated in Model E remain essentially unchanged in sign, magnitude, and significance relative to Models A–C, indicating that the headline geographic and industry findings are robust to controlling for firm profitability and leverage.

Table 7. Multivariate regression models of the overall ESG rating.

(a) Baseline models.				
Variable	Model A	Model B	Model C	Model D
Intercept	0.559 *** (0.008)	0.665 *** (0.010)	0.422 *** (0.010)	0.574 *** (0.010)
Continent: Australia	−0.068 *** (0.014)	0.019 (0.014)	0.062 *** (0.014)	−0.166 *** (0.022)
Continent: Europe	0.101 *** (0.010)	0.107 *** (0.009)	0.118 *** (0.009)	0.096 *** (0.015)
Continent: North America	0.007 (0.010)	−0.060 ** (0.022)	−0.044 * (0.021)	−0.012 (0.014)
Industry: Services	−0.041 *** (0.008)	−0.025 ** (0.008)	−0.027 *** (0.008)	−0.072 *** (0.014)
Size: Medium		−0.080 *** (0.011)		
Size: Small		−0.197 *** (0.010)		
log(employees)			0.120 *** (0.006)	
Australia × Services				0.165 *** (0.029)
Europe × Services				0.012 (0.020)
North America × Services				0.038 * (0.019)
N	1982	1174	1174	1982
R ²	0.095	0.347	0.376	0.111
Adj. R ²	0.093	0.344	0.374	0.108
(b) Robustness checks (additional firm-level controls and lagged predictors).				
Variable	Model E (Profit + Leverage)	Model F (Lagged Controls)		
Intercept	+0.3517 (0.0145) ***	+0.4080 (0.0145) ***		
Australia	+0.0622 (0.0145) ***	+0.0560 (0.0151) ***		
Europe	+0.1129 (0.0092) ***	+0.1020 (0.0093) ***		
North America	−0.0338 (0.0218)	−0.0297 (0.0224)		
Industry: Services	−0.0727 (0.0088) ***	−0.0714 (0.0087) ***		
log(employees)	+0.1469 (0.0068) ***	+0.0570 (0.0030) ***		
Profitability (gross margin)	+0.0751 (0.0207) ***	+0.0768 (0.0209) ***		
Leverage (debt/assets)	+0.0426 (0.0294)	+0.0405 (0.0275)		
N	927	898		
R ²	0.4713	0.4323		
Adj. R ²	0.4672	0.4279		
F-statistic	117.02	96.83		

Note. Cell entries are unstandardized OLS coefficients, with standard errors in parentheses. Baseline categories: continent = Asia; industry = manufacturing; size = large. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Blank cells indicate that the predictor was not included in the corresponding model.

Model F implements a reverse-causality robustness test in which all firm-level controls are computed on the early panel (2015–2017) and used to predict the late-panel (2018–2025) ESG rating. This specification breaks contemporaneous simultaneity between firm characteristics and ratings. With $N = 898$ firms, the model attains an R^2 of 0.432. The early-period size variable (log employees in 2015–2017) significantly predicts later ESG ratings ($b = 0.057$, $p < 0.001$), and the geographic and industry effects are preserved. While Model F cannot rule out all forms of endogeneity (firm characteristics and ESG ratings co-evolve), it does rule out the simple reverse-causality story in which higher ratings drive firm growth or profitability over the sample period: by construction, the controls in Model F are determined before the outcome is observed. We therefore treat the size and industry effects as

descriptive findings that are not driven by simple feedback from rating to firm size, while continuing to acknowledge that ownership structure, board composition, and investor pressure remain unobserved (see Section 5.5).

4.6. Within-Asia Country Heterogeneity

The continent-level analyses treat Asia as a single category, which conceals substantial within-region institutional heterogeneity. To address this, we report the country-level ANOVAs for the four Asian countries with at least 20 sampled firms: Japan ($n = 280$), India ($n = 79$), Republic of Korea ($n = 64$), and Malaysia ($n = 28$). The within-Asia country ANOVA for the overall ESG is not statistically significant ($F = 1.60$, $p = 0.19$, $R^2 = 0.011$), indicating that the four major Asian countries do not differ significantly in their mean Refinitiv ESG ratings over the 2015–2025 panel.

Country-level descriptive statistics are presented in Table 8. Korean firms score highest among the four sampled Asian countries at $M = 0.571$, followed by Indian firms ($M = 0.563$), Malaysian firms ($M = 0.544$), and Japanese firms ($M = 0.528$). None of these countries approaches the European continental mean of 0.636.

Table 8. Within-Asia country breakdown of overall ESG ratings.

Country	Sample Size	Mean ESG	SD
Republic of Korea	64	0.571	0.190
India	79	0.563	0.141
Malaysia	28	0.544	0.130
Japan	280	0.528	0.181

Note. Country-level ANOVA for overall ESG: $F = 1.60$, $p = 0.19$, $R^2 = 0.011$, $N = 451$. Countries with fewer than 20 sampled firms (notably, China, $n = 16$; Singapore, $n = 19$) are excluded from this analysis but included in the continent-level results.

4.7. Multi-Provider Robustness: Refinitiv vs. S&P Global

A central concern in cross-provider ESG research is whether documented patterns are robust to the choice of rating provider. For the subset of 1397 firms with valid full-panel-averaged ESG scores from both Refinitiv and S&P Global over the 2015–2025 window, the Pearson correlation between the two providers is $r = 0.738$ (Spearman rank correlation = 0.781, both $p < 0.001$), strong and substantial and is materially stronger than that obtained on shorter analytical windows, consistent with the interpretation that long-horizon averaging dampens provider-specific year-to-year noise. The pattern qualifies but does not overturn the cross-provider divergence documented by Berg, Kölbel, and Rigobon [34] and Gibson Brandon, Krueger, and Schmidt [46] on shorter windows. Cross-provider statistics and replications of all three primary hypotheses are reported in Table 9. Replicating H1, H2, and H3 using S&P Global ESG scores yields broadly consistent results. The continent effect remains highly significant (S&P H1: $F = 55.34$, $p < 0.001$, $R^2 = 0.106$), with Europe again leading. The industry effect replicates in the same direction: manufacturing firms also score higher than service firms in S&P data ($F = 4.26$, $p = 0.039$). The size effect replicates strongly ($F = 92.44$, $p < 0.001$, $R^2 = 0.207$), with the same large > medium > small ordering. The convergent pattern across providers strengthens the inferences drawn from the Refinitiv-based primary analysis.

Table 9. Multi-provider validation: Refinitiv versus S&P Global ESG.

Variable	Mean (S&P)	N	Sig.
Cross-provider correlation (N = 1397)			
Pearson r	0.738		$p < 0.001$
Spearman ρ	0.781		$p < 0.001$
H1 replication under S&P (continent)			
Europe	50.22	453	
Asia	41.84	142	
Australia	41.41	158	
North America	38.88	644	
S&P H1 F-test	F = 55.34		$p < 0.001$
H2 replication under S&P (industry)			
Manufacturing	44.14	587	
Services	42.42	810	
S&P H2 F-test	F = 4.26		$p = 0.039$
H3 replication under S&P (size)			
Large	58.97	163	
Medium	49.84	187	
Small	41.16	360	
S&P H3 F-test	F = 92.44		$p < 0.001$

Note. S&P Global ESG scores are on a 0–100 scale (compared to Refinitiv’s 0–1 scale). Cross-provider comparisons should be interpreted in terms of relative rankings and effect sizes, not absolute means.

4.8. Sector-Level Robustness

The binary manufacturing-versus-services classification in H2 is necessarily coarse and may conceal substantial within-category variation. To address this concern, we re-estimate the industry analysis using the NAICS two-digit sector code directly. Restricting the analysis to the 16 sectors with at least 20 sampled firms (N = 1267), the sector-level ANOVA is highly significant (F = 6.29, $p < 0.001$, $R^2 = 0.070$). The sector ordering reveals important within-category heterogeneity that the binary specification obscures. Among manufacturing sectors, NAICS 32 (Chemicals/Pharmaceuticals) and NAICS 33 (Machinery/Electronics) score the highest, whereas NAICS 21 (Mining/Oil and Gas) scores the lowest among all sectors. We discuss this finding in Section 5.2: the simple manufacturing-versus-services contrast captures one form of industry variation but conceals a second, arguably more important one: the within-manufacturing variation between high-impact resource-extractive sectors and high-margin processing sectors. Sector-level descriptive statistics are presented in Table 10.

Table 10. NAICS 2-digit sector-level robustness analysis.

Code	Sector	N	Mean ESG
NAICS 32	Chemicals/Pharma (Mfg)	158	0.619
NAICS 33	Machinery/Electronics (Mfg)	249	0.609
NAICS 23	Construction (Mfg)	56	0.585

Table 10. *Cont.*

Code	Sector	N	Mean ESG
NAICS 44	Retail Trade I (Svc)	30	0.583
NAICS 31	Food/Textiles Mfg (Mfg)	76	0.582
NAICS 54	Professional Services (Svc)	49	0.578
NAICS 53	Real Estate (Svc)	63	0.576
NAICS 52	Finance/Insurance (Svc)	215	0.570
NAICS 51	Information/Telecom (Svc)	96	0.544
NAICS 22	Utilities (Svc)	54	0.537
NAICS 56	Admin/Waste Mgmt (Svc)	21	0.531
NAICS 48	Transportation (Svc)	51	0.507
NAICS 99	Unclassified	20	0.501
NAICS 42	Wholesale Trade (Svc)	25	0.497
NAICS 45	Retail Trade II (Svc)	41	0.448
NAICS 21	Mining/Oil and Gas (Mfg)	63	0.443

Note. Restricted to sectors with $N \geq 20$. NAICS 2-digit sectors are labeled with their broader binary classification (Mfg or Svc) in parentheses for cross-reference with Table 5.

4.9. Assumption Diagnostics

The ANOVA and MANOVA results above assume equal within-group variances. Given the unbalanced sample sizes across groups (most pronounced in the continent comparison), we test the equal-variance assumption using Levene's test and report Welch's ANOVA as a robust alternative. Levene's test rejects the equal-variance null for all three primary hypotheses (H1: $W = 4.45$, $p = 0.004$; H2: $W = 4.42$, $p = 0.036$; H3: $W = 9.91$, $p < 0.001$), indicating that group variances are heterogeneous. The Welch's ANOVA, which does not assume equal variances, confirms all three primary findings (H1: $F = 59.11$, $p < 0.001$; H2: $F = 26.74$, $p < 0.001$; H3: $F = 195.92$, $p < 0.001$). The robustness tests therefore support the same substantive conclusions as the standard ANOVAs. For the MANOVA results, we rely on Pillai's trace as the primary statistic, given its known robustness to violations of the equal-covariance assumption. Diagnostic statistics for Levene's and Welch's tests are summarized in Table 11.

Table 11. Assumption diagnostics for ANOVA models.

Hypothesis	Levene W	Levene p	Welch F	Welch p
H1 (continent)	$W = 4.45$	0.004	$F = 59.11$	<0.001
H2 (industry)	$W = 4.42$	0.036	$F = 26.74$	<0.001
H3 (size)	$W = 9.91$	<0.001	$F = 195.92$	<0.001

5. Discussion and Implications

5.1. Geographic Differences: A Moderate and Nuanced Hierarchy

Two features of the H1 results merit theoretical attention. First, the omnibus continent effect is moderate in size (MANOVA partial $\eta^2 = 0.074$; pillar-level ANOVAs yield η^2 values between 0.032 and 0.110). That geography is a moderate rather than dominant determinant of ESG ratings is consistent with the institutional-diffusion mechanisms theorized by DiMaggio and Powell [10]—coercive pressure from spreading disclosure mandates, mimetic adoption of practices from leading firms, and normative pressure from the cross-border

professionalization of sustainability roles—through which ESG management practices diffuse across regions.

Second, the ordering of continents is nuanced rather than a strict ranking. Europe (0.636) retains a clear top position, but North America (0.542) and Asia (0.538) are essentially indistinguishable as a pair (Tukey HSD contrast not significant), and Australia (0.466) occupies the lowest position. The Australia result is partly mechanical (the Australian sample is small and concentrated in extractive industries, which receive lower Refinitiv environmental scores), while the Asia–North America near tie indicates that the four continents are not cleanly separated in their ESG ratings. Multivariate Model B confirms that the European advantage survives the inclusion of industry and size controls ($b = 0.107$, $p < 0.001$), and that the North American coefficient turns significantly negative relative to Asia once size is controlled for, suggesting that the apparent Asia–North America near tie reflects compositional differences in firm size between the two regions.

5.2. Industry Differences in the Environmental and Social Pillars

The H2 analysis reveals a significant manufacturing > services difference ($F = 26.54$, $p < 0.001$), and the pillar-specific decomposition shows that the difference is driven by the environmental and social pillars, with no significant difference in governance—exactly the pattern predicted by the H2a/H2b/H2c.

These industry differences are concentrated in precisely the pillars where sector-specific operational exposures are most salient: manufacturing activities carry larger and more visible environmental and workforce footprints than most service activities, whereas governance is shaped primarily by listing regime and ownership structure rather than by sector. More broadly, because ESG rating providers differ in indicator selection, weighting, and the treatment of sector materiality, an industry contrast estimated under one provider's methodology need not transfer mechanically to another; this is the same comparability–informativeness tension documented in the cross-provider divergence literature [37,109] and analyzed in the ESG disclosure literature [38,39]. Researchers reporting industry effects should therefore be explicit about the materiality treatment embedded in the chosen provider's methodology.

The sector-level robustness check (Section 4.8) further qualifies the binary industry finding. Among manufacturing sectors, NAICS 21 (Mining/Oil and Gas) scores lower than any other sector, while NAICS 32 (Chemicals/Pharmaceuticals) and NAICS 33 (Machinery/Electronics) score the highest. The within-manufacturing variation between extractive and processing sectors is larger than the manufacturing-vs-services variation captured by the binary specification. The implication is that the binary contrast, even when significant, captures only a coarse slice of the actual industry variation in ESG ratings.

5.3. Within-Continent Heterogeneity: The Asia Result

The within-Asia decomposition (Section 4.6) presents a more cautious picture than continent-level aggregation alone. Country-level means across the four major sampled Asian countries are tightly clustered (Republic of Korea (0.571), India (0.563), Malaysia (0.544), and Japan (0.528)), and the within-Asia ANOVA does not reach statistical significance ($p = 0.19$). None of these countries approaches the European continental mean of 0.636. Averaged over the eleven-year panel, the four major Asian countries do not differ significantly in their mean ESG ratings, indicating that cross-country differences within Asia are modest rather than reflecting large, stable institutional gaps.

These findings complicate but do not invalidate the comparative-capitalism framing of Witt and colleagues [110]: East and Southeast Asian economies differ in their corporate-governance and disclosure regimes, but those differences do not translate cleanly into

stable, large-magnitude differences in measured ESG ratings over a long window. Research seeking to test institutional-theory claims about ESG should not assume that long-window country-level rating differences within a continent are large; the pattern is closer to convergence than to divergence over 2015–2025.

5.4. The Persistent Size Effect and Disclosure-Cost Asymmetries

The size effect is the largest and most robust effect documented in this study ($\eta^2 = 0.247$; multivariate R^2 rises from 0.095 in Model A to 0.376 in Model C when log-employees replaces the size categories). The resource-based-view explanation is straightforward: larger firms possess the slack resources, dedicated personnel, and economies of scale that comprehensive ESG programs require [22,23]. However, an alternative interpretation, emphasized by Drempetic, Klein, and Zwergel [49] and Christensen, Serafeim, and Sikochi [109], is that the size effect is, in part, a disclosure-cost artifact: ESG rating providers score on the basis of disclosed information, and the fixed cost of high-quality disclosure is asymmetric across firm size.

Our data cannot distinguish between these two mechanisms, and we caution against interpreting the size effect as evidence that larger firms have better underlying sustainability performance rather than merely better-quantified disclosure. The recent ISSB and CSRD disclosure standards [34,35], by raising the disclosure floor for all firms, plausibly narrow the disclosure-asymmetry component of the size effect over time. A valuable extension would track the size effect across the pre- and post-CSRD periods to test this prediction directly.

To operationalize the disclosure-cost hypothesis more directly, we exploit pillar-level variation in the size effect. If smaller firms receive lower ESG ratings primarily because they bear disproportionately high disclosure costs relative to their revenue base, the size gradient should be largest for the pillar that most heavily rewards detailed disclosure (environmental, where raters score Scope 1, 2, and 3 emissions, water and waste streams, biodiversity exposure, and climate-risk reporting) and smallest for the pillar that is most determined by structural features rather than detailed disclosure (governance, where raters score board independence, audit committee composition, executive compensation structure, and shareholder rights). The pillar ANOVAs in Table 6b are consistent with this pattern: the size effect is most pronounced on the environmental pillar ($\eta^2 = 0.274$), substantial on the social pillar ($\eta^2 = 0.219$, where disclosure of workforce composition, health and safety incidents, supply-chain audits, and community engagement programs is similarly disclosure-heavy), and visibly smaller on the governance pillar ($\eta^2 = 0.062$). The environmental-to-governance ratio of effect sizes ($4.4\times$) is the largest pillar gradient we observe for any of the three explanatory variables. We interpret this monotone pattern as evidence that disclosure-cost asymmetries are a non-trivial component of the size effect on ESG ratings. We are careful, however, not to over-interpret this evidence as decisive: the largest firms may also genuinely invest more in environmental management (a substantive channel), and the pillars are not perfectly comparable in their underlying construction. The pattern is informative about the rating signal, not necessarily about substantive ESG action.

5.5. Limitations

Several limitations warrant explicit acknowledgment. First, the dependent variable is a vendor-assigned ESG rating, not a direct measure of environmental, social, or governance performance. Because Refinitiv and S&P Global construct their scores from disclosed firm-level information, the rating combines what a firm does with how completely it discloses what it does; the geographic, industry, and size differences we document therefore reflect a mixture of substantive action and disclosure footprint that the data alone cannot fully

disentangle. Second, even with the additional Compustat controls in Models E and F (profitability, leverage, log employees, with continent and industry fixed effects), we cannot directly observe ownership structure, board composition, or institutional-investor pressure, all of which plausibly affect both firm size and ESG ratings. Some of the residual size effect almost certainly reflects these unobservables rather than a pure scale effect; we treat the size coefficient as descriptive of the rating gradient rather than as a causal estimate of how firm growth changes ESG actions. Third, our cross-sectional firm-mean specification does not exploit within-firm variation; a panel with firm fixed effects would identify time-varying changes in ratings but would also absorb the cross-sectional differences (continent, industry, size) that are the focus of H1 through H3. Fourth, while the lagged-controls specification (Model F) provides some reassurance against simple reverse-causality stories in which higher ESG ratings cause firms to grow or become more profitable, it does not address the simultaneity operating within the early window. Fifth, generalizability is limited to the universe of publicly listed firms large enough to receive Refinitiv coverage; smaller private firms, particularly in developing markets, are not represented.

5.6. Practical Implications: Reading the Rating Signal

Because the dependent variable in this study is a vendor-assigned ESG rating that combines substantive ESG action with disclosure footprint, the implications for practice are most defensibly framed in terms of how users should interpret the rating signal, rather than as claims about underlying ESG outcomes. We sharpen the discussion of practical implications along those lines for three constituencies.

For investors, the headline finding is that ESG ratings carry meaningful information about geographic and size differences in firm-level disclosure profiles but should not be treated as direct measures of environmental, social, or governance outcomes. The Refinitiv-versus-S&P Global rank correlation of 0.781, while substantial, leaves enough cross-provider disagreement that investment strategies built around the absolute level of a single rating are exposed to provider-methodology risk. Investors using ratings for portfolio screening should (a) verify robustness across at least two providers, (b) treat the size gradient with caution because some of it reflects small-firm disclosure capacity rather than substantive ESG behavior, and (c) supplement rating-based screens with direct evidence on the underlying activities they actually care about (Scope 1–3 emissions for climate concerns, attrition and safety incidents for workforce concerns, and board independence for governance concerns).

For policymakers, the geographic ranking—Europe substantially above Asia, North America, and Australia in ESG ratings—is best interpreted as evidence that mandatory disclosure regimes (SFDR, CSRD, EU Taxonomy, ISSB) raise ESG rating levels by increasing disclosure completeness, with an additional substantive component that the data alone cannot fully separate. As mandatory reporting expands to more jurisdictions, the European advantage in ESG ratings may narrow. Policymakers should therefore distinguish between using ratings as an indicator of compliance with disclosure mandates (an appropriate use) and using them as evidence of substantive environmental or social outcomes (a use that warrants additional measurement instruments).

For managers, the practical question is how to improve the firm's ESG rating profile, which the pillar-specific evidence in Sections 4.1–4.3 helps to inform. Because the size effect is largest on the environmental pillar ($\eta^2 = 0.274$) and smallest on the governance pillar ($\eta^2 = 0.062$), smaller firms can close some of the ESG ratings gap with comparatively modest investments in governance disclosure (board composition, audit committee structure, executive compensation structure) that do not require the operational data systems needed for high-quality environmental disclosure. Larger firms whose ratings still trail those of

comparable peers should focus on the same environmental disclosure dimensions where raters concentrate scoring weight. In all cases, managers should recognize that ratings reward what is disclosed and verifiable, so investments in measurement infrastructure (carbon accounting systems, human-capital data systems, sustainability reporting capabilities) translate into rating improvements in a way that purely substantive but undisclosed actions do not.

6. Conclusions and Future Research

This empirical study examined ESG rating differences across 1982 global firms using Refinitiv ESG ratings averaged over the 2015–2025 panel, with cross-validation against S&P Global ratings on a 1397-firm subset over the same window. Our analysis yields four principal conclusions. First, geographic location is significantly associated with ESG ratings, with European firms clearly leading; the cross-continent ordering of the remaining categories is nuanced, with Asia and North America essentially tied and Australia occupying the lowest position. Second, industry classification is significantly related to ESG ratings under Refinitiv’s pillar-weighted aggregation, with manufacturing firms scoring higher than service firms in the environmental and social pillars but not in the governance pillar. Third, firm size is significantly and positively associated with ESG ratings and emerges as the largest effect in the multivariate analysis. Fourth, the central findings replicate under the S&P Global rating provider, with a substantial cross-provider correlation.

Our findings open several promising avenues for future research. First, a dynamic panel analysis with year fixed effects across the pre- and post-CSR periods would allow direct testing of whether mandatory disclosure regimes change the magnitude of cross-continent ESG rating differences over time. Second, country-level analyses within Asia and Europe with larger samples could exploit the cross-country regulatory variation that the continent-level classification necessarily aggregates. Third, the cross-provider divergence we document points to a research agenda on the specific features of provider methodologies that drive disagreement: indicator selection, weighting, materiality adjustment, and disclosure-coverage choices likely operate through distinct channels. Fourth, mechanism testing for the size effect—distinguishing genuine performance differences from disclosure-cost asymmetries—would speak directly to the interpretation of ESG ratings as measures of corporate sustainability. Finally, extending ESG rating coverage to firms in Africa, Latin America, and the Middle East would enable a more globally representative analysis.

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