*IOSR Journal Of Economics and Finance (IOSR-JEF)*
*e-ISSN: 2321-5933, p-ISSN: 2321-5925.Volume 16, Issue 4 Ser. 4 (July. – August. 2025), Pp 57-66*
*www.Iosrjournals.Org*

# Corporate Environmental Responsibility And Firm Value: A Meta-Study

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***Abstract***
*The link between environmental responsibility and firm value remains a contested topic in corporate sustainability research. While meta-analyses on the subject exist, most stop at supporting one or the other side of the debate. We found none that simultaneously addressed how sectoral materiality, methodological rigor, and publication bias interact to shape observed effects. We collect a total of 241 environmental performance to firm value studies from across the world for the period 2020 to 2025. Using a Random-effects model, we find a robust positive association in which firms with stronger environmental performance demonstrate 7.5% higher value on average (Odds Ratio=1.075, 95% Confidence Interval: 1.059–1.092). We delve deeper into the link using meta-regression analysis and find that; 1. Study methodological quality significantly moderates this link with advanced methods yield 8.1% smaller estimates than basic designs (Odds Ratio=0.92, p-value=0.006), suggesting less rigorous studies overstate effects, 2. Manufacturing and highly resource dependent firms such as agriculture and energy show a 5.8% stronger environment-value relationships (Odds Ratio=1.058, p-value=0.007) compared to low-impact sectors like hospitality or technology which is consistent with the resource dependence theory. However, 3. Geographical context proves insignificant (p-value=0.611). The study is robust to leave one out analysis (Odds Ratio range: 1.068–1.083) though consistent with our methodology moderator results, publication bias tests indicate smaller studies tend to report inflated effects (Egger's intercept=0.170, p-value<0.001). The findings highlight both the value of environmental stewardship and the critical need for methodologically rigor. Policymakers should prioritize sector-specific interventions, while researchers should adopt advanced controls to mitigate publication-related overestimates.*

***Keywords:*** *Firm value, Corporate Environmental Responsibility, Meta-analysis, Methodological Rigor, Industry Context and Geographical Context.*

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Date of Submission: 07-08-2025 Date of Acceptance: 17-08-2025

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## I. Introduction

Firm value, represents the total worth of a company, encompassing both equity and debt (Pignataro, 2013). It reflects the market's assessment of a firm's ability to generate future cash flows, accounting for its assets, liabilities, growth prospects, and risk profile (Hackel, 2011). Investors rely on this metric to assess whether a company is undervalued or overvalued, while corporate leaders use it to guide strategic decisions, from mergers and acquisitions to capital restructuring. Frykman and Tolleryd (2010), contend that firm value is important to both the existing and potential investors, board members and employees of a company. They state that to an investor, firm value is simply a reflection of their wealth in the company while to directors and managers, it is an assessment, by the public, of their performance.

Several key factors influence firm value, including profitability, growth in investments and macroeconomic stability (Fama & French, 2004). However, firm value isn't static and changes in the macroeconomic environment, legal and regulatory changes, or disruptive innovations can rapidly alter perceptions of a company's worth (Bloom et al., 2018). Frykman & Tolleryd (2010) contend that creation of firm value is only scientific to an extent while the rest is created in a myriad of everyday decisions within the organization. One way in which a company endears itself to stakeholders and hence create intangible value is how it interacts with its stakeholders.

Firm value, also known as enterprise value is made up of several components. These include the market capitalization, total debt, any preferred shares, less cash holdings (Berk et al., 2019). By analyzing these elements, investors and managers can better understand how value is created within the firm.

Corporate Environmental Responsibility (CER) is a strategic obligation for organisations that want to enhance their value in a world that is grappling with a supposed climate crisis and global sustainability challenges

Kasych et al. (2020). According to Alam and Islam (2021), Companies that take CER seriously are able to reduce their environmental risk while at the same time acquiring competitive advantages through innovation, cost savings, and an enhanced brand image. As stakeholders demand transparency and accountability, companies that lead in environmental stewardship are positioned to thrive in the evolving global economy (Solikhah & Maulina, 2021).

According to Zhou & Jin (2023), CER is consistent with the goals of economic development and environmental protection. In the US, companies are obliged to disclose the impact of compliance with environmental laws on among other things capital expenditure, earnings and their competitive position (Securities and Exchange Commission, 2020). From an accounting perspective, IFRS S1 mandates businesses to discuss the risks and opportunities associated with sustainability matters that would help current and potential investors decide whether to buy or sell securities (IFRS Foundation, 2023).

Firm value does not always track firm environmental efforts due to divergent stakeholder priorities. Investors often discount long-term ESG investments when short-term costs outweigh visible benefits (Abu-Shakra, 2024), while customers frequently prioritize price over sustainability (Strong et al., 2021). Regulatory uncertainty and flawed climate metrics further decouple environmental actions from valuation (Idso et al., 2016).

Industry, geography and Methodologies are hypothesised as important moderators of the results obtained in the papers. Industry refers to the sector that a given paper looked at classified by their environmental materiality. The resource dependence theory (Pfeffer & Salancik, 1978) posits that firms in resource-intensive industries (e.g., mining, oil) face greater stakeholder pressure to address environmental externalities, making their sustainability efforts more visible and value-relevant. Geographical context refers to the income and regulatory differences across countries. Institutional theory (DiMaggio & Powell, 1983) suggests that high-income countries (HICs) with stringent climate policies (e.g., EU carbon markets) reward environmental stewardship more consistently, as regulations force internalization of ecological costs. Methodological rigor refers to the econometric techniques used to isolate the environment-value relationship, ranging from basic correlation analyses to dynamic causal models. Angrist & Pischke (2010) argues that advanced methods such as GMM and other Instrumental variable methods mitigate endogeneity biases like omitted variables or reverse causality which inflate effects in simpler models.

**Problem Statement**

The link between environmental responsibility and firm value remains a contested topics in corporate sustainability research. While some literature argues that green initiatives enhance financial performance through improved operational efficiency (Eccles et al., 2014), risk mitigation (Khan et al., 2016), and stakeholder trust (Flammer, 2021), an equally substantial set of studies finds neutral or negative effects (Zhang et al. 2020); (Liu & Lee, 2025). These divergent findings persist across industries and geographies, suggesting context-dependency rather than universal applicability (Alshehhi et al., 2018). Regulatory frameworks like IFRS S1 and S2 (Christensen et al., 2022) and the EU's Corporate Sustainability Reporting Directive (CSRD) (Lecoq, 2024) further complicate the picture by imposing standardized disclosures that may misalign with material value drivers. Tesla's ESG paradox (high impact, low ratings) is a case in point of how measurement flaws distort outcomes (Koonin, 2021). The question then becomes; is it possible to isolate the conditions under which environmental responsibility create measurable financial value as opposed to just being an additional compliance cost?

Further Geographical and cultural differences make the contradictions worse. Environmental initiatives show stronger valuation benefits in markets with stringent regulations (Griffin et al., 2018) and sustainability-conscious consumers (White et al., 2019), while emerging economies often report insignificant or negative effects (Shapiro & Walker, 2018). This study starts from more than 1,400 publications to synthesizes evidence to quantify the distribution of positive to negative or insignificant effects (DerSimonian & Laird, 1986); Test whether geography (Liao et al., 2021), industry (Naeem et al., 2022), or methodology (Barros et al., 2020) explain contradictions; And distinguish value-creating initiatives from what Ramaswamy (2021), calls compliance burdens. By mapping these boundaries, the study offers actionable insights for firms and policymakers navigating ESG's financial trade-offs.

**Objectives of the Study**

The general objective of the study was to establish the effect of corporate environmental responsibility disclosures on firm value.

The specific objectives of the study were to:

i. Evaluate the effect of environmental performance on firm value.
ii. Assess how geographical context moderates the relationship between environmental performance and firm value.
iii. Assess how industry context moderates the relationship between environmental performance and firm value.

iv. Assess how research methodology moderates the relationship between environmental performance and firm value.

**Research Hypotheses**

To achieve the aforementioned objectives, the null hypotheses below were formulated and tested:

$H_{01}$: Environmental performance has no significant effect on firm value.

$H_{02}$: The relationship between environmental performance and firm value does not significantly differ between high-income and other countries.

$H_{03}$: The relationship between environmental performance and firm value does not significantly vary by research methodology.

$H_{04}$: The relationship between environmental performance and firm value does not significantly differ between environmentally sensitive sectors and other industry sectors.

**Scope of the Study**

The study examined how Environmental performance affects firm value. It focused on research papers published between 2020 and 2025. The publication window was selected to capture developments in sustainability reporting frameworks, including the implementation of IFRS S1 and S2 and the European Union's Corporate Sustainability Reporting Directive (CSRD). Geographically, it covered the whole world, methodologically, it looked at different types of methods and finally covered all types of corporate industries as all these were theorized to have an effect on the results obtained by the researchers.

**Significance of the study**

The effect of environmental performance on firm value is an important area of inquiry as businesses face increasing pressure to address sustainability challenges. Such a study offers a comprehensive understanding of this relationship by identifying patterns, resolving inconsistencies, and highlighting key moderators. By systematically analysing existing evidence, such a study provides clarity on whether, and under what conditions, environmental stewardship translates into financial value, helping policymakers, investors and businesses navigate the complex interplay between sustainability and corporate success.

For policymakers, the study may be taken as the basis for designing regulations and incentives that promote sustainable business practices. By identifying how and where environmental initiatives affect firm value, policymakers can come up with policies that improve businesses by focusing on the specific actions that improve value while avoiding measures that may impose costs without clear benefits. This study also reveal contextual factors (e.g., industry differences, regional regulations) that influence outcomes, enabling more targeted and effective policy interventions.

For investors the study's findings may be used to enhance ESG investment strategies. By looking at how environmental practices drive valuation investors can allocate capital more effectively. It may also reveal timing effects, showing whether environmental performance pays off in the short or long term, and how market conditions moderate returns. This evidence improves the investors' ability to identify which efforts that enhance financial performance.

Finally, researchers get a distilled framework that provides an up-to-date status of knowledge, gaps, and contradictions in the literature. The study highlights under-explored areas, such as the un-researched geographies, guiding future research agendas. Additionally, by assessing methodological variations across studies, it can propose best practices for measuring environmental performance and firm value, improving the rigor of subsequent work.

## II. Literature Review

The paper reviews theoretical literature, empirical literature and the conceptual framework as documented hereunder.

**Theoretical Review**

This study is premised on several theories including; Shareholder Value Theory: This was first put forth by Friedman (1970). It argues that, the one and only social responsibility of business involves utilizing its resources and undertaking actions aimed at maximizing value. On this basis, managers should focus on profitability and shareholder returns, viewing environmental efforts as costs unless they enhance financial performance. Criticisms of this school of thought comes from among others Bower and Paine (2017), who referred to shareholder centricity as a fundamental mistake in the running co companies because it is erroneous in its presumptions, legally unclear, and harmful in reality.

Conversely, the Stakeholder Theory which was initially proposed by Freeman (1984), and argues that an entity's goals should be determined by weighing the requirements of the many stakeholders such as employees,

community and the environment. On this basis, environmental performance is valued as it strengthens stakeholder relationships, ensuring long-term viability. Critics such as Marcoux (2003) claim that such a business strategy would undermine the fiduciary duties managers owe to shareholders and expand managerial obligations to multiple stakeholders, which can foster moral hazard, create perverse incentives, and ultimately undermine stakeholder confidence in governance systems.

**Empirical Review**

Yoon et al. (2018) sampled 705 companies with equity shares traded in the Korean Exchange over the years 2010 and 2015 in a research to determine how ESG ratings affect valuation of listed companies by the market. They further divided the firms into environmentally sensitive and others where environmentally sensitive firms were those that related to energy, material and utilities. They used ESG data from the Korean Corporate Governance Services. They used an OLS model and regressed this against financial information (book value, market value and earnings per share) obtained from WISEfn database. They find that, in general, ESG ratings trend in the same direction as valuation. That association is also significant. They also found that while the relationship still exists, it is lower for firms in environmentally sensitive industries.

For the period 2017 to 2021, Zhang et al. (2023) used company-level financial data from Bloomberg which included firms from 37 different nations as their dependent variables and climate risk from the Germanwatch-created and maintained Global Climate Risk Index (CRI) as the explanatory variable to ascertain how climate change affects company performance and capital structure decisions. Using an OLS based model, they found no significant relationship between climate risk and return on assets. Nonetheless, they observed that the correlation between long-term debt and climate risk was significant and positive.

Lee (2025) sourced financial data from FnGuide and TS2000, and ESG scores from the Korea Institute of Corporate Governance and Sustainability (KCGS). They found that the environmental score was not significant in a test of relationships between E, S and G separately on one hand and innovation on the other at 5% significance level. However, Lee's research investigated the how ESG is correlated to innovation rather than firm value. The current inquiry however focuses on how ESG trends with firm value. Further, Korea is a much bigger economy than the one in this study.

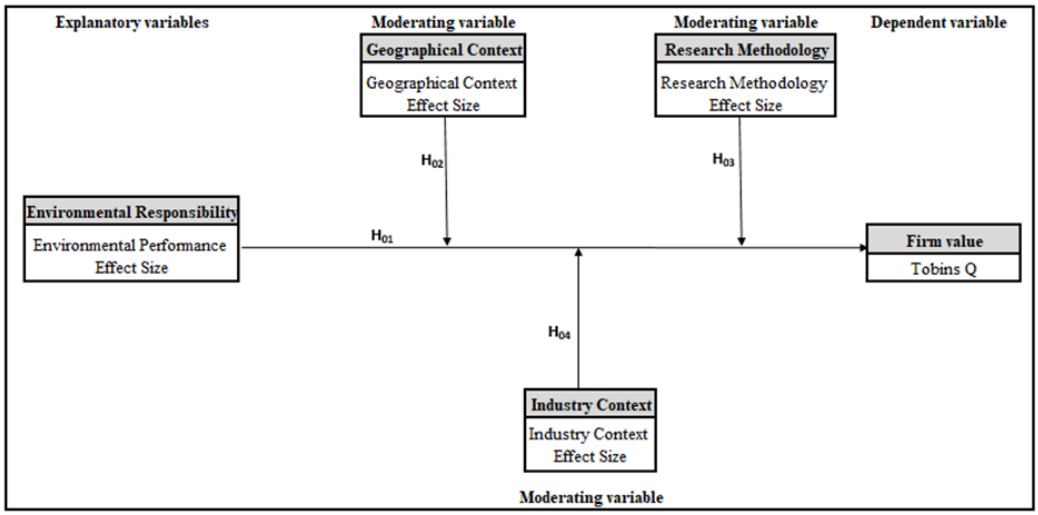
Fiskerstrand et al. (2019) investigated the effect of ESG disclosure on accounting performance of firms with equities trading at the Euronext's Oslo Brs in Norway. They used Dow Jones Sustainability Nordic Index, which is made up of the top thirty percent largest companies from Norway, Sweden, Finland, Denmark and Iceland based on ESG-criteria to provide a measure for sensitivity towards sustainability. For the market return, they used OSEBX, the Oslo Brs index and a Norwegian Government 10 year bonds as the risk free rate. They subjected these to both Carhart (1997) 4 factor model using market risk premiums of Norway from Ødegaard (2017), size and book to market ratios and momentum ratios. They then performed the Fama-MacBeth (1973) procedures to ascertain whether a risk premium exists for equities in Norway for the ESG factor. They find no evidence that a portfolio built on High minus Low (HML) on the ESG factor would have generated a significant return difference once they adjusted for the market risk. They also find no evidence that a Clean minus Dirty (CMD) factor carries a risk premium in the Norway.

Yu and Xiao (2022) carried out a study to investigate how firm value varies with variations in ESG performance. They used 804 Chinese A-share exchange traded companies which published quantitative ESG data between 2010 and 2019. Their two outcome variables were ROA and Tobin's Q. They used an own scoring methodology based on equal weights for environmental, social and governance factors. They find that valuation by the markets is positively correlated to combined ESG score and that the relationship is significant. They also find positive relationships between firm value and each of the Environmental rating, the Social rating, the Governance rating. They run a two stage Heckman Estimation model as a robustness check and find that other than the governance factor, all the other results are robust.

**Conceptual Framework**

The conceptual framework diagram below shows at a glance the relationship between the various variables used in the study.

**Figure 1 Study Conceptual Framework**




**Source: Researcher, 2025**

## III. Research Methodology

**Research Philosophy and Research Design**

This review adopts a meta-regression analysis to analyse the data from past research studies. Meta-studies aim to objectively synthesize existing empirical research, identifying patterns, inconsistencies, and generalizable conclusions (Corcoran & Pillai, 2008). Therefore the most appropriate research philosophy is positivism.

The study adopted an explanatory research design. A meta-study such as this one aims to explain relationships between variables by synthesizing and testing hypotheses from existing studies. This aligns with Saunders et al. (2019) explanation of explanatory studies which aim to establish causal relationships.

**Basic Model**

The paper first estimated the unadjusted overall effect using a random-effects model (DerSimonian & Laird, 1986), which treats variation in effect sizes as a combination of within-study sampling error ($\varepsilon_k$) and between-study heterogeneity ($\upsilon_k$). This model explains the individual and overall effect size from the individual studies and may be illustrated as;

$\beta_i = \beta_0 + \upsilon_i + \varepsilon_i$

Where; $\beta_i$ is the observed effect size from study k, $\beta_0$ is the overall average effect (intercept) $\upsilon_i$ is the between-study heterogeneity (tau-squared) and $\varepsilon_i$ is the within-study error. Rejecting $H_{01}$ requires the 95% confidence interval of the pooled OR to exclude 1, equivalent to $p < 0.05$. To explain heterogeneity (tau-squared), we extended this to a meta-regression model incorporating study-level moderators (industry materiality, methodology, and country income), weighted by inverse variance.

**Meta-Regression Analysis**

Meta-Regression Analysis (MRA) is a statistical technique that examines how effect sizes (e.g., the strength and direction of the environment-value link) vary across studies based on their characteristics (e.g., industry, methodology). It quantifies whether observed differences are systematic or random, while controlling for study-level biases (Stanley & Doucouliagos, 2016). We use as our variables, the study industry context, research methodology and geographical context to determine how each moderates the study outcome i.e. the magnitude and direction of the coefficient weighted by the significance.

The logistic model may be illustrated as;

$\beta_i = \beta_0 + \beta_1(\text{env\_sensitive}) + \beta_2(\text{method\_2}) + \beta_3(\text{method\_3}) + \beta_4(\text{high\_income}) + \upsilon_i + \varepsilon_i$

Where; $\beta_i$ is the observed effect size (log odds ratio) from study i, $\beta_0$ is the baseline effect for reference group, in this case, non-environmentally sensitive industries, basic methods, non-high-income countries, $\beta_1$(env_sensitive) is the adjustment for environmentally sensitive industries, $\beta_2$(method_2) is the adjustment for intermediate vs. basic methodologies, $\beta_3$(method_3) is the adjustment for advanced vs. basic methodologies, $\beta_4$(high_income) is the adjustment for high-income country status, $\upsilon_i$ is the between-study random effects (heterogeneity) and $\varepsilon_i$ is the within-study sampling error.

**Data Collection and Sample Design**

Using Harzing's (2024) Publish or Perish, we collected data from Semantic Scholar, Google Scholar, PubMed, and Scopus. This was supplemented by targeted searches of MDPI's sustainability journals, using the Boolean search string: ("ESG" OR "Environmental") AND ("firm value" OR "financial performance") in article titles.

**Study Selection and Variable Extraction**

We screened the studies obtained above against three strict inclusion criteria namely: (1) each study was done at company level thus eliminating meta-studies and studies done for individual stocks or a portfolio of stocks, (2) each study provided results of environmental-valuation relationships and (3) each study dealt with firm value as opposed to performance. This left a list of 241 studies from an initial list of 1400. Where p-values were stated as greater than or less than 0.05, we estimated a conservative p-value as either 0.045 or 0.055 respectively. Where beta was missing, especially for insignificant results, we assigned the study the minimum negative observed beta (-0.1) for purposes of computing the effect size. All analyses employed inverse-variance weighting ($1/SE^2$) to prioritize precise estimates. Each study was then coded for key variables, i.e., geographical context, methodology rigor and industry context.

Effect size quantifies the strength and direction of a relationship between variables in a study. Unlike p-values (which measure statistical significance), effect sizes measure the practical importance of a particular relationship for a particular individual study. For this study, the effect size represents how strongly environmental performance relates to firm value in a given study with larger absolute effect size showing stronger relationship.

It is measured by transforming t-statistics as below

$$\beta e = \frac{t}{\sqrt{N}}$$

Where t is the study's t-statistic and N is the study's sample size. The Square root of N is used to standardize and make effects comparable across studies with different sample sizes. Where N was not available, a sample size of 100 was assumed.

Industries were categorized based on environmental materiality using a three-tier framework. Multi-sector studies examining firms across diverse industries were analysed separately. Environmentally sensitive entities were defined as those with high environmental externalities (energy, mining, and heavy manufacturing), and the industrial sectors encompassed light manufacturing and transportation. The non-environmentally sensitive sectors included financial services and technology firms. Geographical context classification using the World Bank's income group thresholds, distinguishing between high-income (OECD economies), upper-middle-income (e.g., China, Brazil), and lower-middle-income countries (e.g., India, Nigeria). Global multi-country studies were maintained as a separate category to account for cross-border regulatory heterogeneity.

Methodological rigor classified studies into three tiers based on their capacity to address endogeneity and omitted variable bias. Basic methodologies included simple OLS regressions and bivariate analyses lacking controls for firm characteristics or temporal effects. Intermediate designs included panel regressions with fixed effects, moderated regression models, and basic event studies while advanced methodologies included rigorous techniques like instrumental variable techniques, difference-in-differences designs, and structural equation modelling.

**Robustness and Validation**

Publication bias was assessed using Egger's linear regression test (Egger et al., 1997), which examines the relationship between effect sizes and their precision. In this test, small-study effects are quantified by regressing standardized effects against precision (1/SE), where a non-zero intercept indicates potential bias. Additionally, we performed leave-one-out sensitivity analysis to identify if any of the studies had a disproportionate influence on the results (Borenstein et al., 2021). Each study was sequentially excluded, and the pooled effect size was recalculated using the same random-effects model. Effects are considered robust if all recalculated estimates remained within the original 95% confidence interval.

## IV. Results

**Descriptive Statistics**

Table 1 (below) shows an analysis of the articles used in the study by their source database, publication year, geographical and industrial context and the methodological classification.

**Table 1 Descriptive statistics**

| Category | Subgroup | Count | Percentage | Median Effect Size |
|---|---|---|---|---|
| Database | Semantic Scholar | 139 | 58% | 0.15 |
| | Google Scholar | 63 | 26% | 0.03 |
| | SCOPUS | 32 | 13% | (0.03) |
| | MDPI | 5 | 2% | 0.25 |
| | Pubmed | 2 | 1% | 0.21 |
| Year | 2020 | 34 | 14% | 0.14 |
| | 2021 | 36 | 15% | 0.16 |
| | 2022 | 62 | 26% | 0.14 |
| | 2023 | 38 | 16% | 0.12 |
| | 2024 | 55 | 23% | 0.12 |
| | 2025 | 16 | 7% | 0.14 |
| Context | High-Income (HIC) | 53 | 22% | 0.12 |
| | Upper-Middle-Income (UMIC) | 78 | 32% | 0.15 |
| | Lower-Middle-Income (LMIC) | 81 | 34% | 0.14 |
| | Global | 29 | 12% | 0.11 |
| Industry | Multi-Sector | 155 | 64% | 0.12 |
| | Resource Intensive | 18 | 7% | 0.18 |
| | Industrial | 36 | 15% | 0.15 |
| | Financial | 19 | 8% | 0.10 |
| | Other | 13 | 5% | 0.03 |
| Methodology | Basic | 120 | 50% | 0.15 |
| | Intermediate | 98 | 41% | 0.12 |
| | Advanced | 23 | 10% | (0.04) |

**Source: Study data, 2025**

The analysis encompasses 241 studies published between 2020–2025, drawn primarily from Semantic Scholar (58%) and Google Scholar (26%), with Scopus (13%) and niche databases (MDPI, PubMed) comprising smaller shares. The negative median effect in Scopus (-0.025) may reflect its strict quality criteria dovetailing with the what we find in methodology where more advanced methods yeild lower median effect sizes. Conversely, MDPI's high median (0.250) could stem from its open-access model, which may attract studies with more extreme positive results while Google Scholar's moderate median (0.030) aligns with its broader inclusion of diverse study qualities.

Across the years (2020 to 2025), effect sizes remain stable with medians effect sizes between 0.115 and 0.155, suggesting no temporal inflation bias. Geographically, Upper-middle-income countries show the strongest effects (0.145), possibly due to rapidly evolving environmental regulations that amplify financial impacts. Global studies' lower median (0.110) may reflect dilution effects from cross-border regulatory heterogeneity.

Resource-intensive industries lead at 0.180, supporting the materiality hypothesis where environmental performance directly affects operational costs. The financial sector's weak median (0.100) underscores the limited relevance of ESG factors in asset-heavy industries. Finally, Basic methods' high median effect size of 0.150 compared to advanced methods' negative findingresult (-0.040) is consistent with the argument that design rigor suppresses effect sizes.

**Unadjusted model results**

The table below shows the results of the fixed-effect meta-regression of effect size against firm value for all the studies.

**Table 2 Unadjusted Meta-Analysis of Environmental Performance and Firm Value**

| Statistic | Value | 95% CI | Interpretation |
|---|---|---|---|
| Odds Ratio (OR) | 1.075 | [1.059, 1.092] | 7.5% higher firm value |
| Z-test (p-value) | z = 9.166 (p-value<0.001) | - | Highly significant |
| Heterogeneity ($I^2$) | 76.80% | [68.7%, 82.1%] | High between-study variance |
| Between-study variance ($\tau^2$) | 0.0101 | - | Moderate real differences |

**Source: Study data**

The random-effects meta-analysis of 241 studies revealed a statistically significant positive association between environmental performance and firm value, with firms demonstrating stronger environmental performance exhibiting 7.5% higher value on average (OR = 1.075, $p < 0.001$). We therefore rejected $H_0$ (OR=1.075), and concluded that environmental performance enhances value. However, substantial heterogeneity was observed ($I^2 = 76.8\%$ with tau squared of 0.010), indicating that 76.8% of the variation in effect sizes reflected real differences across studies rather than sampling error. This high heterogeneity justified subsequent moderator analyses to identify sources of variability.

**Meta-Regression Analysis**

Table 3 below shows the results of the meta-regression analysis of the effect of the combined moderators on the relationship between environmental performance and firm value.

**Table 3 Meta-Analysis of Environmental Performance and Firm Value Adjusted for Moderators**

| Moderator | Δ Effect (OR) | 95% CI | p-value | Interpretation |
|---|---|---|---|---|
| Environmentally sensitive | +5.8% (1.06) | [1.02,1.11] | 0.007 | Stronger in high-impact |
| Intermediate methods | −4.1% (0.96) | [0.93,0.99] | 0.029 | Methodological attenuation |
| Advanced methods | −8.1% (0.92) | [0.87,0.98] | 0.006 | Rigor reduces effect size |
| High-income countries | −1.0% (0.99) | [0.95,1.03] | 0.611 | No significant difference |

**Source: Study data, 2025**

The meta-regression (N=241) confirmed that environmentally sensitive sectors showed significantly stronger firm value benefits from environmental performance (+5.8%, OR=1.06, p-value=0.007) compared to low-impact sectors, after controlling for methodology and country income. Methodological rigor attenuated effects, with intermediate methods showing 4.1% smaller estimates (OR=0.96, p-value=0.029) and advanced methods 8.1% smaller (OR=0.92, p-value=0.006). High-income country status did not significantly moderate effects (p-value=0.611). The model explained 10% of between-study heterogeneity ($I^2$=74.8%), leaving substantial residual variation unaccounted for. The intercept indicated a 9.4% baseline value premium for environmental performance (OR=1.09, p-value<0.001) among low-impact firms studied with basic methods in non-high-income countries.

**Individual Moderator Analysis**

Table 4 below shows the results of the meta-regression analysis of the effect of individual moderators on the relationship between environmental performance and firm value.

**Table 4: Results of Moderator Tests-Individual**

| Moderator | Single-Model OR [95% CI] (p-value) | Adj $R^2$ | Full-Model OR [95% CI] (p-value) |
|---|---|---|---|
| Env. Sensitive | 1.07 [1.03–1.12] (0.001) | 6.20% | 1.06 [1.02–1.11] (0.007) |
| Advanced methods | 0.91 [0.87–0.97] (0.002) | 6.40% | 0.92 [0.86–0.98] (0.006) |
| High-income | 1.00 [0.96–1.04] (0.942) | −0.6% | 0.99 [0.95–1.03] (0.611) |

**Source: Study data, 2025**

Single-moderator analyses confirmed that environmentally sensitive industries showed systematically stronger effects (7.0%, p-value=0.001), while advanced methods yielded smaller estimates (−9.4%, p-value=0.002). High-income status still had no significant influence (p-value=0.942). These findings persisted when combined in the full model, though industry effects attenuated slightly (+5.8%), suggesting methodological differences partially explain sectoral variation.

**Robustness tests**

We conducted rigorous sensitivity analyses to validate our findings. Publication bias was assessed through funnel plot symmetry and Egger's regression while individual single study influence was tested using leave-one-out analysis. These approaches together evaluate the stability of our meta-analytic estimates against potential biases and outliers.

Leave-one-out sensitivity analysis demonstrated exceptional stability in effect estimates. Excluding any single study changed the pooled odds ratio by ≤0.12% from the original estimate (OR=1.075), with all recalculated ORs falling between 1.0749 and 1.0763. This confirms our findings are not driven by any individual study.

Egger's regression test however revealed significant small-study effects (intercept=0.170, p<0.001), suggesting potential publication bias. The negative precision coefficient (β=-0.005, p=0.000) indicates smaller studies reported systematically larger effects. These findings imply our meta-analysis may overestimate the true effect due to selective publication of significant positive results. However, this apparent publication bias aligns with our methodology as a moderator findings. We found that studies using basic methods reported 9.4% larger effects (OR=1.09 vs 1.00 for advanced methods, p<0.01). This pattern suggests less rigorous designs may both overestimate effects and be more susceptible to publication bias, as they require stronger results to achieve statistical significance.

## V. Conclusions And Recommendations

This meta-analysis establishes three key insights about the environment-value relationship: First, we confirm a robust positive association where firms with stronger environmental performance exhibit 7.5% higher

value on average, with even greater benefits in environmentally sensitive industries (+5.8%). Second, methodological rigor could change results with advanced methods yielding 8.1% smaller effect size estimates than basic designs, revealing systematic inflation in less rigorous studies. Third, these effects persist after accounting for publication bias, though small-study effects suggest the true association may be slightly weaker than the literature implies.

Based on the findings of this study, we recommend that (a) Policymakers focus incentives on specific sectors as the environment-value effect is significantly stronger in high-impact industries such as manufacturing and other resource intensive industries. (b) In determining the determinants of value, investors should only look at environmental performance in high-impact sectors, where the financial benefits are strongest and (c) Researchers should adopt more rigorous causal inference techniques to mitigate inflated estimates, given the 8.1% attenuation in advanced methods.

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