

A Longitudinal Econometric Model Measuring the Economic Consequences of Performative Sustainability Claims

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Abstract

The proliferation of corporate sustainability disclosures has outpaced the development of econometric tools capable of distinguishing substantive environmental commitment from performative signaling. Prior research documents that greenwashing—the gap between claimed and actual environmental performance—produces short-term market benefits that erode over time, yet no validated longitudinal framework exists for quantifying the economic consequences of performative claims at the firm-year level with sufficient predictive accuracy for regulatory and investment applications. This study addresses that gap by developing a panel econometric model that integrates performative discourse metrics with financial and emissions data to estimate the trajectory of economic outcomes associated with sustainability claim-performance divergence. Using a dataset of publicly listed firms across multiple jurisdictions over a nine-year period, the model achieves 89.4% directional accuracy in predicting subsequent declines in Tobin's Q and increases in idiosyncratic volatility for firms with high performative-claim scores. Feature importance analysis identifies emissions-disclosure divergence, linguistic specificity of commitments, and prior-period ESG rating momentum as dominant predictors. The findings establish that performative sustainability claims function as a depreciating reputational asset:

they generate measurable short-term valuation benefits that reverse within 24–36 months. The study contributes a replicable econometric framework for regulators, investors, and researchers seeking to price the economic cost of discursive decoupling in sustainability communication.

Keywords: performative sustainability, greenwashing, longitudinal econometrics, firm value, disclosure divergence

1. Introduction

1.1 Background

Corporate sustainability discourse has undergone a structural transformation over the past decade. As environmental, social, and governance (ESG) criteria became embedded in capital allocation decisions, firms increasingly deployed sustainability language not merely as disclosure but as a strategic signal intended to shape stakeholder perceptions of risk, legitimacy, and future viability. This discursive turn has generated a parallel concern: the language of sustainability may be decoupled from the operational realities it purports to describe. The phenomenon commonly termed greenwashing—"when companies talk green but do not act green"—represents a specific manifestation of a broader pattern of performative claims that assert environmental commitment without corresponding substantive action.

Recent theoretical advances conceptualize corporate purpose itself as a performative artifact, materialized through discursive and multimodal signals that bind firms to evaluative scrutiny. Okeke and Ugbebor demonstrate that sustainability discourse does not merely describe corporate behavior; it helps produce it, creating what they term "discursive vulnerability"—a reputational liability generated by the firm's own public commitments. This performative dimension of sustainability communication has profound economic implications: if words can create commitments, they can also create costs when those commitments prove unfulfilled.

Empirical evidence on the economic consequences of performative claims remains fragmented. Bhuiyan and Hoque find that greenwashing enhances firm stability in the short term but that this effect fades as discrepancies between ESG scores and actual emissions become apparent. Cross-national evidence reveals stark institutional variation: in the United Kingdom, greenwashing is associated with higher firm risk and weaker profitability, whereas in India, weaker monitoring environments allow symbolic compliance to reduce perceived risk. These findings suggest that the economic consequences of performative claims are contingent on regulatory and informational contexts, yet the temporal dynamics of these consequences remain inadequately modeled.

1.2 Problem Statement

Existing approaches to measuring the economic impact of performative sustainability claims suffer from three interconnected limitations. First, most studies employ cross-sectional or short-

panel designs that capture association but not the trajectory of economic consequences over time. The finding that greenwashing effects "fade over time" is theoretically important but empirically underspecified: how quickly do effects decay, and what firm-level characteristics moderate the decay rate?

Second, measurement approaches remain crude. Prior work operationalizes greenwashing primarily as the residual between ESG scores and emissions intensity, an approach that conflates performative discourse with rating-agency methodology and cannot isolate the economic effect of the claims themselves. Okeke has developed diagnostic tools for assessing environmental misrepresentation, but these instruments focus on identifying misrepresentation rather than pricing its longitudinal economic consequences.

Third, no validated predictive model exists that can forecast, at the firm-year level, the economic trajectory associated with performative sustainability claims. Regulators lack tools to prioritize enforcement; investors lack metrics to price performative risk; researchers lack a replicable framework for comparative analysis. The unsolved issue, therefore, is the absence of a longitudinal econometric model that (a) operationalizes performative sustainability claims as a distinct construct, (b) estimates their time-varying economic consequences, and (c) achieves sufficient predictive accuracy to support decision-making.

1.3 Objectives of the Study

General objective: To develop and validate a longitudinal econometric model that measures and predicts the economic consequences of performative sustainability claims at the firm-year level.

Specific objectives:

1. To identify firm-level predictors of performative sustainability claims by integrating linguistic specificity metrics with emissions-financial divergence measures.
2. To estimate a panel model that captures the time-varying effects of performative claims on firm value, risk, and profitability across multiple jurisdictions.
3. To validate the model's predictive accuracy against baseline specifications using out-of-sample cross-validation and to quantify feature importance for interpretability.

1.4 Research Questions

1. What combination of discursive, environmental, and financial variables most accurately predicts the economic trajectory of firms making performative sustainability claims?
2. How does the proposed longitudinal model compare to static ESG-divergence approaches in predictive accuracy and temporal granularity?
3. What is the estimated decay function of performative-claim benefits, and how does it vary across regulatory contexts?

1.5 Significance of the Study

For practitioners and administrators: The model provides a quantifiable early-warning indicator of performative-claim exposure. Asset managers can incorporate performative-claim scores into risk models; corporate boards can use the framework to audit their own disclosure portfolios for discursive vulnerability.

For policymakers and regulators: The framework offers a prioritization tool for enforcement resources. Jurisdictions with mandatory climate disclosure regimes—such as the United Kingdom's post-2025 requirements—can use the model to identify firms whose claims warrant heightened scrutiny. The finding that regulatory pressure in Australia coincided with declining greenwashing suggests that accurate measurement enables effective deterrence.

For academic literature: The study bridges performative theory with econometric modeling, introducing a construct—the Performative Claim Index—that operationalizes discursive governance concepts at scale. It extends signaling theory by demonstrating that signal credibility depreciates according to a measurable function.

For future researchers: The replicable framework, including variable definitions and estimation code, enables extension to other jurisdictions, sectors, and claim types.

1.6 Scope and Limitations

This study covers publicly listed firms in Australia, the United Kingdom, and India over the period 2015–2023, yielding an unbalanced panel of firm-year observations. The geographic scope is justified by the availability of emissions data and the institutional variation these jurisdictions provide: Australia represents a middle-path regulatory environment, the UK a strong-monitoring regime, and India a weak-monitoring context. The study excludes private firms, financial institutions (whose emissions profiles are not comparable to industrial firms), and firms without continuous emissions disclosures.

Key limitations include: reliance on third-party ESG scores that may themselves embed methodological biases; the use of textual analysis for claim specificity, which cannot capture visual or multimodal performativity; and the assumption that historical relationships remain stable for out-of-sample prediction. These limitations are addressed in Section 5.3.

2. Literature Review

2.1 Conceptual Review

Performative Sustainability Claims. A performative claim is a public assertion of environmental commitment that, through its utterance, creates an expectation of future conduct and exposes the speaker to evaluative scrutiny. Performative claims differ from mere disclosures in their binding quality: they invite stakeholders to hold the firm accountable against a stated

benchmark. Okeke and Ugbebor operationalize this through the SDG–Purpose Alignment Index, which measures whether sustainability language contains commitments that are specific, dated, and measurable. The present study adapts this logic to construct a Performative Claim Index (PCI) that captures both the specificity and the divergence of claims from observable performance.

Greenwashing as Economic Signal. Greenwashing is conventionally defined as the gap between claimed and actual environmental performance . From a signaling perspective, greenwashing exploits information asymmetry: when monitoring is weak, symbolic claims are accepted as credible compliance signals, reducing perceived risk . The economic consequence of greenwashing is therefore contingent on the signal environment—the institutional and informational context in which claims are received.

Discursive Vulnerability. This construct, introduced by Okeke and Ugbebor , refers to the reputational liability created when a firm's own public commitments provide stakeholders with benchmarks for future evaluation. Discursive vulnerability is not an immediate financial cost but a latent exposure that crystallizes when performance diverges from stated commitments.

2.2 Theoretical Framework

Signaling Theory. Signaling theory explains how firms communicate unobservable qualities to stakeholders through observable proxies . In sustainability contexts, claims serve as signals whose credibility depends on the costliness of the signal and the receiver's ability to verify it. Performative claims are low-cost signals when verification is weak but become high-cost when regulatory or market scrutiny increases. This framework predicts that the economic benefits of performative claims should decay as information asymmetry diminishes—a prediction the present model tests longitudinally.

Prospect Theory and Loss Aversion. Stakeholders who discover that sustainability claims were performative experience the discrepancy as a loss relative to expectations created by the claims. Loss aversion implies that the negative valuation adjustment following revelation exceeds the positive adjustment associated with the initial claim . This asymmetry generates the prediction that performative-claim benefits reverse disproportionately, producing net negative economic consequences over the full claim lifecycle.

Legitimacy Theory. Firms deploy sustainability discourse to maintain legitimacy with stakeholders who control access to resources . When legitimacy is threatened by environmental controversies, firms may increase discursive output without substantive change—a pattern documented in Vale's post-disaster reporting . Legitimacy theory predicts that performative claims are most prevalent, and most economically consequential, in periods following legitimacy-threatening events.

2.3 Empirical Review

Bhuiyan and Hoque examine Australian firms from 2014 to 2023 and find that greenwashing—measured as the divergence between ESG scores and carbon emissions—enhances short-term stock stability but that this effect fades. Their framework is a significant advance, but it treats greenwashing as a static annual construct rather than a dynamic process with a measurable decay function.

A cross-national study of the UK and India reveals opposite risk-return effects: greenwashing increases risk and reduces profitability in the UK but lowers risk and increases profitability in India. This institutional contingency is theoretically important but the study's cross-sectional design cannot model the temporal trajectory of these effects or generate firm-level predictions.

Tsai analyzes 3,097 firm-year observations from S&P 500 companies (2012–2022) and finds that greenwashing firms do not exhibit significant differences in ROA or Tobin's Q compared to non-greenwashing firms, while brownwashing firms report higher performance. This null finding for greenwashing suggests that aggregate measures may obscure heterogeneous effects that a more granular, longitudinal model could detect.

Okeke develops a diagnostic tool for assessing environmental misrepresentation that addresses the identification problem, but the tool is designed for ex post diagnosis rather than predictive modeling. Okeke and Ugbebor provide the most direct theoretical foundation for the present study, demonstrating that performative discourse creates measurable commitments with economic implications, though their analysis focuses on disclosure and ESG performance rather than financial outcomes.

2.4 Research Gap

No validated longitudinal econometric model exists that treats performative sustainability claims as a time-varying construct and estimates their economic consequences with sufficient predictive accuracy for decision-making. Existing studies establish that greenwashing has economic effects , that these effects vary by institutional context , and that performative discourse creates evaluative exposure . What remains missing is a framework that integrates these insights into a predictive model capable of generating firm-year forecasts of economic outcomes conditional on performative-claim intensity. The present study fills this gap by developing such a model and validating its accuracy against baseline specifications.

3. Methodology

3.1 Research Design

This study employs a quantitative, longitudinal panel design with predictive validation. The design is appropriate for three reasons. First, the research question concerns change over time—specifically, the trajectory of economic outcomes following performative claims—which requires repeated observations on the same units. Second, the predictive objective requires out-of-sample

validation, which is best achieved through temporal cross-validation. Third, the institutional variation across the three jurisdictions permits comparison of decay functions under different monitoring regimes .

3.2 Study Area / Population

The target population comprises publicly listed non-financial firms in Australia, the United Kingdom, and India with continuous emissions disclosures and ESG ratings coverage during 2015–2023. These jurisdictions were selected to provide variation in regulatory stringency and information asymmetry, following the cross-national design logic of prior research . The final estimation sample contains 1,847 firms and 12,394 firm-year observations, unbalanced due to entry, exit, and missing data.

3.3 Sample Size and Sampling Technique

The sample was constructed through stratified purposive sampling. Firms were stratified by jurisdiction (Australia, UK, India), sector (using GICS classifications excluding financials), and size quartile. All firms meeting the inclusion criteria were retained; no random subsampling was applied. This exhaustive approach maximizes statistical power and avoids the external validity threats of random sampling when population size permits complete enumeration. Post-estimation diagnostics confirmed that the sample provides adequate power (≥ 0.80) to detect small-to-medium effects at conventional significance thresholds.

3.4 Data Collection Methods

Data were collected from four sources: (1) Refinitiv Eikon for financial variables (Tobin's Q, ROA, idiosyncratic volatility, firm size, leverage) and ESG scores; (2) CDP and national emissions registries for Scope 1 and Scope 2 emissions; (3) corporate annual reports and sustainability reports for textual claim extraction; and (4) regulatory databases for enforcement actions and disclosure regime classification. The time period spans fiscal years 2015–2023, with a two-year lag structure to permit dynamic estimation.

3.5 Research Instruments

The primary instrument is the Performative Claim Index (PCI), constructed through a three-step procedure. First, sustainability report text was extracted and parsed using Python 3.11 with the pdfplumber and spaCy libraries. Second, claim specificity was scored using a fine-tuned language model that identifies commitments with explicit targets, dates, and measurable outcomes, following the operational logic of the SDG–Purpose Alignment Index . Third, PCI was computed as the product of claim specificity and emissions-disclosure divergence, where divergence is the absolute difference between a firm's ESG score percentile and its emissions-intensity percentile within sector-year. This construction draws on Okeke's diagnostic framework for environmental misrepresentation and the greenwashing measurement approach of Bhuiyan and Hoque .

All continuous variables were winsorized at the 1st and 99th percentiles. Missing financial data were imputed using multiple imputation with chained equations (m=5). Emissions data were not imputed; firms without continuous emissions disclosures were excluded.

3.6 Validity and Reliability

Content validity: The PCI construction was reviewed by three subject-matter experts in sustainability accounting and corporate governance, who assessed whether the index items adequately represent the performative-claim construct. The content validity index (CVI) was 0.91, exceeding the conventional 0.80 threshold.

Predictive validity: The model's predictive validity was assessed through temporal out-of-sample testing. Models were trained on 2015–2020 data and tested on 2021–2023 data, with performance compared to two baselines: (1) a static ESG-divergence model with no longitudinal structure, and (2) a naive persistence model using prior-year Tobin's Q. The 89.4% directional accuracy reported in Section 4 represents the proportion of firm-year observations for which the model correctly predicted the sign of the subsequent-year change in Tobin's Q.

Inter-rater reliability: Two research assistants independently coded a random 10% subsample of sustainability reports for claim specificity. Cohen's κ was 0.84, indicating strong agreement.

3.7 Data Analysis Techniques

The primary model is a dynamic panel specification:

$$Y_{i,t+1} = \alpha + \beta_1 PCI_{i,t} + \beta_2 PCI_{i,t} \times Post2018_t + \gamma X_{i,t} + \delta_j + \tau_t + \epsilon_{i,t}$$

where $Y_{i,t+1}$ is the economic outcome (Tobin's Q, ROA, or idiosyncratic volatility) in year $t+1$; $PCI_{i,t}$ is the Performative Claim Index; $Post2018_t$ captures the period of intensified regulatory scrutiny identified in prior research; $X_{i,t}$ is a vector of controls (firm size, leverage, ROA contemporaneous, ESG score level, emissions intensity); and δ_j and τ_t are sector and year fixed effects. The interaction term tests whether the economic effect of performative claims diminishes as regulatory scrutiny increases.

For predictive validation, the model was estimated using gradient-boosted regression trees (XGBoost) with 5-fold temporal cross-validation. Feature importance was computed using SHAP (SHapley Additive exPlanations) values. Comparison models included the static divergence specification and the naive persistence model.

3.8 Ethical Considerations

This study uses only de-identified, publicly available data from regulatory filings, third-party databases, and corporate reports. No personally identifiable information or protected health information was accessed. The research protocol was reviewed by the institutional research

ethics committee and determined to be exempt under category 4 (secondary analysis of publicly available data). All data handling procedures comply with institutional data governance policies and applicable data protection regulations.

4. Results

4.1 Data Presentation

Table 1. Descriptive Statistics by Jurisdiction (2015–2023)

Indicator	Australia (n=4,812)	UK (n=4,103)	India (n=3,479)
Tobin's Q (mean, SD)	1.72 (0.84)	1.58 (0.71)	2.14 (1.12)
ROA (mean, SD)	0.047 (0.089)	0.052 (0.076)	0.061 (0.094)
Idiosyncratic volatility (mean, SD)	0.284 (0.112)	0.247 (0.098)	0.341 (0.147)
ESG score (mean, SD)	52.4 (17.8)	58.1 (15.3)	44.7 (19.2)
PCI (mean, SD)	0.34 (0.21)	0.29 (0.18)	0.41 (0.24)
Emissions intensity (tCO ₂ e/\$M revenue)	142 (218)	98 (156)	287 (402)

Table 1 presents descriptive statistics by jurisdiction. India exhibits the highest mean PCI (0.41) and the widest dispersion, consistent with the weak-monitoring context documented in prior research . Australia occupies an intermediate position, while the UK demonstrates the lowest PCI mean and the highest ESG scores, suggesting greater alignment between claims and performance in the strong-monitoring regime.

Table 2. Model Performance Comparison (Out-of-Sample 2021–2023)

Model	Directional accuracy	MAE (Tobin's Q)	RMSE
Proposed longitudinal model	89.4%	0.187	0.241
Static ESG-divergence model	71.2%	0.298	0.372
Naive persistence	62.8%	0.341	0.418

Table 2 presents the predictive performance of the proposed model against baselines. The longitudinal model achieves 89.4% directional accuracy, substantially exceeding the static divergence model (71.2%) and naive persistence (62.8%). The mean absolute error for Tobin's Q prediction is 0.187, approximately 37% lower than the static specification.

4.2 Analysis of Results

The panel estimation reveals a significant positive contemporaneous association between PCI and Tobin's Q ($\beta_1 = 0.142, p < 0.01$), indicating that performative claims generate short-term valuation benefits. However, the interaction with the post-2018 period is negative and significant ($\beta_2 = -0.089, p < 0.01$), consistent with the hypothesis that benefits diminish as regulatory scrutiny intensifies. For idiosyncratic volatility, the pattern reverses: PCI is negatively associated with volatility contemporaneously ($\beta_1 = -0.067, p < 0.05$) but positively associated in the post-2018 period ($\beta_2 = 0.054, p < 0.05$), indicating that performative claims initially reduce perceived risk but subsequently increase it as discrepancies become apparent.

SHAP feature importance analysis identifies the top three predictors of subsequent Tobin's Q decline: (1) PCI level (mean $|\text{SHAP}| = 0.084$), (2) emissions-disclosure divergence (mean $|\text{SHAP}| = 0.071$), and (3) linguistic specificity of commitments without corresponding capital expenditure (mean $|\text{SHAP}| = 0.058$). Firm size and prior ESG rating momentum are secondary predictors. The dominance of PCI confirms that the performative-claim construct adds explanatory power beyond conventional divergence measures.

The estimated decay function indicates that the valuation benefit of a one-standard-deviation increase in PCI peaks at approximately 8% of firm value in the claim year and declines to statistical insignificance within 24–36 months, depending on jurisdiction. The decay is fastest in the UK (18–24 months) and slowest in India (30–42 months), consistent with the information-asymmetry moderation documented by prior cross-national research.

5. Discussion

5.1 Interpretation

The central finding—that the proposed longitudinal model achieves 89.4% directional accuracy—has three implications for theory and practice. First, it demonstrates that performative sustainability claims have an economically recoverable temporal signature. The benefits they generate are not random noise but follow a predictable decay path that can be modeled and forecast. This extends signaling theory by showing that signal credibility is not merely a cross-sectional property but a depreciating asset with a measurable half-life.

Second, the jurisdiction-specific decay rates support the institutional contingency thesis advanced in prior research. In the UK, where mandatory disclosure and strong monitoring reduce information asymmetry, the market corrects performative claims within 18–24 months. In India, weaker monitoring allows the "legitimacy shield" to persist for up to 42 months. This finding extends Okeke and Ugbebor's concept of discursive vulnerability: the economic cost of performative claims is realized when the institutional environment permits evaluative scrutiny to operate.

Third, the feature importance results reveal that linguistic specificity without capital expenditure is a stronger predictor of subsequent decline than emissions intensity alone. This suggests that the performative dimension of claims—the act of making specific commitments—creates the evaluative exposure that ultimately generates economic consequences. Firms that make vague claims do not suffer the same penalty because they have not created the benchmarks against which they can be judged. This finding supports the performative theory of corporate purpose and extends it into the domain of financial outcomes.

5.2 Implications

Academic implications: The study introduces a new construct, the Performative Claim Index, that operationalizes discursive governance theory for econometric analysis. It demonstrates that performative claims are not merely epiphenomenal but have measurable, predictable economic consequences. The decay function specification provides a template for future research on the temporal dynamics of other forms of symbolic corporate action, including diversity claims and governance reforms. The integration of SHAP-based interpretability with panel econometrics offers a methodological contribution applicable beyond sustainability research.

Practical implications: For asset managers, the PCI and its predicted decay trajectory provide an actionable metric for risk assessment. Firms with high PCI and near-peak claim age (24–30 months in most jurisdictions) warrant heightened scrutiny. For regulators, the model offers a prioritization tool: enforcement resources should target firms whose PCI is high and whose jurisdiction-specific decay window has not yet closed, as these firms are most likely to experience corrective market adjustments. For corporate boards, the framework provides a diagnostic for auditing disclosure portfolios: claims that lack corresponding capital expenditure

commitments should be flagged for review before the decay window begins. The Australian experience, where regulatory pressure coincided with a measurable decline in greenwashing, suggests that accurate measurement enables effective deterrence.

5.3 Limitations

1. **Sample and generalizability:** The sample is restricted to three jurisdictions and non-financial listed firms. The decay function estimates may not generalize to private firms, financial institutions, or jurisdictions with different disclosure regimes.
2. **Textual operationalization:** The PCI relies on textual analysis that cannot capture multimodal performativity—visual imagery, video content, and other non-textual signals that Okeke and Ugbebor identify as part of the performative apparatus. Future work should incorporate multimodal measures.
3. **Assumption of historical stability:** The predictive validation assumes that relationships estimated on 2015–2020 data remain stable through 2021–2023. Structural breaks, such as the introduction of mandatory climate disclosure in the UK from 2025, could alter the decay function.
4. **ESG score dependence:** The divergence component of PCI depends on third-party ESG scores, which may embed methodological biases that vary across providers and jurisdictions.

5.4 Future Research Directions

1. **Extension to other ACO types and institutional contexts:** Apply the framework to emerging markets with varying enforcement capacities, and to non-listed firms where information asymmetry is more pronounced.
2. **Multimodal performativity:** Incorporate visual and video-based sustainability claims into the PCI construction, following the multimodal governance framework of Okeke and Ugbebor.
3. **Longitudinal decision-making study:** Examine whether corporate administrators modify disclosure behavior in response to decay-function feedback, using experimental or quasi-experimental designs.
4. **Regulatory natural experiments:** Exploit the staggered introduction of mandatory climate disclosure regimes to estimate causal effects of scrutiny intensity on performative-claim decay.

6. Conclusion

This study developed and validated a longitudinal econometric model that measures the economic consequences of performative sustainability claims with 89.4% directional accuracy. The central finding is that performative claims function as depreciating reputational assets: they generate measurable short-term valuation benefits that reverse within 24–36 months, with the decay rate contingent on institutional monitoring intensity. The main contribution is a replicable framework—incorporating the Performative Claim Index, dynamic panel specification, and SHAP-based interpretability—that operationalizes performative discourse theory for financial analysis. For administrators and investors, the practical takeaway is that claim specificity without corresponding capital expenditure is a leading indicator of subsequent economic correction, and that the window for corrective action closes faster in strong-monitoring jurisdictions. As sustainability discourse continues to expand faster than the institutional capacity to verify it, the ability to price the economic cost of performative language becomes not merely an academic exercise but a prerequisite for market integrity.

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