Hirindu Kawshala
Department of Accounting and Finance
Surrey Business School, University of Surrey
hk00775@surrey.ac.uk | +44 7956 240106
20 July 2025

To the Organizing Committee
NBER PhD Student Workshop on Climate Finance
Cambridge, MA

Dear Professors Flammer and Giglio,

I am writing to express my enthusiastic interest in participating in the upcoming NBER PhD Student Workshop on Climate Finance, scheduled for October 9, 2025. I am currently a final-stage PhD candidate in Finance at the University of Surrey, UK. My research lies at the intersection of corporate communication, investor sentiment, and environmental outcomes, directly aligned with the workshop's core focus on how climate change interacts with financial markets and firm behaviour.

I examine whether climate change communication in earnings conference calls (ECCs) translates into real environmental actions. Using firm-level climate change exposure and sentiment scores from ECCs (following Sautner et al., 2023) and linking them to emissions data from the EPA TRI database, I test whether more positive or risk-focused climate discourse corresponds with lower toxic emissions. I further explore how reputational risk, measured by the RepRisk Index, strengthens this relationship. Preliminary results suggest that when firms face higher reputational risk, climate-related dialogue becomes a more reliable predictor of emissions reductions, revealing both market and governance implications.

This paper forms part of my third PhD essay. My broader research agenda explores how climate disclosures, firm complexity, and sentiment shape market reactions and firm behaviour. I have presented related work at the Financial Economics of Climate and Sustainability Seminar at Harvard, the 2025 BAFA Conference, and the Behavioural Finance Working Group (BFWG) Conference.

I am eager to receive feedback from leading scholars and peers at the NBER workshop. Engaging with other PhD students and faculty will help sharpen the theoretical framing and policy relevance of my work as I prepare this paper for submission to a top-tier journal (e.g., *Journal of Business Ethics* or *Review of Finance*). I also look forward to the career development and networking opportunities the workshop offers.

Thank you very much for considering my application. I have attached my CV and the paper draft as requested. My faculty supervisor, Professor Bonnie Buchanan (b.buchanan@surrey.ac.uk), would be happy to provide a reference if needed. I am confident this workshop will be instrumental to the refinement and impact of my work, and I would be honoured to participate.

Warm regards,
Hirindu Kawshala

HIRINDU KAWSHALA

Department of Finance and Accounting,
Surrey Business School, University of Surrey, United Kingdom
+44 7956 240106 | hk00775@surrey.ac.uk
ORCiD: 0000-0002-0262-1471
LinkedIn

Profile

I am a accounting and finance researcher currently completing my PhD at the University of Surrey, with a strong passion for teaching, research, and student experience. I thrive in collaborative and interdisciplinary academic environments and am committed to contributing to both research and teaching excellence.

Research Interests

Textual Analysis; FinTech and Accounting Analytics; Corporate Disclosures; Firm Complexity; Climate Risk and Sustainability Reporting; Biodiversity Disclosures; Corporate Governance; ESG Communication; Information Asymmetry; Investor Sentiment; Financial Reporting Quality; Machine Learning in Accounting

---

Education

2022 – due Sept 2025	**PhD in Accounting and Finance** Surrey Business School, University of Surrey, UK Thesis: *Decoding signals in earnings conference calls: investor sentiment, firm complexity and climate disclosures* Supervisors: Dr. Shuhui Wang, Professor Bonnie Buchanan
Jan/2017 – Jan/2020	**MSc in Management (Finance) | First Class Honours** University of Sri Jayawardenepura, Sri Lanka Thesis: *Influence of socio-economic, trading sophistication, and self-reflection factors on investment biases*
Dec/2011 – Feb/2015	**Bachelor of Commerce (Special) Degree in Business Technology | First Class Honours** University of Kelaniya, Sri Lanka Award: Gold Medal for Best Performing Student

---

Professional Qualifications

- Associate of the Higher Education Academy (AHEA), Advance HE – Merit Pass
- Certified Business Accountant (CBA), Institute of Chartered Accountants of Sri Lanka (ICASL)

Teaching Experience

Graduate Teaching Assistant

For Professor Bonnie Buchanan and Professor Ali Emrouznejad 2023 –2025

Surrey Business School, University of Surrey, UK

Assisting in module delivery, lab sessions, and academic support across multiple finance and analytics courses, including Python Programming in FinTech, Data Mining and Text Analytics.

- **Python Programming in FinTech (MANM491)** 2025 – Present
  Lab Sessions for MSc FinTech Students
- **Data Mining and Text Analytics** 2023 – Present
  Supporting MSc-level students in practical labs using SAS software.
- **Business Reporting Techniques** 2023 – Present
  Supporting MSc-level students in data analytics labs and guiding students in SPSS techniques

Exam Invigilator

Surrey Business School, University of Surrey, UK 2023 – Present

University of Kelaniya, Sri Lanka 2016 – 2022

Senior Lecturer

University of Kelaniya, Sri Lanka 2016 – Present

- Developed engaging learning materials, including lecture slides, reading packs, case studies, and practical exercises tailored to varying student abilities.
- Delivered guest lectures and workshops on management and finance, including leadership, financial statement analysis and capital budgeting.
- Facilitated online and blended learning sessions using platforms such as Zoom, Moodle, Microsoft Teams, and Google Classroom
- Organized and led revision sessions and exam preparation workshops to improve student performance and reduce failure rates.
- Provided constructive, timely feedback on assignments and exams to support continuous improvement and skill development.
- Assisted with student admissions, orientation programs, and induction sessions for new cohorts.
- Supported accreditation processes by preparing module outlines, assessment rubrics, and teaching evaluations for internal and external reviews.
- Actively participated in academic committees and departmental meetings, contributing to curriculum planning, faculty development, and institutional initiatives
- Engaged with parents and guardians (in diploma settings) to discuss academic progress and behavioral concerns, ensuring collaborative student support.

Visiting Lecturer

Colombo International Nautical and Engineering College, Sri Lanka 2020 – 2022

- CILT Diploma

Senior Lecturer /Visiting Lecturer
University of Kelaniya, Sri Lanka

- Graduate Studies Division, Gampaha Wickramarachchi Institute 2018– 2022
- Diploma in Business, Department of Commerce and Financial Management 2017 – 2022
- Higher Diploma in Financial Service Management 2019– 2022
- Diploma in Correction and Rehabilitation for Prison Officers, Department of Humanities 2017– 2022
- Department of Computer Systems Engineering 2017– 2022
- Department of Library and Information Science 2018– 2019

Research Experience
Doctoral Researcher | Finance PhD 2022 – due Sept 2025
University of Surrey, Surrey Business School
Thesis: *Decoding signals in earnings conference calls: investor sentiment, firm complexity and climate disclosures*

- Collected data from CRSP and Compustat, Refinitiv, EPA TRI, RepRisk, and Bloomberg
- Processed and analysed over 260,000 ECC transcripts for textual insights.
- Applied FinBERT and dictionary-based methods for sentiment and complexity scoring.
- Utilized text analytics (NLP), sentiment analysis, econometrics, and statistical modelling.
- Conducted cross-sectional and time-series regressions using CRSP and Compustat data.
- Presented research at leading conferences including BAFA, FMA, BFWG, and IAFDS

Working Papers and Research Pipeline
Under Review

- Kawshala, H., Buchanan, B., Wang, S. *Alphabetic bias and investor sentiment interplay: Evidence from earnings conference calls.*
  Submitted to *The British Accounting Review* (CABS 3) – Under Review

In Preparation

- *Firm complexity and sentiment interplay: Evidence from earnings conference calls.*
  Target journal: *Contemporary Accounting Research* (CABS 4) – Revising for submission.
  Co-authors: Bonnie Buchanan, Shuhui Wang
- *Climate change exposure, reputational risk, and corporate emissions.*
  Co-authors: Bonnie Buchanan, Shuhui Wang
  Target journal: *Journal of Business Ethics* (CABS 3/Financial Times Top 50)– Revising for submission.

Research in Behavioural Finance University of Kelaniya

- Collaborated on multiple peer-reviewed journal publications.
- Supervised 15+ undergraduate research theses

Academic Administration & Volunteering

University of Kelaniya, Sri Lanka

- Chief Examiner | Advanced Level Examination 2018-2021
- Senior Treasurer | Students' Association of Financial Management 2019
- Development Committee Member | Business Internship Digital System 2022
- Coordinator | Business Internship Digital System 2020-2022
- Coordinator | Stock Market Competition 2019
- Coordinator | Association of Southeast Asian Institutions of Higher Learning (ASAIHL) Conference 2019
- Committee Member | Gender Festival 2018
- Assistant to Chairperson | Corporate Plan Monitoring Committee 2017–2023
- Committee Member & Session Rapporteur | ICBI Conferences 2016–2020
- Editorial Board Member | Glimpse Magazine 2017
- Editorial Board Member | The 3rd Undergraduate Symposium on Contemporary Management and Theory (USCMT) 2016
- Editorial Board Member | YBTER Congress Proceedings 2016
- Volunteer Project Coordinator | Hands in Service Program 2015-Present
- Student Counsellor 2015–2020

Industry Experience

Senior Associate – Operations, **WNS Global Services, Sri Lanka** 2015– 2016

- Supported financial reporting and reconciliations for international banking clients.
- Prepared variance analysis and managed large transaction datasets with high accuracy
- Collaborated with cross-functional teams to improve reporting processes and operational efficiency.
- Developed a keen understanding of back-office financial operations, customer service, and regulatory compliance.

Audit Trainee, **KPMG Sri Lanka** 2014 –2015

- Assisted in statutory audits for listed and private companies across manufacturing, finance, and service sectors.
- Prepared financial statements in compliance with IFRS and local GAAP.
- Performed substantive testing, internal control reviews, and audit documentation under supervision.
- Gained practical exposure to risk assessment, financial disclosures, and corporate governance processes.

Skills

Computational & Statistical Tools

- STATA, Python, SPSS, NVivo, SAS Viya (Certified in Visual Text Analytics and Machine Learning), LaTeX, Microsoft Excel (Advanced)

Database Experience

- CRSP and Compustat, Refinitiv, EPA TRI, RepRisk, and Bloomberg

Publications

- Rohana Kumari, R.M.K.S., Kawshala, B.A.H. (2021). *The Impact of Heuristic Biases on Investors' Investment Decision Making: Evidence from Colombo Stock Exchange*. Journal of Business and Technology (JBT), ISSN 2738-2028, pp. 08–20. https://doi.org/10.4038/jbt.v5i0.55
- Ranaweera, S.S., Kawshala, B.A.H. *Influence of Behavioral Biases on Investment Decision Making with Moderating Role of Financial Literacy and Risk Attitude: A Study Based on Colombo Stock Exchange*. South Asian Journal of Finance (SAJF), University of Kelaniya. https://journals.kln.ac.lk/sajf/images/articles/vol2/i01/v02i01a04.pdf
- Kawshala, B.A.H., Anuradha, P.A.N.S., & Shamil, M.M. (2020). *Socio-Economic, Trading Sophistication and Self-Reflection on Investors' Herding Bias: Evidence from Colombo Stock Exchange*. International Journal of Management, Innovation & Entrepreneurial Research, 6(2), 128–138. https://doi.org/10.18510/ijmier.2020.6212
- Kawshala, B.A.H., Surangi, H.A.K.N.S. (2019). *A Discourse Analysis on Research Texts on Copreneurs*. Journal of Business and Technology (JBT), 3, 10–19. ISSN 2550-2530. https://jbt.sljol.info/articles/10.4038/jbt.v3i1.64
- Kawshala, B.A.H., Yatigammana, K.N. (2018). *Customer Purchase Intention towards Environmentally Friendly Vehicles in Sri Lanka*. Journal of Business and Technology (JBT), 2, 01–16. ISSN 2550-2530. http://repository.kln.ac.lk:8080/server/api/core/bitstreams/0586920f-26e3-4717-86da-a3c816e1a598/content
- Madhushani, I.K.H.H., Kawshala, B.A.H. (2018). *The Impact of Financial Distress on Financial Performance: Special Reference to Listed Non-Banking Financial Institutions in Sri Lanka*. International Journal of Scientific and Research Publications (IJSRP), 7(2), 393–404. ISSN 2250-3153. https://www.ijsrp.org/research-paper-0218/ijsrp-p7448.pdf
- Kawshala, B.A.H., Panditharathna, K.M. (2017). *The Effect of Dividend Policy on Corporate Profitability: An Empirical Study on Beverage, Food and Tobacco Industry in Sri Lanka*. IJSRP, 7(8), 542–546. ISSN 2250-3153. https://www.ijsrp.org/research-paper-0817.php?rp=P686736
- Kawshala, B.A.H. (2017). *Theorizing the Concept of Core Competencies: An Integrative Model beyond Identification*. IJSRP, 7(2), 253–256. ISSN 2250-3153.
- Kawshala, B.A.H., Panditharathna, K.M. (2017). *The Factors Effecting on Bank Profitability*. IJSRP, 7(2), 212–216. ISSN 2250-3153. https://www.ijsrp.org/research-paper-0217/ijsrp-p6237.pdf

Conference and Presentations

The following is a list of selected conferences where I have presented my papers titled:

"Climate change exposure, reputational risk, and corporate emissions"

- International Environmental Economics (IEE) Conference 2025 (*upcoming*)
- 11th International Corporate Governance Society (ICGS) Conference 2025 (*upcoming*)

- Financial Economics of Climate and Sustainability 2025 Seminar, Harvard University
- Climate Conference 2025, Oxford University

"Firm complexity and sentiment interplay: Evidence from earnings conference calls"

- Finance and Accounting 2025 Annual Research Symposium, Westminster Business School
- British Accounting & Finance Association (BAFA) South-East Area Group 2025 Annual Conference
- BAFA Annual conference with Doctoral Masterclasses 2025
- 2024 Financial Management Association (FMA) Doctoral Consortium in Texas, USA
- Finance Hybrid Conference (2024), Menlo College, USA

"Alphabetic bias and investor sentiment interplay: Evidence from earnings conference calls"

- 17th International Accounting & Finance Doctoral Symposium (2024)
- Behavioural Finance Working Group 17th Annual International Conference (2024)
- FASS Poster competition, Faculty of Arts and Social Sciences, University of Surrey (2024)

Pre-Surrey University, UK

- Kawshala B.A.H, Anuradha P.A.N.S. (2020), Socio-Economic, Trading Sophistication & Self- Reflection on Investors' Disposition Bias: Evidence from Colombo Stock Exchange, *11th International Conference on Business, and Information (ICBI 2020)*, ISSN 2465-6399, P.2, University of Kelaniya, Sri Lanka.
- Kawshala B.A.H, Anuradha P.A.N.S. (2020), Socio-Economic, Trading Sophistication & Self- Reflection on Investors' Overconfidence Bias: Evidence from Colombo Stock Exchange, *17th International Conference on Business Management (ICBM 2020).*
- Kawshala B.A.H, (2019), The Influence of Corporate Profitability on Dividend Policy in Microfinance Companies in Sri Lanka, *Annual International Conference on "9th Accounting and Finance (AF 2019)*, Global Science and Technology Forum (GSTF), Singapore.
- Kawshala B.A.H, (2018), The Impact of Dividend Policy on Firm Performance under High or Low Leverage, *4th International Academic Conference on Social Science, Dubai.*
- Kawshala B.A.H, (2017), Relationship between Stakeholder Power and Corporate Environmental Disclosures: Evidence from Listed Firms in Sri Lanka, "Exploring Disruptive Opportunities for Exponential Business Growth", *8th International Conference on Business and Information (ICBI 2017)*, ISSN 2465-6399, P.2, University of Kelaniya, Sri Lanka.
- Kawshala B.A.H, (2016), Factors Influencing Green IT Adoption in Sri Lanka, "Envisioning Youth Dynamism", *4th Students' International Conference on Business (SICB 2016)*, ISSN 2536– 8877, P.49, University of Kelaniya.
- Kawshala B.A.H, Yatigammana M.R.K.N. (2016), Factors Influencing Green IT Adoption in Sri Lanka, "Triumphing Business Excellence through Knowledge Exploration", *7th International Conference on Business and Information (ICBI 2016)*, ISSN 2465 – 6399, P.5, University of Kelaniya.

- Kawshala B.A.H, (2016), The Impact of Occupational Stress on Organizational Commitment in Apparel Industry in Sri Lanka, "Managing Systems from source to sink: Current Theories and Applications", *Wayamba International Conference (WINC 2016)*, ISBN 978-955-4079-53-9, P.82, University of Wayamba, Sri Lanka.
- Kawshala B.A.H, Pathirana R.P.L.R.R, Deshapriya S.W.R.S, Gamage T.D, Kanchana G.A.D, Naseefa R.N.N, Senadheera S.L.P, Karunasena K.A.S.M, PheliaPlus-Desktop Manager: Re- Engineer, Towards Technological Development, *Young Business Technology & Entrepreneurial Researchers Congress Proceedings (YBTER 2014)*, ISBN 978-955-0947-02-7, P. 10-15, University of Kelaniya, Sri Lanka.
- Kawshala B.A.H, Dilshan S.G.T, Ekanayaka E.K.D.K.A.A, Jayasanka N.D.T, G.A.D. Kanchana, Samarasooriya A.K, Sureshwararajhe S.A, Soysa W.H.U.H, Tissaweerasinghe D.D, Conceptualizing the Notion of Core Competencies: An Integrative Model beyond Identification: A Research Proposal, *The Undergraduate Symposium on Contemporary Management and Theory (USCMT 2014)*, ISBN 978-955-0994-12-0, P. 185-204, University of Kelaniya, Sri Lanka.

Awards

- 2nd Prize | PGR Poster Competition, University of Surrey, Festival of Research 2024
- Best Presenter | Staff Development Research Forum 2016 of the Staff Development Program for Probationary Lecturers
- Best Presenter | Accounting, Finance & Economics Track, ICBI 2020, Sri Lanka
- Two Senate Honours (2017) for SCI/SCOPUS publications, University of Kelaniya, Sri Lanka
- Gold Medal | Best Performing Student in BCom, University of Kelaniya, Sri Lanka
- The Best Portfolio Report at the Staff Development Research Forum 2016 of the Staff Development Program for Probationary Lecturers
- Vice-Chancellor's Letter of Appreciation for planning contributions, University of Kelaniya, Sri Lanka
- Runner-up | Young Business Technology & Entrepreneurial Researchers (YBTER) Congress Proceedings 2014
- Runner-up | Best Web Designer Competition, 2013, University of Kelaniya, Sri Lanka

---

Thesis Supervision

University of Kelaniya, Sri Lanka

Master of Business Administration (MBA) Level 2019 - 2021

- Erangika. P.V.I., Kawshala B.A.H, *"Impact Of Work From Home On Employee Productivity: Special Reference To Apparel and IT Companies In Sri Lanka"*
- Gunasekara, T.S.U., Kawshala B.A.H., *"Entrepreneurial Intention towards the Agriculture Sector of Agriculture Undergraduates of State Universities in Sri Lanka"*
- Ravihansa., B.A.H.V., Kawshala B.A.H, "*A Study of Medium and Large Sized Manufacturing Enterprises in Sri Lanka"*
- Bandara, K.B.T.U.K., Kawshala B.A.H, *"Risk & Resilience of Agri-food Supply Chain: The Case of Small Firms in Agri-food Sector of Sri Lanka"*

Undergraduate level 2016-2020

- Athuraliya.A.A.U., Kawshala B.A.H, The Impact of Firm Financial Performance on Share Price of Listed Manufacturing Companies in Sri Lanka. *Annual Undergraduate Research Symposium (AURS 2020)*, In Search of Research Excellence in Business. ISBN 978-955-0704-136-0, P. 8.
- Deshapriya. K.D.K.P., Kawshala B.A.H, Impact of Job Satisfaction, Leadership Style, Organizational Commitment, Work Family Balance on Turnover Intention: Special Reference to Garment Factory Employees in Sri Lanka. *Annual Undergraduate Research Symposium (AURS 2020)*, In Search of Research Excellence in Business. ISBN 978-955-0704-136-0, P. 23.
- Gunawardhana. S.K.W., Kawshala B.A.H, Impact of Value Relevance Accounting Information on Share Price: Special Reference to Listed Manufacturing Companies in Sri Lanka. *Annual Undergraduate Research Symposium (AURS 2020)*, In Search of Research Excellence in Business. ISBN 978-955-0704-136-0, P. 44.
- Kariyawasam. K.B.G.U.N., Kawshala B.A.H, The Influence of Socio-economic Variables on Financial Inclusion of Microfinance Beneficiaries in Sri Lanka: Special Refeence in Baddegama Region. *Annual Undergraduate Research Symposium (AURS 2020)*, In Search of Research Excellence in Business. ISBN 978-955-0704-136-0, P. 62.
- Perera.R.I.M., Kawshala B.A.H, Investigating the Impact of Bank Ownership on Financial Performance in Licenced Commercial Banks in Sri Lanka. *Annual Undergraduate Research Symposium (AURS 2020)*, In Search of Research Excellence in Business. ISBN 978-955-0704-136-0, P. 111
- Ransika.S.H., Kawshala B.A.H, Investigating the Impact of Intellectual Capital on Financial Performance of Listed Manufacturing Companies in Sri Lanka. *Annual Undergraduate Research Symposium (AURS 2020)*, In Search of Research Excellence in Business. ISBN 978-955-0704- 136-0, P. 128.
- Tissera.W.L.M., Kawshala B.A.H, Impact of Financial Literacy on Household Saving Behaviour in Sri Lanka: Special Reference to Chilaw Region. *Annual Undergraduate Research Symposium (AURS 2020)*, In Search of Research Excellence in Business. ISBN 978-955-0704-136-0, P. 158.
- Gunasekara.P.C.D., Kawshala B.A.H, Investigate the Impact of Tax Incentives on Net Inflows of Foreign Direct Investment in Sri Lanka. *Annual Undergraduate Research Symposium (AURS 2020)*, In Search of Research Excellence in Business. ISBN 978-955-0704-136-0, P. 183.
- Samali Y.T.D.P., Kawshala B.A.H, The Relationship between Corporate Social Responsibility Disclosure and Financial Performance: Empirical Study in Sri Lankan Domestic Commercial Banks. *The 3rd Undergraduate Symposium on Contemporary Management and Theory (USCMT 2016)*, Pragmatic Youth Scholar Driving Knowledge Creation. ISBN 978-955-704-018-9, P. 115- 116
- Sandamali L.W, Kawshala B.A.H, The Determinants of Bank Profitability: Empirical Study in Sri Lankan Domestic Commercial Banks. *The 3rd Undergraduate Symposium on Contemporary Management and Theory (USCMT 2016)*, Pragmatic Youth Scholar Driving Knowledge Creation. ISBN 978-955-704-018-9, P. 120

- Videshika W.V.J, Kawshala B.A.H, Young Consumer's Attitude towards Mobile Banking in Sri Lanka. *The 3rd Undergraduate Symposium on Contemporary Management and Theory (USCMT 2016)*, Pragmatic Youth Scholar Driving Knowledge Creation. ISBN 978-955-704-018-9, P. 138
- Weerasuriya H.N.S.D, Kawshala B.A.H, Relationship between Foreign Direct Investment and Stock Market Development: Special Reference to the Colombo Stock Exchange. *The 3rd Undergraduate Symposium on Contemporary Management and Theory (USCMT 2016)*, Pragmatic Youth Scholar Driving Knowledge Creation. ISBN 978-955-704-018-9, P. 144-145
- Weihena K.N, Kawshala B.A.H, Relationship between Stakeholders Power and Corporate Environmental Disclosure: Empirical Study on Sri Lanka's Top 100 Listed Companies. *The 3rd Undergraduate Symposium on Contemporary Management and Theory (USCMT 2016),* Pragmatic Youth Scholar Driving Knowledge Creation. ISBN 978-955-704-018-9, P. 146-147
- Wickramasinghe K.D.W.S, Kawshala B.A.H, The Stock Participation: The Study based on Investors in Western Province in Sri Lanka. *The 3rd Undergraduate Symposium on Contemporary Management and Theory (USCMT 2016)*, Pragmatic Youth Scholar Driving Knowledge Creation. ISBN 978-955-704-018-9, P. 150
- Thivya J., Kawshala B.A.H, The Effect of Divided Policy on Corporate Profitability in Beverage, Food and Tobacco Industry in Sri Lanka. *The 3rd Undergraduate Symposium on Contemporary Management and Theory (USCMT 2016)*, Pragmatic Youth Scholar Driving Knowledge Creation. ISBN 978-955-704-018-9, P. 182
- Withanage W.M.J, Kawshala B.A.H, Corporate Social Responsibility Disclosures and Financial Performance: Empirical Study on Food and Beverage Companies in Sri Lanka. *The 3rd Undergraduate Symposium on Contemporary Management and Theory (USCMT 2016)*, Pragmatic Youth Scholar Driving Knowledge Creation. ISBN 978-955-704-018-9, P. 199.

Program Participation

- Participated in the International Mobility Management Online Training organized by Erasmus+ CBHE Project TOOLKIT.
- Attended the 4 days' workshop on "*Case Study and Case Teaching Methodology*" ,2020 organized by Faculty of Commerce and Management Studies, University of Kelaniya.
- Awarded for participation in Summer Program, College of Management, Taiwan from June 4th to June 8th , 2018.
- Successfully Completed Workshop on Structural Equation Modeling (with AMOS) for Quantitative Research, National Centre for Advanced Studies.
- Successfully Completed Certificate Examination in Modern Languages, University of Kelaniya, Sri Lanka.
- Participated in Sri Lanka Youth to Business Forum, AIESEC, 2014, University of Kelaniya, Sri Lanka.
- Awarded for holding CFO in the winning team of the company simulation competition parallel to the Entrepreneurship Workshop, "*My Company 2012*", AIESEC in Sri Lanka in collaboration with AIESEC in Azerbaijan.

References

Professor Bonnie Buchanan
BSc (Hons); MAppSc; PhD, FRSA
Associate Dean (International) – Faculty of Arts, Business and Social Sciences (FABBS)
Director of Sustainable and Explainable FinTech (SAEF) Center, Immediate Past Head of Department of Finance and Accounting and Professor of Finance
Surrey Business School, University of Surrey, UK
✉ b.buchanan@surrey.ac.uk

Professor Ali Emrouznejad
BSc, MSc, PGc, PhD, FORS, FIMA
Professor and Chair in Business Analytics, Director of the "Centre for Business Analytics in Practice", and Program Lead for "Sustainability Analytics, Metrics, and NetZero"
Surrey Business School, University of Surrey, UK
✉ a.emrouznejad@surrey.ac.uk

Dr. Shuhui Wang
PhD; ACCA
Lecturer in Finance
Surrey Business School, University of Surrey, UK
✉ shuhui.wang@surrey.ac.uk

Dr Saori Sugeno
PhD in Economics
Senior Lecturer in Finance and Corporate Governance, Director of Global Mobility
Surrey Business School, University of Surrey, UK
✉ s.tada@surrey.ac.uk

Dr. Roshani Abdolreza
BSc, MSc, PGc, FHEA, PhD
Lecturer (Assistant Professor) in Business Analytics
Surrey Business School, University of Surrey, UK
✉ a.roshani@surrey.ac.uk

Professor D.M. Semasinghe Dissanayake
Ph.D. (Entrepreneurship), MCom (Management)
Professor of Entrepreneurship
Immediate Past Vice-chancellor
University of Kelaniya, Sri Lanka
✉ semasinghe@kln.ac.lk

Climate Change Exposure and Reputational Risk on Onsite Emissions

Hirindu Kawshala, University of Surrey

We examine whether firms' exposure to climate change, measured through climate-related discourse in ECCs correlates with actual reductions in onsite emissions, and whether this relationship is reinforced by reputational risk. Analyzing a panel of U.S. publicly listed firms from 2003 to 2023, we find that firms with higher climate change exposure are more likely to reduce emissions. Crucially, this negative association is significantly stronger among firms facing higher reputational risk. The results are robust across multiple emissions measures, including onsite toxic releases, total pollution, and pollution intensity. Overall, the findings underscore the role of reputational pressure as a forward-looking mechanism that enhances the credibility of climate disclosures and strengthens environmental accountability.

JEL classification : G32, M14, Q54, Q56

Keywords: climate change exposure, onsite emissions, environmental performance, ESG risk, reputational risk

The authors gratefully acknowledge Peter Tufano and all other participants of the Financial Economics of Climate and Sustainability Seminar 2025 at Harvard University.

1.1.Introduction

Despite a surge in climate-related and sustainability disclosures, the extent to which climate discourse translates into tangible environmental outcomes remains uncertain (Bingler, Kraus, Leippold & Webersinke, 2024). Firms are increasingly under pressure to address climate change, not only from regulators and investors but also from a reputational standpoint, as inaction can result in significant public backlash. While existing literature extensively investigates the drivers of climate disclosures (Berg, Kolbel & Rigobon, 2022; Ilhan, Sautner, & Vilkov, 2021), it falls short of establishing whether firm-level climate exposure, as expressed through public discourse, predicts actual reductions in emissions.

In this study, we examine whether firms' climate change exposure, measured by the frequency of climate-related terms in ECCs, is associated with reductions in onsite emissions, and how reputational risk influences this relationship. Reputational risk refers to the potential loss of stakeholder trust resulting from unmet expectations or perceived failures in a firm's actions or communications. It reflects the pressure on companies to maintain credibility and social approval among key audiences such as investors, regulators, and the public (Fombrun, 1996) and reflects the pressure firms face to maintain social approval in the eyes of investors, regulators, and the public. Climate change exposure, as captured through public communication, signals the salience of climate issues and often arises in response to growing stakeholder demands for environmental accountability (Cheng, Ioannou, & Serafeim, 2014; Krueger, Sautner, & Starks, 2020; Sautner et al., 2023). We draw on threat-rigidity theory (Staw et al., 1981), which posits that organizations facing simultaneous and intense external threats tend to narrow their strategic focus and take concrete, corrective actions. Applying this logic, we argue that firms highly exposed to climate issues and simultaneously facing elevated reputational risk experience dual pressures that heighten scrutiny and limit their ability to engage in symbolic compliance. As a result, these firms are more likely to align their climate discourse with measurable reductions in emissions.

Our analysis leverages three data sources: (1) climate change exposure scores from ECC transcripts (Sautner et al., 2023); (2) firm-level reputational risk scores from the RepRisk database, which monitors real-time ESG-related controversies; and (3) onsite emissions data from the Toxics Release Inventory (TRI). Using a comprehensive panel of U.S. publicly listed firms from 2007 to 2023, we estimate the relationship between climate discourse and emissions while accounting for firm characteristics, fixed effects, and reputational exposure.

Our results show that firms with greater climate exposure exhibit significantly lower onsite emissions. More importantly, we find that this negative relationship is amplified in the

presence of higher reputational risk. Specifically, a one-standard-deviation increase in climate change exposure is associated with a 4.3% reduction in onsite toxic emissions. When reputational risk is also elevated, the combined effect corresponds to a 7.8% reduction in emissions, indicating that reputational pressure materially reinforces the emissions-reducing effect of climate discourse. These findings are robust across alternative emissions proxies, such as total pollution and pollution intensity, with effect sizes ranging from 5.4% to 7.6%.

This paper contributes to several strands of literature. First, our study extends the ESG and climate finance literature by examining whether firms' climate-related discourse in ECCs is associated with actual environmental outcomes. While prior work, such as Sautner et al. (2023), uses ECCs to measure climate exposure and relates them to market reactions, we go further by linking this communication to specifically on onsite emissions reductions[1]. Our approach offers a behaviorally grounded and forward-looking validation of climate discourse as a credible signal of environmental intent.

Second, we contribute to the growing literature on greenwashing and reputational risk (e.g., Lyon & Montgomery, 2015) by showing that reputational pressure does not merely emerge as a reaction to environmental misconduct. Rather, it acts as a proactive external governance mechanism that encourages firms to align climate talk with environmental action. We demonstrate that firms with higher reputational exposure are more likely to translate climate discourse into lower emissions, even in the absence of regulatory mandates.

Third, we bring threat-rigidity theory (Staw et al., 1981) into the ESG context to explain firm responses to reputational scrutiny and climate expectations. Unlike prior studies that treat reputational pressure as a binary outcome of misconduct, we show that it functions as an anticipatory constraint. Under heightened reputational threat, firms reduce symbolic behavior and instead commit to real environmental improvements, offering a behavioral explanation for heterogeneity in sustainability outcomes.

Fourth, our study draws on communication theory (McLuhan, 1975) to underscore the importance of the medium. ECCs, as unscripted and real-time interactions, differ from static ESG reports by revealing managerial tone, confidence, and strategic priorities. We demonstrate that this live communication channel provides richer insight into environmental commitment and stakeholder perception.

[1] We focus on onsite emissions because they are directly attributable to a firm's operations and managerial decisions.

From a policy and managerial perspective, our findings suggest that reputational mechanisms can complement regulatory efforts by serving as soft enforcement tools. For investors, monitoring ECC discourse alongside reputational signals can enhance ESG evaluations. For managers, our results highlight the strategic necessity of aligning environmental messaging with substantive action, especially when under public scrutiny.

The remainder of this paper proceeds as follows. Section 2 reviews the related literature and develops testable hypotheses. Section 3 describes the data and empirical methodology. Section 4 presents the regression results. Section 5 concludes with practical implications and directions for future research.

1.2.Literature and hypothesis development

1.2.1. Climate change exposure and onsite emissions

Climate change has emerged as a systemic risk to firms, financial markets, and the global economy, compelling corporations to engage with climate-related issues more proactively (Krueger et al., 2020; TCFD, 2021). In response, firms increasingly disclose their climate change exposure through sustainability reports, press releases, and managerial discussions in ECCs. The climate discourse captured in ECCs is not merely symbolic; rather, it is interpreted by analysts and investors as reflecting managerial attention, strategic priorities, and likely future firm behavior (Sautner et al., 2023). Climate change exposure, as measured by the frequency of climate-related terms in ECCs, is considered a forward-looking proxy of a firm's perceived environmental risks and opportunities (Sautner et al., 2023). Firms that discuss climate issues more frequently are thought to be under greater regulatory, investor, and societal pressure, and therefore may be more likely to respond through concrete environmental action. This aligns with stakeholder theory (Freeman, 1984), which posits that firms are accountable to a broad set of stakeholders beyond shareholders, including regulators, communities, and customers who increasingly demand environmental responsibility (Cheng et al., 2014).

Empirical studies support this stakeholder-oriented view. For example, Bolton and Kacperczyk (2021) find that firms with higher carbon emissions face higher cost of capital, suggesting that market participants penalize environmentally risky behavior. Firms can reduce such costs by adopting greener practices, including lowering emissions. Ilhan et al. (2021) show that climate risk is priced into stock returns, making carbon exposure a financially material concern. Consequently, managers have strategic incentives to reduce emissions not just for ethical or regulatory reasons, but also for value protection.

From the lens of signalling theory (Spence, 1978), firms that publicly discuss climate issues may aim to send credible signals of environmental commitment to investors. Communicating climate awareness through ECCs reduces information asymmetry and may increase firm valuation if such communication is interpreted as a precursor to strategic investment in green technologies or emissions reductions (Clarkson, Richardson, & Vasvari, 2008; Flammer, 2021). In this context, higher climate change exposure may precede real efforts to cut emissions.

However, other scholars highlight the symbolic nature of climate discourse, questioning the link between climate-related communication and actual environmental performance. Lyon and Maxwell (2011) argue that firms often engage in "*greenwashing*" providing misleading signals of environmental commitment to enhance reputation while making little substantive change. Marquis, Toffel, and Zhou, (2016) show that firms strategically disclose selective environmental information to manage external perceptions.

This disconnects between talk and action raises questions about the effectiveness of climate change exposure as a driver of onsite emissions reduction. While some firms use ECCs to reflect genuine commitment and strategic alignment, others may employ climate narratives as a reputational shield. In such cases, emissions may remain unchanged or even rise, despite increased communication.

To reconcile these mixed findings, we argue that climate change exposure has the potential to reduce onsite emissions, but only when it reflects substantive engagement rather than symbolic signalling ECCs are a key channel through which managers engage with external stakeholders, and repeated climate mentions may indicate increased managerial attention to environmental issues. As such, we hypothesize a directional relationship between exposure and emissions:

H_1: Firms with higher climate change exposure reduce onsite emissions.

1.2.2. Reputational risk on the relationship between climate change exposure and onsite emissions

While climate change exposure may reflect a firm's environmental awareness and strategic priorities, not all firms that publicly discuss climate risks follow through with meaningful emissions reductions. Some firms take real steps to address environmental challenges, while others engage in symbolic signalling to appease stakeholders without implementing substantive change. One critical factor explaining this variation is reputational risk.

Reputational risk refers to the potential for loss resulting from deteriorated stakeholder perceptions and public trust. Eccles, Newquist, and Schatz (2007) emphasize that most companies focus on managing reputational threats only after they surface, adopting a reactive approach rather than proactively addressing the underlying drivers of reputational exposure. It reflects the level of scrutiny firms face from investors, regulators, NGOs, media, and consumers, especially in the ESG domain. When reputational risk is high, firms are more likely to be held accountable for inconsistencies between their environmental rhetoric and actual performance.

We build on threat-rigidity theory (Staw et al., 1981), which suggests that when organizations face heightened external threats, such as reputational scrutiny combined with climate-related expectations they become more constrained in their behavior and adopt more rigid, action-oriented responses. Under dual pressure from climate change exposure and reputational risk, firms are pushed to respond not only with discourse but with tangible emissions reductions. That is, reputational threats convert climate talk into operational commitment.

Empirical evidence supports this claim. Flammer (2021) shows that firms issuing green bonds improve their environmental performance and attract long-term, sustainability-focused investors. This consistent with the idea that such firms respond strategically to climate-related investor expectations. Conversely, firms facing lower reputational risk may have more freedom to engage in greenwashing. Marquis et al. (2016) show that firms in less visible sectors often rely on symbolic ESG disclosures to manage stakeholder perceptions. Consistently, Goss and Roberts (2011) find that firms unconstrained by reputational pressure are more likely to prioritize financial outcomes over sustainability, engaging in CSR primarily for appearance rather than substantive change.

Reputational risk also shapes stakeholder interpretation. When a firm with high reputational exposure discusses climate change, stakeholders are more likely to expect and demand follow-through, making the discourse more impactful. In contrast, similar discourse from firms with low reputational stakes may be discounted or overlooked.

Taken together, these insights suggest that reputational risk amplifies the effect of climate change exposure on emissions reductions. When both pressures are present, firms are more likely to translate climate communication into genuine environmental improvements.

H_2: The negative effect of climate change exposure on onsite emissions is more pronounced for firms with higher reputational risk.

1.3.Data and empirical methodology

1.3.1. Sample construction

The sample for this study is constructed by integrating data from three key sources: (1) climate change exposure data from Sautner et al. (2023), (2) firm-level ESG-related reputational risk scores from the RepRisk database, and (3) financial and firm characteristics data from the CRSP/Compustat merged database. The study period spans from 2007 to 2023, encompassing U.S. publicly listed firms for which ECC transcripts, reputational risk data, and accounting variables are available[2].

We begin by obtaining firm-year climate change exposure scores developed by Sautner et al. (2023), which are based on textual analysis of ECCs. These scores reflect the frequency of climate-related bigrams in the transcripts.

We then match these exposure scores with the firm-year level RepRisk Index (RRI), which captures the firm's ESG-related reputational risk based on media and stakeholder reports. Finally, we merge this dataset with annual firm-level control variables from the CRSP/Compustat merged database. After dropping observations with missing values in key variables and winsorizing continuous variables at the 1st and 99th percentiles to mitigate the effect of outliers, we obtain a final balanced panel consisting of 4,847 firm-year observations. Table 1 shows the steps we followed to build the final sample for the analysis.

Table 1. Sample selection process and screening criteria

This table outlines the sequential steps used to build the final sample. Starting from ECC-based climate exposure scores, the data is merged with reputational risk and financial datasets. Firm-level emissions are matched using a fuzzy string algorithm based on name and location data (Jing, Keasey, Lim, & Xu, 2024). The final dataset comprises 4,847 firm-year observations from 2007 to 2023 after applying exclusion criteria and winsorization.

Step	Description	Number of observations
1	ECC transcripts from U.S. firms (2001–2023); climate change exposure (CCE) scores from (Sautner et al., 2023)	70,266
2	Drop observations with missing key variables and merge CCE with CRSP/Compustat to obtain financial and accounting control variables (2001–2023)	59,512
3	Reputational risk data (2007–2023) from RepRisk	34,000
4	TRI emissions data (2007–2023), from U.S. EPA	66,251
5	Merge CCE + CRSP/Compustat with RepRisk (2007–2023)	30,565
6	Merge CCE + CRSP/Compustat + RepRisk with TRI: (2007–2023)	4,847

[2] RepRisk data are available from 2007 onward, which determines the start year of the sample.

	Apply fuzzy matching for TRI firm alignment (based on name, location, DUNS), following data (Jing et al., 2024).	
7	Final sample	**4,847**

1.3.2. Onsite emissions

Our dependent variables measure onsite emissions using firm-level data from the U.S. Environmental Protection Agency's Toxics Release Inventory (TRI). However, since there is no universal firm identifier across TRI, Compustat, and other financial databases, we follow Jing et al. (2024) and implement a fuzzy string-matching algorithm. This approach aligns TRI parent company names with publicly listed firm names in Compustat, allowing us to construct a consistent firm-level panel. We further verify the matches using firm-specific identifiers such as headquarters location, corporate websites, and DUNS numbers to ensure accuracy.

The TRI emissions data are reported at the chemical-plant-year level. To obtain firm-level emissions, we aggregate emissions across all chemicals and plants owned by each firm in a given year, following the approach of Delmas and Toffel (2008) and Berrone and Gomez-Mejia (2009). Our primary emissions variables include: (i) Onsite emissions, measuring pollution released directly into air, water, or land at the plant site; (ii) Total pollution, the sum of all onsite and offsite emissions; and (iii) Total pollution to sales, a scaled intensity measure reflecting pollution per unit of firm revenue. These variables are aggregated annually at the parent company level and converted into millions of pounds. Missing values are treated as zero, and values are winsorized at the 1^{st} and 99^{th} percentiles.

These aggregated TRI-based emissions measures are then merged with the core panel of climate exposure, reputational risk, and financial control variables, resulting in a novel firm-year dataset capable of capturing the dynamic interplay between climate discourse, reputational salience, and environmental outcomes.

1.3.3. Climate change exposure

Climate change exposure is obtained from the dataset developed by Sautner et al. (2023). It measures the relative frequency of climate change-related bigrams discussed in ECCs. Specifically, the exposure score is calculated as the number of climate-related bigrams divided by the total number of bigrams in each transcript. This metric captures how frequently a firm discusses climate change in its public disclosures. To align with financial reporting, we aggregate the exposure scores at the firm-year level by averaging across transcripts. This results in a continuous variable, scaled to reflect differences in emphasis on climate-related topics across firms.

Table 2 lists the bigrams employed to quantify climate change exposure in ECC transcripts.

Table 2. Climate change exposure bigrams

This table presents the top 100 bigrams associated with climate change exposure, based on their relative frequency in ECC transcripts. These bigrams are drawn from Sautner et al. (2023).

renewable energy, onshore wind, carbon intensity, electric vehicle, electric motor, energy application, clean energy, provide energy, produce electricity, new energy, efficient solution, help state, climate change, global warm, environmental standard, wind power, power generator, power agreement, wind energy, solar, supply energy, energy efficient, scale solar, electric hybrid, greenhouse gas, need clean, source power, solar energy, coastal area, sustainability goal, air quality, energy star, energy reform, clean air, environmental footprint, plant power, carbon emission, design use, compare conventional, gas emission, area energy, gas vehicle, extreme weather, charge station, effort energy, carbon dioxide, clean water, pass house, water resource, major design, carbon free, autonomous vehicle, vehicle manufacturer, driver assistance, energy environment, future energy, electrical energy, wind resource, motor control, solar installation, government india, combine heat, snow ice, battery power, electric bus, renewable natural, air pollution, distribute power, promote use, battery electric, environmental benefit, farm project, integrate resource, eco friendly, laser diode, clean power, electrical vehicle, deliver energy, carbon price, carbon neutral, protect environment, world population, fast charge, sustainable energy, solar farm, cell power, manage energy, energy regulatory, energy team, invest energy, obama administration, cycle gas, electric energy, heat power, coal gasification, forest land, carbon tax, environmental concern, capacity energy, unite nation

1.3.4. Reputational risk

Reputational risk is measured using the RepRisk Index (RRI), which quantifies ESG-related controversies based on daily media monitoring and stakeholder input. The RRI captures the level of reputational risk associated with a firm by assessing the volume and severity of reported ESG incidents. From the daily RRI data, we compute the annual average for each firm using the International Securities Identification Number (ISIN) to ensure accurate firm-level matching. This reputational risk measure is higher for firms that face greater scrutiny or controversies related to environmental and social issues. To harmonize with our exposure and financial datasets, we collapse daily RRI scores into yearly firm-level observations.

1.3.5. Control variables

Control variables are drawn from the CRSP and Compustat databases and include firm size (log of market capitalization), debt-to-capital ratio, R&D intensity (R&D expenses scaled

by sales), bid-ask spread, return volatility (standard deviation of monthly returns), dividend payout indicator, share price (log of *PRCC_F*), firm age (log of years since listing), market-to-book ratio, trading volume (log of shares traded), and an indicator for negative net income (loss). These variables are commonly used in empirical studies on firm behavior, ESG, and financial performance (Clarkson et al., 2008; Flammer, 2021).

1.4.Results

1.4.1. Summary statistics

Table 3 presents the descriptive statistics for all key variables used in our empirical analysis, covering a panel of U.S. publicly listed firms from 2007 to 2023. Our primary variable of interest, climate change exposure, derived from Sautner et al. (2023), has a mean value of 2.2453, a median of 0.8492, and a standard deviation of 3.4527. These values indicate considerable variation in the degree to which firms discuss climate change in their ECCs. Compared to Sautner et al. (2023), who report a mean exposure of around 2.20, our figures are consistent, reflecting a broad sample window and firm coverage.

The average value of onsite emissions, measured using EPA's TRI, is 1.4550 million pounds, with a highly skewed distribution (standard deviation of 5.2931), similar to previous environmental disclosure literature such as Griffin, Lont, and Sun (2017). We also report alternative pollution indicators: total pollution (mean = 1.8488) and total pollution to sales (mean = 3.2802), capturing both volume-based and intensity-based environmental outcomes following Jing et al. (2024).

Reputational risk, sourced from the RepRisk Index, shows a mean value of 10.7280 and a standard deviation of 11.1834, suggesting wide dispersion in firm-level ESG-related controversies and public scrutiny. This is comparable to RepRisk-based ESG risk studies such as Harjoto and Laksmana (2018), where firm-level reputational risk exhibits high variance across industries and years.

Control variables exhibit expected distributions. Firm size, measured as the log of market capitalization, has a mean of 8.3614, while research and development intensity show a low mean of 0.0300, aligning with Jing et al. (2024). Other financial controls such as bid-ask spread (mean = 0.1363), return volatility (mean = 0.0110), and market-to-book ratio (mean = 1.8181) fall within typical ranges.

We winsorize all continuous variables at the 1st and 99th percentiles to mitigate the influence of outliers. Overall, the summary statistics reflect data characteristics consistent with

existing environmental and ESG research, ensuring the reliability and comparability of our variables.

Table 3. Summary statistics

This table presents summary statistics for the variables used in our analysis. Climate change exposure is obtained from Sautner et al. (2023) and represents the frequency of climate-related discussions in ECCs. Reputational risk is measured using the RepRisk Index, which captures firm-specific ESG-related risks and public scrutiny. The dependent variables include onsite emissions, total pollution, and total pollution to sales, which measure corporate emissions and environmental impact. Control variables are sourced from CRSP and Compustat and include firm size, debt-to-capital ratio, research and development (R&D), bid-ask spread, return volatility, dividend payout, share price, firm age, market-to-book ratio, trading volume, and loss. These variables cover annual firm-level observations from 2007 to 2023. The dataset integrates climate change exposure data from Sautner et al. (2023), financial and firm characteristics from CRSP and Compustat, and reputational risk scores from RepRisk. To mitigate the influence of outliers, all variables are winsorized at the 1st and 99th percentiles, except for those that are log-transformed for normalization. The definitions of all variables are provided in the Appendix.

Variable	Min	P25	Mean	P50	P75	Max	SD
Climate change exposure	0.0000	0.3159	2.2453	0.8492	2.3280	19.2962	3.4527
Onsite emissions	0.0000	0.0010	1.4550	0.0282	0.3791	51.7996	5.2931
Reputational risk	0.0000	0.0000	10.7280	9.1781	18.8074	52.5096	11.1834
Total pollution	0.0000	0.0062	1.8488	0.0727	0.7035	62.3991	6.2967
Total pollution to sales	0.0000	0.0173	3.2802	0.1930	1.7694	98.4188	9.0838
Firm size	0.0000	7.1895	8.3614	8.3476	9.5706	13.9032	1.7441
Debt to capital	0.0000	0.1116	0.2479	0.2015	0.3548	0.9582	0.1850
Research and development	0.0000	0.0000	0.0300	0.0098	0.0288	9.5288	0.1511
Bid-ask spread	0.0419	0.0842	0.1363	0.1143	0.1601	4.9458	0.1299
Return volatility	-0.1969	-0.0048	0.0110	0.0123	0.0269	0.3316	0.0355
Dividend	0.0000	0.0000	0.7362	1.0000	1.0000	1.0000	0.4407
Share price	0.1596	3.1050	3.6548	3.7477	4.2599	6.9639	0.9468
Firm age	0.0000	2.6391	3.1157	3.3322	3.8712	4.1271	0.9033
Market to book assets	0.6345	1.2086	1.8181	1.5333	2.0952	14.2846	0.9808
Trading volume	14.9862	18.2552	19.2602	19.3208	20.2123	23.8915	1.4361
Loss	0.0000	0.0000	0.1502	0.0000	0.0000	1.0000	0.3573

To provide context on how climate change exposure has evolved over time in our sample, we plot the annual average climate exposure scores across firms. These scores, derived from ECC transcripts following of Sautner et al. (2023), reflect the salience of climate-related topics in firm communications. Figure 1 illustrates this trend from 2001 to 2023.

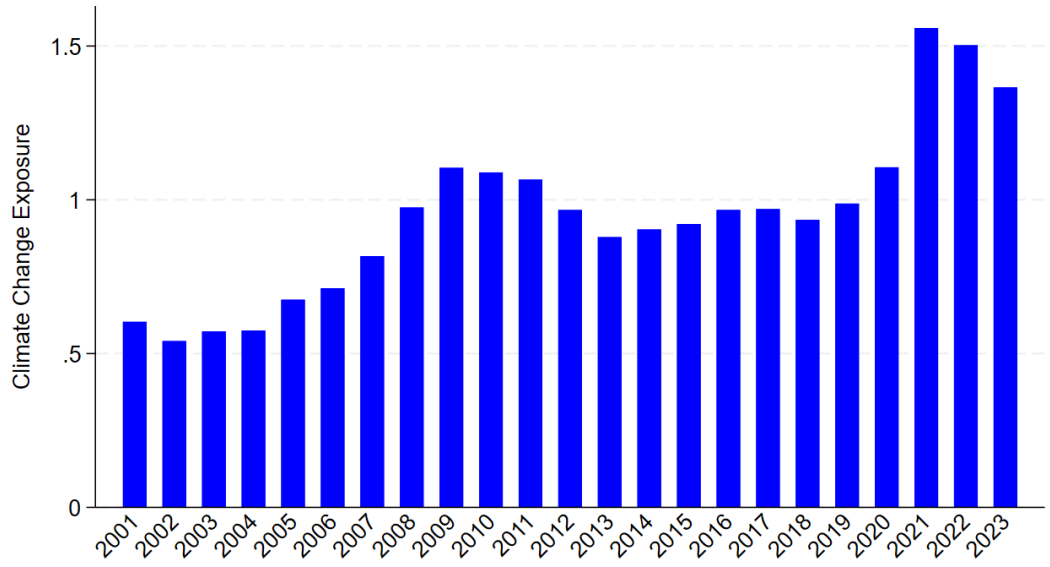


Figure 1. Annual average climate change exposure (2001–2023).
This figure plots the annual average of firm-level climate change exposure scores derived from ECC transcripts, following the methodology of Sautner et al. (2023). The exposure scores reflect the relative frequency of climate-related keywords used by firms and serve as a proxy for the salience of climate-related issues. The sample includes U.S. publicly listed firms from 2001 to 2023. *Source: Author's analysis, 2001–2023 ECC transcripts.*

1.4.2. Correlation matrix

Table 4 reports the pairwise correlation coefficients among the key variables used in this study. Reputational risk is also strongly associated with total pollution and trading volume, indicating that firms with ESG concerns may attract more market attention. Notably, firm size is highly correlated with reputational risk and trading volume, aligning with expectations that larger firms are more visible and subject to greater scrutiny. Other significant relationships include a negative correlation between market-to-book assets and climate change exposure, and a positive correlation between R&D expenses and climate change exposure is absent, which may reflect a disconnection between innovation investment and climate change exposure. The loss variable shows significant negative correlations with dividends, share price, and firm size, as expected. Across the matrix, asterisks denote statistical significance: *p < 0.10, **p < 0.05, ***p < 0.

Table 4. Correlation matrix

This table presents the correlation matrix for the key variables used in our analysis. Climate change exposure is obtained from Sautner et al. (2023) and represents the extent of climate-related discussions in ECCs. Reputational risk is sourced from RepRisk, measuring firm-specific ESG-related risks. Onsite emissions are measured using firm-reported onsite emissions data. Control variables include firm size, debt-to-capital ratio, research and development (R&D), bid-ask spread, return volatility, dividend payout, share price, firm age, market-to-book ratio, trading volume, and loss. Across the matrix, asterisks denote statistical significance: *p < 0.10, **p < 0.05, ***p < 0.01.

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
(1)	Climate change exposure	1.000															
(2)	Onsite total emissions	0.110***	1.000														
(3)	Reputational risk	0.102***	0.223***	1.000													
(4)	Total pollution	0.114***	0.890***	0.220***	1.000												
(5)	Total pollution to sales	0.099***	0.578***	0.043**	0.657***	1.000											
(6)	Firm size	0.082***	0.094***	0.607***	0.096***	-0.077***	1.000										
(7)	Debt to capital	0.202***	0.123***	0.044**	0.121***	0.089***	-0.214***	1.000									
(8)	Research and development	-0.005	-0.046***	-0.006	-0.048***	-0.044***	0.047***	-0.100***	1.000								
(9)	Bid-ask spread	-0.027*	-0.003	-0.151***	-0.001	0.060***	-0.268***	0.139***	0.012	1.000							
(10)	Return volatility	0.006	-0.003	-0.015	-0.006	0.027*	0.071***	-0.173***	-0.013	-0.003	1.000						
(11)	Dividend	0.057***	0.074***	0.256***	0.082***	-0.017	0.378***	-0.052***	-0.110***	-0.157***	-0.045***	1.000					
(12)	Share price	0.044***	-0.041***	0.268***	-0.038**	-0.109***	0.697***	-0.403***	-0.045***	-0.265***	0.161***	0.366***	1.000				
(13)	Firm age	0.111***	0.055***	0.198***	0.060***	-0.000	0.295***	-0.160***	-0.003	-0.140***	-0.007	0.309***	0.282***	1.000			
(14)	Market to book assets	-0.136***	-0.086***	0.056***	-0.095***	-0.077***	0.383***	-0.472***	0.093***	-0.098***	0.176***	0.047***	0.436***	0.061***	1.000		
(15)	Trading volume	0.086***	0.160***	0.557***	0.168***	-0.006	0.748***	0.051***	0.119***	-0.151***	-0.030*	0.140***	0.156***	0.154***	0.153***	1.000	
(16)	Loss	-0.019	0.018	-0.091***	0.014	0.041***	-0.323***	0.324***	0.110***	0.193***	-0.085***	-0.254***	-0.453***	-0.145***	-0.207***	-0.022	1.000

1.4.3. Empirical analysis

We begin our empirical tests by examining how firms' climate change exposure influences their onsite emissions, and whether this relationship is conditioned by reputational risk. We estimate the following panel regression model using OLS with firm and year fixed effects:

$$\text{Onsite emissions}_{i,t} = \alpha + \beta_1 \text{ Climate change exposure}_{i,t-1} + \beta_2 \text{Reputational risk}_{i,t-1} + \beta_3(\text{Climate change exposure}_{i,t-1} \times \text{Reputational risk}_{i,t-1}) + \sum \text{Controls}_{i,t-1} + d_i + d_t + e_i \quad (5.1)$$

where onsite emissions $_{i,t}$ denotes firm-level emission measured by onsite emissions. Climate change exposure is the lagged value of the relative frequency of climate change-related bigrams in the firm's ECCs. Reputational Risk represents the firm's ESG controversy exposure measured via the RepRisk Index. represents control variables including firm size, debt-to-capital, R&D intensity, bid-ask spread, return volatility, dividend status, share price, firm age, market-to-book, trading volume, and loss. Standard errors are clustered at the firm level.

Table 5 presents compelling evidence that climate change exposure is negatively associated with firm-level emissions, measured by onsite emissions. Specifically, a one-standard-deviation increase in climate change exposure is associated with a 4.3% reduction in onsite toxic emissions. When reputational risk is also elevated, the combined effect corresponds to a 7.8% reduction in emissions, indicating that reputational pressure materially reinforces the emissions-reducing effect of climate discourse[3]. These results suggest that firms more actively engaged in climate-related discussions and simultaneously facing greater reputational scrutiny undertake significantly more aggressive emissions reduction efforts. This supports the view that climate salience and stakeholder pressure jointly serve as critical motivators for environmental responsiveness, consistent with the threat-rigidity theory.

[3] Economic and standardized effects are calculated as follows:
• Economic effect = –0.0671 × 3.4527 = –0.2316
• Standardized effect = –0.2316 ÷ 5.2931 = –0.04375 ≈ –4.3%

For the interaction term:
• Combined effect = –0.0048 × 3.4527 × 11.1834 = –0.1853
• Total effect = –0.2316 + (–0.1853) = –0.4170
• Standardized total effect = –0.4170 ÷ 5.2931 = –0.0788 ≈ –7.8%

Table 5. Impact of reputational risk on the relationship between climate change exposure and onsite emissions

This table presents the results of OLS regressions examining the relationship between climate change exposure, reputational risk, and onsite emissions. Climate change exposure is measured using lagged values (t-1), and reputational risk is captured through the RepRisk Index $_{t-1}$. The dependent variable is Onsite emissions, representing firm-level emissions for the current period (t). The interaction of climate change exposure variable with reputational risk is examined to understand its influence on the relationship between climate-related discussions and onsite emissions. The table also includes control variables for the lagged year: firm size (Firm size $_{t-1}$), debt to capital (Debt to capital $_{t-1}$), research and development (Research and development $_{t-1}$), bid-ask spread (Bid-ask spread $_{t-1}$), return volatility (Return volatility $_{t-1}$), dividend (Dividend $_{t-1}$), share price (Share price $_{t-1}$), firm age (Firm age $_{t-1}$), market-to-book ratio (Market-to-book $_{t-1}$), trading volume (Trading volume $_{t-1}$), loss (Loss $_{t-1}$). Statistical significance levels are indicated as follows: *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively. The numbers in parentheses are the p-values associated with each coefficient. Year and firm fixed effects are included to control unobserved heterogeneity. The number of observations and Adjusted R-squared values for each model are also reported.

Dependent variable = Onsite emissions $_t$	Predicted	(1)	(2)	(3)
Climate change exposure $_{t-1}$ × Reputational risk $_{t-1}$	-			-0.0048*
				(0.097)
	-	-		-0.0671*
		0.2976*		
Climate change exposure $_{t-1}$		*		
		(0.032)		(0.069)
Reputational risk $_{t-1}$	+		0.0053	0.0158*
			(0.301)	(0.081)
Firm size $_{t-1}$		0.1704	0.3278*	0.3475*
		(0.312)	(0.075)	(0.065)
Debt to capital $_{t-1}$		0.2830	0.5538	0.5131
		(0.600)	(0.321)	(0.358)
Research and development $_{t-1}$		0.1175*	-0.0799	-0.0565
		(0.056)	(0.106)	(0.338)
Bid-ask spread $_{t-1}$		-0.0993	-0.2991	-0.3227
		(0.126)	(0.192)	(0.170)
Return volatility $_{t-1}$		-0.2403	0.2950	0.5966
		(0.735)	(0.646)	(0.384)
Dividend $_{t-1}$		0.1177	0.2098*	0.2084*
		(0.362)	(0.100)	(0.095)

Dependent variable = Onsite emissions $_t$	Predicted	(1)	(2)	(3)
Share price $_{t-1}$		-0.1235	-0.3613	-0.4085
		(0.686)	(0.297)	(0.251)
Firm age $_{t-1}$		0.2900	0.3199*	0.3079*
		(0.189)	(0.065)	(0.069)
Market to book assets $_{t-1}$		0.1314	0.0916	0.0913
		(0.149)	(0.186)	(0.167)
Trading volume $_{t-1}$		0.0875	-0.0893	-0.0762
		(0.405)	(0.191)	(0.261)
Loss $_{t-1}$		0.0536	-0.2324*	-0.2374*
		(0.642)	(0.090)	(0.082)
Year fixed effects		Yes	Yes	Yes
Firm fixed effects		Yes	Yes	Yes
No of observations		7,354	4,847	4,847
Adjusted R-squared		0.835	0.889	0.891

1.4.4. Endogeneity checks

To address potential endogeneity in the relationship between climate change exposure and onsite emissions, we employ three complementary approaches: industry fixed effects, entropy balancing (EB), and the system generalized method of moments (System GMM). First, we control for unobservable industry-specific factors by including industry fixed effects in our regressions. This accounts for time-invariant characteristics shared by firms within the same industry that might otherwise bias the estimated relationship. Second, we implement EB to correct for potential selection bias. By reweighting observations so that firms with high and low climate change exposure are balanced across observable characteristics, EB ensures covariate balance without the need for explicit matching. Third, we apply System GMM to address dynamic endogeneity, reverse causality, and unobserved firm-specific effects. This method uses lagged instruments for the dependent and endogenous variables, making it well-suited for panel data and mitigating biases arising from persistent performance trends.

1.4.4.1.Industry fixed effects

Table 6 incorporates industry fixed effects to address potential endogeneity from unobserved sectoral characteristics. The results remain robust, reinforcing the conclusion that climate exposure significantly reduces emissions, and that reputational risk amplifies this

relationship. A one-standard-deviation increase in climate change exposure is associated with a reduction in onsite total emissions equivalent to 14.5% of its standard deviation, even after accounting for industry-specific dynamics. The interaction with reputational risk adds a further 25.1% reduction, highlighting the reinforcing role of reputational pressure. This highlights how reputational pressure intensifies environmental responsiveness even within sectors facing distinct norms and expectations.

Table 6. Industry fixed effect: Impact of reputational risk on the relationship between climate change exposure and onsite emissions

This table presents the results of OLS regressions examining the relationship between climate change exposure, reputational risk, and onsite emissions. Climate change exposure is measured using lagged values (t-1), and reputational risk is captured through the RepRisk Index $_{t-1}$. The dependent variable is Onsite emissions, representing firm-level emissions for the current period (t). The interaction of climate change exposure variable with reputational risk is examined to understand its influence on the relationship between climate-related discussions and onsite emissions. The table also includes control variables for the lagged year: firm size (Firm size $_{t-1}$), debt to capital (Debt to capital $_{t-1}$), research and development (Research and development $_{t-1}$), bid-ask spread (Bid-ask spread $_{t-1}$), return volatility (Return volatility $_{t-1}$), dividend (Dividend $_{t-1}$), share price (Share price $_{t-1}$), firm age (Firm age $_{t-1}$), market-to-book ratio (Market-to-book $_{t-1}$), trading volume (Trading volume $_{t-1}$), loss (Loss $_{t-1}$). Statistical significance levels are indicated as follows: *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively. The numbers in parentheses are the p-values associated with each coefficient. Year and industry fixed effects are included to control unobserved heterogeneity. The number of observations and Adjusted R-squared values for each model are also reported.

Dependent variable = Onsite emissions $_t$	Predicted	(1)	(2)	(3)
Climate change exposure $_{t-1}$ × Reputational risk $_{t-1}$	-			-0.0146**
				(0.037)
Climate change exposure $_{t-1}$	-	-0.1695*		-0.2218***
		(0.094)		(0.010)
Reputational risk $_{t-1}$	+		0.0592***	0.0267
			(0.001)	(0.154)
Firm size $_{t-1}$		-0.2206	-0.8311	-0.8294
		(0.610)	(0.124)	(0.124)
Debt to capital $_{t-1}$		1.0210	1.2341	0.9740
		(0.216)	(0.170)	(0.283)
Research and development $_{t-1}$		-0.5448	-0.4804	-0.2477
		(0.135)	(0.114)	(0.466)

Dependent variable = Onsite Predicted emissions $_{t}$	(1)	(2)	(3)
Bid ask spread $_{t-1}$	0.5526	0.2306	0.2316
	(0.193)	(0.463)	(0.453)
Return volatility $_{t-1}$	4.3926***	4.5125**	4.5878**
	(0.003)	(0.012)	(0.013)
Dividend $_{t-1}$	0.6299	1.0276**	1.0667***
	(0.112)	(0.012)	(0.008)
Share price $_{t-1}$	0.4154	1.1661*	1.1445*
	(0.433)	(0.061)	(0.067)
Firm age $_{t-1}$	0.0618	-0.0999	-0.0993
	(0.745)	(0.575)	(0.572)
Market to book assets $_{t-1}$	-0.3382***	-0.3315***	-0.3625***
	(0.009)	(0.001)	(0.000)
Trading volume $_{t-1}$	0.5933	0.9464*	0.9695**
	(0.124)	(0.057)	(0.050)
Loss $_{t-1}$	0.1311	-0.1083	-0.0996
	(0.554)	(0.672)	(0.703)
Year fixed effects	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes
No of observations	7,413	4,862	4,862
Adjusted R-squared	0.317	0.412	0.421

1.4.4.2.Entropy balancing (EB)

To address potential endogeneity concerns and ensure covariate balance between treated and control groups, we apply EB[4]. This approach creates a weighted control group that mirrors the treatment group on all specified covariates, thereby reducing bias from observable characteristics. In our context, the treated group comprises firms with high reputational risk, defined as those above the median of the current RepRisk Index (RRI), while the control group consists of firms with lower reputational risk.

[4] EB is a multivariate reweighting technique that ensures covariate balance between treated and control groups (Hainmueller, 2012)

Panel A of the Table 7 presents the results of the balancing procedure, showing the distribution of covariates before and after weighting. As shown, the standardized mean differences and variance ratios for all covariates are effectively reduced to zero and one, respectively, after EB is applied. This confirms that the balancing was successful across key variables, including firm size, debt to capital, R&D intensity, return volatility, bid-ask spread, firm age, dividends, and market-to-book ratio. Following Rubin (2001) and Austin (2011), the absence of large deviations in standardized differences or variance ratios provides strong support for the comparability between the matched groups.

Panel B of the Table 7 reports the regression results using the entropy balancing weights in a weighted ordinary least squares framework. The dependent variable is onsite emissions, and the key independent variables include climate change exposure, a dummy for high reputational risk, and their interaction term. All models include firm-level controls, industry fixed effects (based on the Fama French 49 classification), and year fixed effects. Standard errors are clustered at the firm level to account for within-firm correlation.

The results reveal that climate change exposure is significantly negatively associated with onsite emissions, suggesting that firms that frequently discuss climate change tend to reduce their environmental footprint. Interestingly, firms with high reputational risk exhibit higher levels of onsite emissions, perhaps reflecting their legacy risk profile or less effective climate governance. However, the interaction term between climate exposure and reputational risk is negative and statistically significant at the 10% level, indicating that the emission-reducing effect of climate change exposure is more pronounced among firms with elevated reputational concerns.

Collectively, these findings highlight that reputational risk not only reflects past environmental behavior but may also serve as a forward-looking disciplinary mechanism that shapes corporate environmental outcomes. The use of entropy balancing ensures robustness of these inferences by ruling out biases from observable firm-level differences.

Table 7. Entropy balancing

This table presents the results of entropy balancing to address potential endogeneity concerns. Panel A summarizes the distribution of control variables after entropy balancing (EB), ensuring comparability between the treated and control groups. The Standardized Difference (Std. Diff.) measures the difference in means between the two groups, standardized by the treated group's standard deviation, with values close to zero indicating better balance. The Variance Ratio (Var. Ratio) represents the ratio of the variance in the treated sample to that in the control sample. Following Rubin (2001) and Austin (2011), none of the standardized differences or variance ratios fall outside acceptable thresholds, confirming the effectiveness of entropy balancing. The treated group consists of firms exhibiting high

reputational risk (above-median current RRI), while the control group comprises firms with lower reputational risk. Panel B presents the results of a weighted ordinary least squares (Weighted OLS) regression, incorporating entropy balancing weights to ensure covariate balance. The dependent variable is Onsite emissions. The key independent variables include climate change exposure, reputational risk dummy (high reputational risk firms), and their interaction. The models control firm-specific characteristics and include the full set of control variables. All models incorporate firm and year fixed effects, and standard errors are clustered at the firm level. P-values are reported in parentheses, and significance levels are denoted as follows: ***p < 0.01, **p < 0.05, *p < 0.10.

Panel A: After Entropy balancing

Covariate	Treated (N =)			Control (N =)			Std.	Var
	Mean	Variance	Skewness	Mean	Variance	Skewness	Diff	Ratio
Firm size $_{t-1}$	6.9000	4.4740	0.1511	6.9000	2.5030	-0.2012	0.0000	1.0000
Debt to capital $_{t-1}$	0.2064	0.0477	1.1420	0.2065	0.0479	1.1890	0.0000	1.0000
Research and development $_{t-1}$	0.4126	8.2740	12.8400	0.4124	8.9220	12.6800	0.0000	1.0000
Bid ask spread $_{t-1}$	0.2074	0.1292	9.9170	0.2074	0.1589	10.8300	0.0000	1.0000
Return volatility $_{t-1}$	0.0087	0.0021	0.2122	0.0088	0.0021	0.2445	0.0000	1.0000
Dividend $_{t-1}$	0.4426	0.2467	0.2313	0.4425	0.2467	0.2317	0.0000	1.0000
Share price $_{t-1}$	2.928	1.3840	-0.0932	2.9280	1.1270	-0.1369	0.0000	1.0000
Firm age $_{t-1}$	2.493	0.9943	-0.4826	2.4930	0.9602	-0.7203	0.0000	1.0000
Market to book assets $_{t-1}$	2.0610	2.5730	3.0150	2.0610	2.5530	2.9300	0.0000	1.0000
Trading volume $_{t-1}$	18.4100	2.9600	-0.0590	18.4100	1.9990	-0.2141	0.0000	1.0000
Loss $_{t-1}$	0.3438	0.2256	0.6577	0.3436	0.2256	0.6585	0.0000	1.0000

Panel B: Regression results using EB	
Climate change exposure $_{t-1}$ × Reputational risk $_{t-1}$	-0.037*
	(0.083)
Climate change exposure $_{t-1}$	-0.219***
	(0.024)
High reputational risk $_{t-1}$	0.572**
	(0.016)
Control variables of Table 5	Yes
Firm fixed effect	Yes
Year fixed effect	Yes
Observations	7,455
Adjusted R-squared	0.2834

1.4.4.3.Generalized method of moments (GMM) dynamic panel estimation

A key concern in estimating the relationship between climate change exposure, reputational risk, and onsite emissions is the potential endogeneity of the main explanatory variables. For instance, firms anticipating environmental scrutiny may increase climate-related discourse as a reputational strategy, introducing reverse causality. Additionally, time-invariant unobserved firm characteristics, such as environmental culture or governance quality, may

jointly influence emissions and disclosure practices, biasing OLS estimates. To mitigate these issues, we employ the two-step System GMM estimator developed by Arellano and Bover (1995) and Blundell and Bond (1998), which is appropriate for dynamic panel settings with firm-level heterogeneity and potential endogeneity (Wintoki et al., 2012).

In this specification, the lagged dependent variable is included to account for dynamic adjustment in emissions. Both climate change exposure and its interaction with reputational risk are treated as endogenous and instrumented using their second and third lags (collapsed to limit instrument proliferation). Other firm-level controls are assumed exogenous and are entered in levels.

Table 8 presents the results from a dynamic GMM model estimating the impact of climate change exposure and reputational risk on firms' onsite emissions. The coefficient for climate change exposure is negative and statistically significant, suggesting that firms that communicate more about climate change tend to have lower onsite emissions. This supports the idea that climate-related communication can reflect real environmental efforts.

The interaction between climate change exposure and reputational risk is also significant and negative. This supports H_2, showing that the emissions-reducing effect of climate exposure is stronger in firms with higher reputational risk. In other words, when firms under greater public or stakeholder scrutiny talk more about climate change, they are more likely to take real action to reduce emissions.

Diagnostic tests support the validity of the model. The Arellano-Bond test detects first-order serial correlation but not second-order correlation, while the Hansen J test fails to reject the null of instrument validity. Collectively, these results suggest that the GMM estimator effectively addresses endogeneity and produces consistent estimates, underscoring the robustness of our findings.

Table 8. Generalized method of moments (GMM) dynamic panel estimation

This table reports the dynamic GMM estimation results for onsite emissions. The AR (1) and AR (2) rows present the Arellano-Bond tests for first order and second-order serial correlation in the first-differenced residuals, under the null hypothesis of no serial correlation. The Hansen test of over-identifying restrictions assesses the validity of the instruments, with the null hypothesis assuming all instruments are valid. Year and firm fixed effects are included. Standard errors are robust to heteroskedasticity. Asterisks denote significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

	Onsite emissions
Climate change exposure $_{t-1}$ × Reputational risk $_{t-1}$	-0.0002*

	Onsite emissions
	(0.098)
Climate change exposure $_{t-1}$	–0.0327*
	(0.085)
Reputational risk $_{t-1}$	0.0044*
	(0.638)
Firm size $_{t-1}$	0.0264*
	(0.089)
Debt to capital $_{t-1}$	–0.1659
	(0.576)
Research and development $_{t-1}$	0.0900**
	(0.019)
Bid ask spread $_{t-1}$	0.0701*
	(0.075)
Return volatility $_{t-1}$	0.9012
	(0.214)
Dividend $_{t-1}$	–0.0320*
	(0.062)
Share price $_{t-1}$	0.0013
	(0.991)
Firm age $_{t-1}$	–0.0291*
	(0.095)
Market to book assets $_{t-1}$	–0.0080
	(0.845)
Trading volume $_{t-1}$	–0.0426**
	(0.017)
Loss $_{t-1}$	–0.0055
	(0.938)
L. Onsite emissions $_{t}$	1.0485***
	(0.00)
Year fixed effects	Yes
Firm fixed effects	Yes

	Onsite emissions
AR (1) test (*p*-value)	0.000
AR (2) test (*p*-value)	0.264
Hansen over-identification test (*p*-value)	0.197
No of observations	4,862

1.5.Robustness tests

To test the robustness of the main findings, Table 9 replaces onsite emissions with total pollution as an alternative proxy for corporate environmental performance. A one-standard-deviation increase in climate change exposure is associated with a reduction in total pollution equivalent to 4.5% of its standard deviation, even after accounting for industry-specific dynamics. The interaction with reputational risk adds a further 5.4% reduction, highlighting the reinforcing role of reputational pressure. Table 10 extends the analysis to pollution intensity, measured as total pollution scaled by sales. The results reveal that a one standard deviation increase in climate exposure corresponds to a 6.7% decrease in pollution intensity, and the interaction with reputational risk leads to an additional 7.6% decline. These findings suggest that firms actively engaged in climate-related discourse not only cut down absolute emissions but also improve efficiency by reducing emissions relative to their output.

In all models, the interaction between climate change exposure and reputational risk remains statistically significant and economically meaningful. This underscores the role of reputational risk as a disciplining mechanism that translates symbolic climate rhetoric into tangible environmental action. These results support earlier concerns around greenwashing and symbolic compliance (Delmas & Burbano, 2011; Lyon & Montgomery, 2015), while affirming the potential for reputational accountability to convert climate-related disclosures into substantive performance improvements (Marquis et al., 2016).

Table 9. Total pollution as an alternative measure of onsite emissions

This table presents the results of OLS regressions examining the relationship between climate change exposure, reputational risk, and corporate pollution levels. Climate change exposure is measured using lagged values (t-1), and reputational risk is captured through the RepRisk Index $_{t-1}$. The dependent variable is Total Pollution, representing firm-level emissions for the current period (t). The interaction of climate change exposure variable with reputational risk is examined to understand its influence on the relationship between climate-related discussions and corporate pollution levels. The interaction of climate change exposure variable with reputational risk is examined to understand its influence on the relationship between climate-related discussions and onsite emissions. The table also includes control

variables for the lagged year: firm size (Firm size $_{t-1}$), debt to capital (Debt to capital $_{t-1}$), research and development (Research and development $_{t-1}$), bid-ask spread (Bid-ask spread $_{t-1}$), return volatility (Return volatility $_{t-1}$), dividend (Dividend $_{t-1}$), share price (Share price $_{t-1}$), firm age (Firm age $_{t-1}$), market-to-book ratio (Market-to-book $_{t-1}$), trading volume (Trading volume $_{t-1}$), loss (Loss $_{t-1}$). Statistical significance levels are indicated as follows: *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively. The numbers in parentheses are the p-values associated with each coefficient. Year and firm fixed effects are included to control unobserved heterogeneity. The number of observations and Adjusted R-squared values for each model are also reported.

Dependent variable = Total pollution $_t$	Predicted	(1)	(2)	(3)
Climate change exposure $_{t-1}$ × Reputational risk $_{t-1}$	-			-0.0015*
				(0.093)
Climate change exposure $_{t-1}$	-	-0.3070*		-0.0824*
		(0.051)		(0.059)
Reputational risk $_{t-1}$	+		0.0152*	0.0186
			(0.080)	(0.137)
Control variables as in Table 5		Yes	Yes	Yes
Year fixed effect		Yes	Yes	Yes
Firm fixed effect		Yes	Yes	Yes
No of observations		7,661	5,112	5,112
Adjusted R-squared		0.789	0.857	0.858

Table 10. Total pollution relative to sales as an alternative measure of onsite emissions

This table presents the results of OLS regressions examining the relationship between climate change exposure, reputational risk, and corporate pollution intensity, measured as total pollution scaled by sales. Climate change exposure is measured using lagged values (t-1), and reputational risk is captured through the RepRisk Index $_{t-1}$. The dependent variable is Total Pollution to Sales, representing firm level pollution intensity for the current period (t). The interaction of climate change exposure variable with reputational risk is examined to understand its influence on the relationship between climate-related discussions and pollution intensity. The table also includes control variables for the lagged year: firm size (Firm size $_{t-1}$), debt to capital (Debt to capital $_{t-1}$), research and development (Research and development $_{t-1}$), bid-ask spread (Bid-ask spread $_{t-1}$), return volatility (Return volatility $_{t-1}$), dividend (Dividend $_{t-1}$), share price (Share price $_{t-1}$), firm age (Firm age $_{t-1}$), market-to-book ratio (Market-to-book $_{t-1}$), trading volume (Trading volume $_{t-1}$), loss (Loss $_{t-1}$). Statistical significance levels are indicated as follows: *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively. The numbers in parentheses are the p-values associated with each coefficient. Year and firm fixed effects are included to control unobserved heterogeneity. The number of observations and Adjusted R-squared values for each model are also reported.

Dependent variable = Total pollution to sales $_t$	Predicted	(1)	(2)	(3)
Climate change exposure $_{t-1}$ × Reputational risk $_{t-1}$	-			-0.0022*
				(0.092)
Climate change exposure $_{t-1}$	-	-0.3143**		-0.1758*
		(0.021)		(0.095)
Reputational risk $_{t-1}$	+		0.0266**	0.0318*
			(0.037)	(0.051)
Control variables as in Table 5		Yes	Yes	Yes
Year fixed effect		Yes	Yes	Yes
Firm fixed effect		Yes	Yes	Yes
No of observations		7,661	5,112	5,112
Adjusted R-squared		0.604	0.743	0.744

1.6.Conclusion

Although a growing body of research investigates the consequences of climate change for corporate strategy, few studies have systematically examined how firms' climate change exposure, as conveyed through their ECCs, affects actual environmental outcomes such as onsite emissions. In this study, we utilize the climate change exposure dataset constructed by Sautner et al. (2023), emissions data from the EPA's TRI, and reputational risk scores from the RepRisk Index to assess whether and how firms' climate issues align with their environmental performance.

Our analysis reveals a robust negative relationship between climate change exposure and firm-level emissions. Specifically, we find that firms with greater climate change exposure in their ECCs tend to report lower levels of onsite toxic releases. This suggests that firms actively discussing climate change may also take more concrete steps to reduce their environmental footprint.

Importantly, we uncover that this negative association is significantly moderated by reputational risk. Firms with higher reputational risk show a stronger negative relationship between climate change exposure and emissions. This implies that reputational pressures can serve as a disciplinary mechanism, aligning firms' public discourse with tangible

environmental action. This finding underscores the salience of ESG-driven reputational considerations in shaping firms' climate behavior.

To strengthen causal inference, we conduct several robustness tests including firm and industry fixed effects, year fixed effects, lagged specifications, and entropy balancing. Across all specifications, the relationship remains economically and statistically significant. Furthermore, our findings are consistent across multiple dependent variables measuring pollution and across various sub-samples.

Collectively, our study offers insights into how firms' climate-related narratives, reputational concerns, and environmental practices are interlinked. Unlike traditional disclosures, ECCs provide a real-time, unscripted window into managerial thinking and priorities. Thus, analysing ECCs allows us to assess the substance behind corporate climate communication, going beyond greenwashing concerns.

Appendix for variable definitions

Variable	**Variable description**
Climate change exposure	Relative frequency with which bigrams related to climate change occur in the transcripts of ECCs. The number of bigrams and divided by the total number of bigrams in the transcripts. Source: Sautner et al., (2023).
Onsite emissions	The total volume of toxic substances directly discharged into the environment at a firm's facilities without being transferred offsite for treatment or recycling. This measured in million pounds using the Toxics Release Inventory (TRI) reported to the U.S. Environmental Protection Agency (EPA). This variable represents the firm-year total of onsite releases, aggregated across all facilities under the same parent company, and is winsorized at the 1st and 99th percentiles to reduce the influence of extreme outliers.
Reputational risk	Reputational risk is measured using the RepRisk Index (RRI), which quantifies a firm's ESG-related controversies based on media reports and stakeholder actions. The variable *CURRENT_RRI* represents the annual means of daily RRI scores, aggregated at the firm level using International Securities Identification Numbers (ISINs) and cleaned to remove duplicates.
Firm size	Shares outstanding (*CSHO*) multiplied by share price (*PRCC_F*), and log transformed as log (1 + market capitalization) to address skewness. The variable is constructed using data from the CRSP/Compustat merged database.
Debt to capital	The ratio of long-term debt (*DLTTQ*) to the sum of long-term debt (*DLTTQ*) and market value of equity (*PRCCQ*CSHOQ*). We winsorize returns at the 1% and 99% levels to remove the outliers. The variable is constructed using data from the CRSP/Compustat merged database.
Research and development	Research and development expenditure (*XRDQ*) divided by sales (*SALEQ*). We replace missing RD with zero. We winsorize returns at the 1% and 99% levels to remove the outliers. The variable is constructed using data from the CRSP/Compustat merged database.

Bid-ask spread	The relative spread between the highest ask price (*ASKHI*) and lowest bid price (*BIDLO*), averaged annually. The variable is constructed using data from the CRSP/Compustat merged database.
Return volatility	The annual standard deviation of monthly stock returns (*RET*). The variable is constructed using data from the CRSP/Compustat merged database.
Dividend	An indicator variable equal to 1 for firms reporting cash dividends in the fiscal year (*DV*>0) and zero otherwise. The variable is constructed using data from the CRSP/Compustat merged database.
Share price	Nominal share price is defined as log (abs (*PRCCQ*)). The variable is constructed using data from the CRSP/Compustat merged database.
Firm age	The natural logarithm of the firm's age. Firm age is measured as the number of years since the firm first appeared in Compustat. The variable is constructed using data from the CRSP/Compustat merged database.
Market to book assets	The ratio of market value of assets to book value of assets (*ATQ*). The market value of assets is measured as the sum of book value of assets (*ATQ*) and share outstanding (*CSHOQ*) minus total common equity (*CEQQ*). We winsorize the market-to-book ratio at the 1% and 99% levels to remove the outliers. The variable is constructed using data from the CRSP/Compustat merged database.
Trading volume	The log10 (base 10 logarithm) of the total yearly number of shares traded (*CSHTR_F*). The variable is constructed using data from the CRSP/Compustat merged database.
Loss	A binary variable indicating whether a firm reports negative net income (*NI* < 0) in a given year, where Loss = 1 if *NI* < 0, otherwise Loss = 0. The variable is constructed using data from the CRSP/Compustat merged database.

This table presents the definitions of all variables used in our analysis. Mnemonics for Compustat variables are presented in parentheses, italicized and capitalized.

References

Arellano, M., & Bond, S. (1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. Review of economic studies, 58(2), 277-297. https://www.jstor.org/stable/2297968

Austin, P. C. (2011). An introduction to propensity score methods for reducing the effects of confounding in observational studies. *Multivariate Behavioral Research*, 46(3), 399–424. https://doi.org/10.1080/00273171.2011.568786

Berg, F., Kölbel, J. F., & Rigobon, R. (2022). Aggregate Confusion: The Divergence of ESG Ratings. *Review of Finance*, 26(6), 1315–1344. https://doi.org/10.1093/rof/rfac033

Berrone, P., & Gomez-Mejia, L. R. (2009). Environmental performance and executive compensation: An integrated agency-institutional perspective. *Academy of Management Journal*, 52(1), 103–126. https://doi.org/10.5465/AMJ.2009.36461950

Bingler, J. A., Kraus, M., Leippold, M., & Webersinke, N. (2024). How cheap talk in climate disclosures relates to climate initiatives, corporate emissions, and reputation risk. *Journal of Banking and Finance*, 164(June 2023), 107191. https://doi.org/10.1016/j.jbankfin.2024.107191

Blundell, R., & Bond, S. (1998). Reprint of: Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics*, 234, 38–55. https://doi.org/10.1016/j.jeconom.2023.03.001

Bolton, P., & Kacperczyk, M. (2021). Do investors care about carbon risk? *Journal of Financial Economics*, 142(2), 517-549. https://doi.org/10.1016/j.jfineco.2021.05.008

Cheng, B., Ioannou, I., & Serafeim, G. (2014). Corporate social responsibility and access to finance. *Strategic Management Journal*, 35(1), 1–23. https://doi.org/10.1002/smj.2131

Clarkson, P. M., Li, Y., Richardson, G. D., & Vasvari, F. P. (2008). Revisiting the relation between environmental performance and environmental disclosure: An empirical analysis. Accounting, *Organizations and Society*, 33(4–5), 303–327. https://doi.org/10.1016/j.aos.2007.05.003

Delmas, M. A., & Burbano, V. C. (2011). The drivers of greenwashing. *California Management Review*, 54(1), 64–87. https://doi.org/10.1525/cmr.2011.54.1.64

Delmas, M., & Toffel, M. (2008). Organizational Responses to Environmental Demands: Opening the Black Box. *Strategic Management Journal*, 29, 1027–1055. https://doi.org/10.1002/smj

Eccles, R. G., Newquist, S. C., & Schatz, R. (2007). Reputation and its risks. *Harvard Business Review*, 85(2), 104. https://hbr.org/2007/02/reputation-and-its-risks

Flammer, C. (2021). Corporate green bonds. *Journal of Financial Economics*, 142(2), 499-516. https://doi.org/10.1016/j.jfineco.2021.01.010

Fombrun, C. J. (1996). Reputation: Realizing Value from the Corporate Image. Cambridge. MA: Harvard Business School Press.

Freeman, R. E. (1984). Strategic management: A stakeholder approach. Boston: P

Goss, A., & Roberts, G. S. (2011). The impact of corporate social responsibility on the cost of bank loans. *Journal of Banking and Finance*, 35(7), 1794–1810. https://doi.org/10.1016/j.jbankfin.2010.12.002

Griffin, P. A., Lont, D. H., & Sun, E. Y. (2017). The Relevance to Investors of Greenhouse Gas Emission Disclosures. *Contemporary Accounting Research*, 34(2), 1265–1297. https://doi.org/10.1111/1911-3846.12298

Hainmueller, J. (2012). Entropy Balancing for Causal Effects: A Multivariate Reweighting Method to Produce Balanced Samples in Observational Studies. *Political Analysis*, 20(1), 25–46. https://doi.org/10.1093/pan/mpr025

Harjoto, M., & Laksmana, I. (2018). The Impact of Corporate Social Responsibility on Risk Taking and Firm Value. *Journal of Business Ethics*, 151(2), 353–373. https://doi.org/10.1007/s10551-016-3202-y

Ilhan, E., Sautner, Z., & Vilkov, G. (2021). Carbon Tail Risk. *Review of Financial Studies*, 34(3), 1540–1571. https://doi.org/10.1093/rfs/hhaa071

Jing, C., Keasey, K., Lim, I., & Xu, B. (2024). Analyst Coverage and Corporate Environmental Policies. *Journal of Financial and Quantitative Analysis*, 59(4), 1586–1619. https://doi.org/10.1017/S0022109023000340

Krueger, P., Sautner, Z., & Starks, L. T. (2020). The importance of climate risks for institutional investors. *Review of Financial Studies*, 33(3), 1067–1111. https://doi.org/10.1093/rfs/hhz137

Lyon, T. P., & Montgomery, A. W. (2015). The Means and End of Greenwash. *Organization and Environment*, 28(2), 223–249. https://doi.org/10.1177/1086026615575332

Marquis, C., Toffel, M. W., & Zhou, Y. (2016). Scrutiny, norms, and selective disclosure: A global study of greenwashing. *Organization Science*, 27(2), 483–504. https://doi.org/10.1287/orsc.2015.1039

McLuhan, M. (1975). McLuhan's Laws of the Media. *Technology and Culture*, 16(1), 74–78. https://www.jstor.org/stable/3102368

Rubin, D. B. (2001). Estimating the causal effects of smoking. *Statistics in Medicine*, 20(9–10), 1395–1414. https://doi.org/10.1002/sim.677

Sautner, Z., Van Lent, L., Vilkov, G., & Zhang, R. (2023). Firm-Level Climate Change Exposure. *Journal of Finance*, 78(3), 1449–1498. https://doi.org/10.1111/jofi.13219

Spence, M. (1978). Job market signaling. *In Uncertainty in economics* (pp. 281-306). Academic Press. https://doi.org/10.1016/B978-0-12-214850-7.50025-5

Staw, B. M., Sandelands, L. E., & Dutton, J. E. (1981). Threat Rigidity Effects in Organizational Behavior: A Multilevel Analysis Barry. *Administrative Science Quarterly*, 26(April), 501–524. https://www.jstor.org/stable/2392337

TCFD. (2021). Task Force on Climate-related Financial Disclosures Guidance. In Task Force on Climate-Related Financial Disclosures (TCFD) (Issue October). https://assets.bbhub.io/company/sites/60/2021/07/2021-Metrics_Targets_Guidance-1.pdf

Wintoki, M. B., Linck, J. S., & Netter, J. M. (2012). Endogeneity and the dynamics of internal corporate governance. *Journal of Financial Economics*, 105(3), 581–606. https://doi.org/10.1016/j.jfineco.2012.03.005