Green Investors and Green Transition Efforts: Talk the Talk or Walk the Walk?*

Shuang Chen†

August 31, 2024

Click here for most recent version

Abstract

This paper develops a method to separately measure a company's efforts in substantive environmental improvements ("walk") and mere promotion of a green image ("talk") by analyzing online job postings. Walk efforts positively predict future environmental performance and data disclosure, while talk efforts do not. Applying this method reveals that sustainable mutual funds in the EU and US hold higher ownership stakes in companies with higher talk efforts, and three major ESG rating agencies award greener scores to these companies, controlling for walk efforts. Evidence suggests sustainable mutual funds invest in companies with higher talk efforts to attract higher fund flows.

JEL Classification: G11, G12, G23, M3, Q5.
Keywords: ESG, sustainable investing, greenwashing, green marketing, green jobs.

*I am deeply grateful to my committee members Laurent Frésard, Francesco Franzoni, and Clemens Sialm. I thank Emirhan İlhan(discussant), David Oesch (discussant), Jing Xie (discussant), Annika Schürle (discussant), Nathan Barrymore, Marie Brière, Patrick Bolton, Jesse Chan, Jonathan Cohn, François Derrien, Soh Young In, Wei Jiang, Augustin Landier, Tong Li, Ellie Luu, Nadya Malenko, Loriano Mancini, Dongyang Pan, Alberto Plazzi, Paul Schneider, Naciye Sekerci, Changyong Song, Laura Starks, Jan Starmans, Alexander Wagner, Xiaoyun Yu, Boris Vallée, seminar participants at the University of Texas at Austin, University of Lugano, SFI Workshop, SWUFE PhD Forum, Utrecht University, University of Manchester, Erasmus School of Economics, IE University, ESADE, Stockholm University, Stockholm School of Economics, City University of Hong Kong, University of Technology Sydney, University of Melbourne, Labor and Finance Conference 2023, SFS Cavalcade North America 2023, Accounting Research Workshop 2023, CICF 2023, GRASFI 2023, AFFECT 2024, Deakin University for insightful discussions and comments. This work is partly funded by the SNSF.

†University of Melbourne. shuang.chen3@unimelb.edu.au

1 Introduction

As demand for environmentally responsible business practices grows, the capital managed by mutual funds with environmental objectives (referred to as green investors in this paper) has increased. However, a lack of transparency in both fund management and investee company practices, along with the absence of immediate, visible outcomes, makes it difficult to assess the environmental impact of these investments. This challenge is further complicated by the lack of standardized criteria for measuring various dimensions of environmental performance, raising questions about the accountability of green investors, particularly regarding whether their focus is on genuine environmental improvements or merely the appearance of being green.

This study investigates the extent to which mutual funds with sustainability mandates emphasize investees' efforts in substantive environmental improvements (i.e., walk) versus efforts that merely promote a green corporate image (i.e., talk). While investee companies may enhance either their walk or talk in response to growing societal demands for sustainability, these two types of efforts differ significantly in their direct environmental impact. I find that both walk and talk efforts significantly correlate with ESG funds' ownership stakes in companies, with walk efforts generally having a stronger impact across three types of ESG funds in the US and EU. However, the positive correlation between ESG fund ownership and talk efforts remains robust and economically significant. A one-standard-deviation increase in walk efforts is associated with a 21.14% increase in US ESG funds' aggregate ownership stake compared to the average ownership level, while a one-standard-deviation increase in talk efforts corresponds to a 6.52% increase compared to the average.

It is important to understand whether green investors pursue talking the talk or walking the walk. The ultimate goal of green investors should be to support substantive environmental improvements in society. While focusing on the appearance of being green might encourage companies to contribute to this goal, its environmental impact is harder to track and more uncertain than directly supporting genuine improvements. Moreover, Heeb, Kölbel, Paetzold, and Zeisberger (2023) document that investors' willingness to pay for sustainable investments is driven more by emotional considerations than by a calculative assessment of impact. Since merely talking the talk already offers emotional satisfaction (i.e., a warm glow), investors may see little need to follow through with genuine actions. The literature has not empirically distinguished the two, possibly due to the lack of measurements that separately quantify companies' walk efforts and talk efforts.[1]

[1]Separating talk efforts from walk efforts goes beyond the concept of greenwashing. Greenwashing

First, it is difficult to find information sources that do not mix these two. Most existing environmental information, such as carbon emissions and environmental policies, is self-reported, and therefore, it combines walk efforts and talk efforts. Many studies document that firms embellish their environmental disclosures (Marquis, Toffel, and Zhou, 2016; Diouf and Boiral, 2017). To distinguish walk efforts from talk efforts, we need novel environmental information sources that are less susceptible to embellishment.

Second, because investors support current or future activities, measures of walk efforts and talk efforts need to be current or forward-looking. Most existing environmental information is disclosed with a substantial time lag. Using past achievements as investment standards leads to companies with lower ESG scores often being excluded from the investment universe of ESG funds, even though they are crucial for society's green transition and key innovators in the green patent landscape in the United States (Cohen, Gurun, and Nguyen, 2020). We need measurements that reflect firms' work in progress and near-future paths.

Lastly, while no effort yields no improvement, not all efforts ensure success. High-risk projects critical to the green transition, such as developing clean technology, particularly need investor support for efforts rather than just outcomes. A company may spend years on these projects and still fail. By supporting these efforts, investors create an environment conducive to innovation, fostering long-term progress.

This study tackles the challenge of separately measuring firms' walk efforts and talk efforts by proposing a new approach based on their hiring demand shown in online job postings. Labor is a necessary production factor. Thus, a firm's demand for certain worker expertise reflects its ongoing or near-future production in the corresponding area. For example, a company working on solar energy projects requires solar energy systems engineers to implement them, while a firm managing its public image in air pollution scandals needs public relations specialists with knowledge of environmental issues. As in this example, modern society has a highly specialized occupation system, resulting in distinct walk-relevant and talk-relevant job positions. Based on this clear occupational division, the proportion of a firm's job openings for walk-relevant positions serves as a proxy for its walk efforts, and the same applies to talk efforts.

This proxy satisfies the above three criteria for measuring walk and talk efforts. First,

typically refers to the intersection of poor environmental performance and positive communication about environmental performance (Delmas and Burbano, 2011). The difference between vocal green firms and silent green firms (i.e., greenhushing) is not discussed. However, among both environmentally good and bad performers, communication strategies may influence green investors' decisions. This paper studies how much emphasis green investors place on talk efforts and walk efforts, without limiting the analysis to firms with low walk efforts.

job postings are less prone to green image embellishment because they need to accurately describe the job to attract suitable candidates. The detailed job descriptions allow for an objective evaluation of whether the position is walk-relevant, talk-relevant, or neither. Second, job openings reflect current or future demand for workers involved in future activities, aligning with investors' forward-looking perspective. Additionally, online job postings provide real-time, publicly available information, giving investors the latest data. Lastly, labor demand reflects labor input, thus representing efforts rather than outcomes. Darendeli, Law, and Shen (2021) also uses job postings to measure a company's engagement in green activities. However, they do not differentiate walk efforts from talk efforts, whereas this study focuses on separating the two.

I confirm that the novel job-posting-based measures of walk and talk efforts exhibit intuitive properties. First, only walk efforts positively predict a company's future environmental disclosure completeness, while talk efforts show no significant association. This suggests that in a voluntary disclosure context, companies committed to substantive environmental improvements are more likely to disclose, while those focused on promoting a green image rely on strategies other than data disclosure. Second, walk efforts have a robust negative correlation with both contemporaneous and future toxic emissions' health risk impact. In contrast, talk efforts show a strong positive correlation with chemical pollution and pollution intensity. This aligns with the expectation that walk efforts target tangible environmental improvements, while talk efforts focus on projecting a green image, including repairing a deteriorating public image.

I further validate the walk and talk measurements with four additional tests, which are detailed in the appendix: (1) Walk efforts robustly and positively predict the future number of green patents. (2) Walk efforts positively predict the future percentage of recycled waste in a company's total waste and negatively predict the future percentage of hazardous waste. (3) Walk efforts negatively correlate with reputational risk exposure, while talk efforts positively correlate, suggesting that companies utilize communication strategies to repair a worsening public image. (4) Neither walk nor talk efforts robustly correlate with future carbon emission intensity or energy consumption intensity. However, companies with higher talk efforts tend to have lower intensities, while those with higher walk efforts tend to have higher intensities. This distinction supports the idea that walk and talk efforts capture different aspects of the green transition. The lack of carbon intensity reduction with walk efforts may be due to the rebound effect documented by Bolton, Kacperczyk, and Wiedemann (2022) or by companies with low energy consumption business models actively marketing a green image.

I begin the analysis by describing key patterns in walk and talk efforts. First, both

walk and talk efforts, measured by the fraction of walk-relevant and talk-relevant job postings in a company in the past 12 months, have increased over time. The average walk efforts have risen from 4.28% in 2010 to 7.61% in 2023 and the average talk efforts have increased from 0.55% to 1.42% over the same period. Second, there is substantial variation in both walk efforts and talk efforts across individual firms and over time that can provide regression tests using them as independent variables with robust statistical power. Third, different industries exhibit varying magnitudes of walk and talk efforts, suggesting some industries are more crucial to green transition than others. For example, the utility industry (electric, natural gas, water services) is high in both walk and talk efforts, while the computer software industry has high talk efforts but limited walk efforts. Lastly, while contemporaneous walk and talk efforts show a weak positive correlation, with a Pearson correlation between 0.2 and 0.4 that decreases over time, talk efforts do not predict future walk efforts. This suggests that talk efforts are not reliable predictors of future walk efforts, highlighting the importance of distinguishing between the two and evaluating true green transition commitment based on walk efforts.

Next, I examine the relationship between the percentage of a company's ownership held by ESG funds and the company's walk and talk efforts. As talk efforts do not predict better future environmental performance or data disclosure, if ESG funds invest more in companies with higher talk efforts when controlling for walk efforts, it suggests ESG funds are supporting verbal commitments and therefore deviating from the goal of directly supporting substantive green transitions. I separately consider three types of ESG funds classified by Bloomberg: ESG funds in the US, Sustainable Finance Disclosure Regulation Article 8 (i.e., light green) funds, and Article 9 (i.e., dark green) funds in the EU. I start with examining each type of ESG fund's aggregate ownership stake in a stock. I include a rich set of control variables: market capitalization, book-to-market ratio, 1-month reversal, number of analysts covering the stock, return on assets, leverage ratio, earnings-to-price ratio, and bid-ask spread. Additionally, I include different fixed effects settings: time fixed effects or industry-by-time fixed effects. I document a robust pattern that for all three types of ESG funds, companies with higher talk efforts receive higher aggregate ownership stakes from ESG funds, even though walk efforts are associated with larger changes in ownership. Specifically, a one-standard-deviation increase in talk efforts is associated with a 2.98% increase in Article 8 funds' aggregate ownership stake, a 15.38% increase in Article 9 funds, and a 6.52% increase in U.S. ESG funds. The finding that Article 9 funds are most responsive to companies' talk efforts aligns with their definition as dark green funds with the strictest commitment to sustainability.

To verify whether the aggregate pattern holds at the individual fund level, I analyze

the relationship between an individual ESG fund's portfolio weight or ownership stake in a company's stock and the company's walk and talk efforts. I control for the same set of stock characteristics and present the results both with and without controlling for time fixed effects. The analysis reveals that the positive correlation between ESG funds' aggregate ownership stake and a company's talk efforts also persists among individual ESG funds. Specifically, a one-standard-deviation increase in talk efforts is associated with a 1.95% increase in an Article 8 fund's portfolio weight in the company, a 7.57% increase in Article 9 funds, and a 4.29% increase in U.S. ESG funds.

To understand the drivers behind ESG funds' preference for companies with higher talk efforts, I investigate two complementary mechanisms: (1) Do ESG rating agencies assign greener environmental ratings to companies with higher talk efforts, considering that many green investors, lacking in-house teams to monitor each investee's green transition, rely heavily on these ratings to guide their investments? (2) Does investing more in companies with higher talk efforts align with fund managers' incentives, such as increasing fund flows, improving fund returns, and enhancing fund Morningstar Sustainability ratings?

Firstly, to test whether ESG rating agencies assign greener environmental ratings to companies with higher talk efforts, I regress a company's environmental rating, provided by MSCI KLD, Sustainalytics, or Refinitiv, on its contemporaneous walk and talk efforts. The regressions control for the same set of stock characteristics used in the fund ownership analysis and include time fixed effects or industry-by-time fixed effects. The results show that companies with higher talk efforts receive greener environmental ratings from MSCI KLD, Sustainalytics (both under the old method until August 2019 and the new method after August 2019), and all three Refinitiv environmental pillar subcategories: emissions, innovation, and resource use. Notably, the new Sustainalytics rating method measures unmanaged environmental risk, so lower scores indicate greener ratings, while the other ratings measure environmental performance, where higher scores are greener. These findings suggest that even when walk efforts are held constant, talk efforts positively enhance a company's environmental ratings across different rating systems, despite not being linked to better future environmental performance or disclosure.

Secondly, I assess how ESG fund flows in the following month vary with the fund portfolio's average green transition efforts. A fund portfolio's average walk and talk efforts are representative only when most securities in the portfolio have these measures available. Since ESG funds for sale in the EU often allocate less than 50% of their portfolio weight to US stocks, many EU ESG funds are not suitable for the above test. Therefore, the tests focusing on portfolio average green transition efforts are limited to U.S. ESG funds. I regress the fund flow in month T+1 on the fund portfolio's weighted average walk

efforts, talk efforts, and other stock characteristics, including market capitalization, book-to-market ratio, 1-month reversal, number of analysts, return on assets, leverage ratio, earnings-to-price ratio, and bid-ask spread, all available in month T. When controlling for time fixed effects, a one-standard-deviation increase in the portfolio's average talk efforts predicts a 0.4433 percentage point increase in fund flow in the next month. This increase represents 46.84% of the fund flow's mean and 6.10% of its standard deviation. This significant positive relationship indicates a strong incentive for ESG fund managers to invest in companies that put more effort into communicating their environmental aspects.

To better understand this incentive, I explore whether the patterns in fund flows align with both fund returns and Morningstar Sustainability Ratings. For fund returns, fund portfolio's average talk efforts show a significant positive correlation with future fund returns when controlling for time fixed effects, while average walk efforts do not. However, this correlation for talk efforts weakens when controlling for fund-category-by-time fixed effects. For Morningstar Sustainability Ratings, average walk efforts negatively predict future ratings, whereas average talk efforts positively predict them. This is consistent with the results of Sustainalytics environmental rating under the new method, where a company's higher walk efforts are linked to higher unmanaged environmental risk, and higher talk efforts are linked to lower risk. Since the Morningstar Sustainability Rating is based on the average Sustainalytics ratings of the securities within a fund portfolio, portfolios investing more in companies with higher talk efforts—who tend to receive greener Sustainalytics ratings—will mechanically achieve a higher Sustainability Rating. Both higher future fund returns and better Morningstar Sustainability Ratings corroborate ESG fund managers' incentive to invest more in companies with higher talk efforts.

Altogether, I document that all three types of ESG funds, including US ESG funds, EU Sustainable Finance Disclosure Regulation Article 8 funds, and Article 9 funds, hold higher ownership stakes in companies with higher talk efforts, and all three major ESG rating agencies, Sustainalytics, MSCI KLD, and Refinitiv, give greener scores to these companies, controlling for the companies' walk efforts. Higher talk efforts do not correlate with better environmental performance or more complete environmental disclosure in the future. However, the positive association between a fund portfolio's average talk efforts and future fund flows, returns, and sustainability ratings incentivizes ESG funds to invest more in companies with higher talk efforts.

This paper makes four primary contributions to the literature. First, it offers a new framework to evaluate the commitment level of mutual funds with sustainability mandates, specifically the fund's emphasis on substantive environmental improvements (i.e., walking the walk) versus promoting a green image (i.e., talking the talk).The key distinc-

tion is that walking the walk has a direct environmental impact, while talking the talk offers only the satisfaction of doing good without tangible environmental consequences, akin to the warm glow effect.

Unlike evaluating mutual funds focused solely on financial returns, assessing mutual funds' environmental commitment is challenging due to the various dimensions of environmental impact and the severe information asymmetry involved. A common practice is to assess mutual funds' environmental commitment by their Morningstar Sustainability Ratings. Studies document that investors marketwide value Morningstar Sustainability Ratings (Hartzmark and Sussman, 2019), mutual funds adjust their holdings to improve these ratings and attract fund flows (Gantchev, Giannetti, and Li, 2024), and ESG funds even strategically hold more responsible portfolios immediately before mandated disclosure than afterward to inflate these ratings(Parise and Rubin, 2023). This paper reveals that Morningstar Sustainability Ratings are higher for fund portfolios with higher average talk efforts but lower for those with higher average walk efforts. This widely used sustainability evaluation standard rewards funds that pursue talking the talk. Consequently, when fund investors rely on this standard, ESG funds may lose the incentive to pursue substantive environmental improvements. This is consistent with Edmans, Levit, and Schneemeier (2022), showing that when green transition actions are not publicly observable, investors may avoid holding brown stocks that take corrective actions because holding these stocks leads to accusations of greenwashing.

Other metrics for evaluating mutual funds' non-pecuniary commitments include the Active ESG Share, as developed by Cremers, Riley, and Zambrana (2023), which measures how actively a fund manager incorporates ESG information. However, this metric primarily indicates the fund manager's specialized ESG investment skills and the fund's potential future financial performance, rather than the fund's environmental commitment. Lowry, Wang, and Wei (2023) measure an ESG fund's commitment level by its incentive to engage as in Lewellen and Lewellen (2022) and its cost to exit as in Pástor et al. (2020).

Second, the analysis of investees' walk and talk efforts provides new insights into whether the two strategies of sustainable investing, voice (engagement) and exit (divestment and boycott) effectively support substantive environmental improvements, as described by Broccardo, Hart, and Zingales (2022). The weak correlation between companies' walk and talk efforts suggests that substantive improvements are not well-aligned with a company's corporate image. This disconnect influences investor decisions, as all three types of ESG funds in both the US and the EU, along with all three major ESG rating agencies, are sensitive to talk efforts even after controlling for walk efforts. In the voice strategy, where investors actively monitor investees, this disconnect is more likely

to be observed and reduce the risk of biased investments. However, in the exit strategy, significant information asymmetry between investors and investees persists, leading to the risk that investors may mistake talk efforts for walk efforts, thereby reducing the strategy's effectiveness.

Few studies differentiate between walk and talk in the context of sustainable investing. Chen (2023) is one of the few that consider this distinction, modeling how companies can manipulate ESG disclosures, potentially leading to decreased green investment despite stronger investor ESG preferences. Most normative studies focus on the interaction between sustainable investors and companies' walk efforts. For instance, Berk and Van Binsbergen (2021) show that a divestiture strategy's impact on brown companies' cost of capital is too small to meaningfully affect company decisions, while Landier and Lovo (2020) argue that the threat of divestment raises a firm's effective cost of capital due to matching friction between firms and investors. Edmans, Levit, and Schneemeier (2022) suggest that tilting, which involves holding brown stocks that have taken corrective action, may be more effective than blanket exclusion of brown stocks. On the engagement side, studies have explored conditions under which impact investments improve social outcomes (Chowdhry, Davies, and Waters, 2019; Biais and Landier, 2022; Oehmke and Opp, 2024). Oehmke and Opp (2024) emphasize that achieving ESG impact requires sacrificing financial returns, and they argue that ESG funds need to be evaluated with broader measures that explicitly account for real impact, which this study's measures of investees' walk and talk efforts contribute to.

Empirical studies on the real impact of sustainable investing have produced mixed results. On the one hand, Dyck, Lins, Roth, and Wagner (2019) document a positive association between institutional ownership and firms' environmental and social performance across 41 countries. Gantchev, Giannetti, and Li (2022) find that firms with higher E&S-conscious institutional ownership improve their environmental performance after E&S incidents, especially if their managers receive equity compensation. Ilhan, Krueger, Sautner, and Starks (2023) show that institutional investors motivate firms to increase climate risk disclosures. Lowry, Wang, and Wei (2023) document that some more committed ESG funds improve investees' ESG performance. On the other hand, Atta-Darkua, Glossner, Krueger, and Matos (2023) reveal that institutional investors who join climate-related initiatives tend to re-weight portfolios toward lower-carbon-emitting firms rather than allocate capital to firms developing climate patents, raising doubts about these initiatives' effectiveness. Hartzmark and Shue (2022) argue that sustainable investing often rewards green firms for trivial emissions reductions due to an overemphasis on percentage reductions rather than absolute impact. This paper's finding that green investors tend to favor

companies with higher talk efforts, while certain industries with limited environmental impact, such as computer software companies, exhibit high talk efforts despite low walk efforts, is consistent with Hartzmark and Shue (2022)'s concerns. However, this paper also documents that green investors invest more in companies with higher walk efforts, suggesting that sustainable investing still yields positive impacts despite these concerns.

Third, this study contributes to the literature on ESG ratings and their role in sustainable investing. Previous research, including Berg, Koelbel, and Rigobon (2022), Billio, Costola, Hristova, Latino, and Pelizzon (2021), Berg, Koelbel, Pavlova, and Rigobon (2022), and Avramov, Cheng, Lioui, and Tarelli (2022), highlights the divergence, heterogeneity, noise, and uncertainty in ESG rating criteria across agencies. I extend this literature by identifying a commonality: all agencies tend to assign greener environmental ratings to companies with higher talk efforts. Berg, Heeb, and Kölbel (2022) show that only MSCI ESG ratings correlate with the holdings of US ESG funds, and that fund ownership responds slowly to rating changes, indicating that ESG ratings function more as compliance criteria than indicators of fundamental value. My findings suggest a new channel where future fund flows and Morningstar Sustainability Ratings incentivize ESG funds to invest based on investee companies' environmental ratings.

Finally, methodologically, this paper provides a new approach to separately measure a company's real-time efforts in substantive green transition and mere promotion of a green corporate image. It complements the existing environmental information and can be used to guide investment in practice. For example, for high-stakes projects requiring high substantive efforts but without immediate successful outputs, investors can use the proportion of walk-relevant job postings as an indicator of the investee's substantive efforts.

This new approach has one major limitation: the hiring demand indicated through online job postings may contain noise. For instance, the job positions a company posts may not align with the actual employees hired, or a company might retrain existing employees with new skills related to green transition rather than hiring new staff. However, I verify that this noise does not obscure the informative signals that can predict a company's future environmental performance and the completeness of its environmental data disclosures. These outcomes are critical to green investors, thereby confirming the validity of using measured walk and talk efforts to assess green investors' environmental objectives. Other studies that utilize online job postings (Abis and Veldkamp, 2020; Babina, Fedyk, He, and Hodson, 2024; Darendeli, Law, and Shen, 2021) also address this noise concern by cross-validating with other data sources. For example, Babina, Fedyk, He, and Hodson (2024) confirms that the proportion of AI-related job positions among current employees

(from resumes) and the demand for additional employees (from job postings) are highly correlated and exhibit consistent trends.

Another limitation of this study is that it does not employ identification strategies to establish causality out of the observed positive correlation between ESG funds' ownership stakes and companies' talk efforts. The primary goal of this study is to reveal how much emphasis mutual funds with environmental objectives place on supporting substantive environmental improvements versus promoting a green image. The robust, significant, and widespread correlations observed answer this question, even without identifying whether companies' walk or talk efforts lead to increased ESG fund investments or whether ESG fund investments encourage companies to walk or talk more.

The paper is organized as follows. Section 2 describes the data. Section 3 details the measurement approach and the descriptive features of walk and talk efforts. Section 4 validates the intuitive properties of these efforts. Section 5 examines the relationship between ESG fund ownership and companies' walk and talk efforts. Section 6 investigates the mechanism behind ESG funds' preference for companies with higher talk efforts. The conclusion is presented in Section 7.

2 Data

I propose a new method to separately measure a company's walk efforts and talk efforts based on the intensity of demand for job positions in the corresponding areas. Labor is a key input in any production, and our modern society's labor force is highly specialized, with different occupations handling different production tasks. Therefore, occupations handling tasks in walk efforts can be distinguished from those handling tasks in talk efforts. A company's demand intensity for occupations specializing in walk efforts (or talk efforts) provides insights into its current or future production intensity in that area.

Using detailed job task descriptions from online job postings, I categorize job openings as walk-relevant, talk-relevant, or neither, and then quantify a company's demand intensity for workers specializing in walk or talk efforts. I validate these measurements by examining their relationship with the company's contemporaneous and subsequent environmental information. Then, I assess how different sustainable investment mandates and environmental ratings emphasize walk and talk efforts and analyze how this emphasis relates to fund flow, return, and Morningstar Sustainability Rating. The datasets used in this analysis are described below. See Appendix A6 for all variables' definitions.

2.1 Online job postings from Lightcast

Lightcast (formerly Burning Glass) collects job postings from various sources daily, including job boards and company websites. Utilizing natural language processing technology and dedicated in-house experts, Lightcast parses these postings into a machine-readable format and extracts commonly included elements, such as employer name, job position's occupation, posting date, skills in demand, and education requirements. This dataset has been widely used in labor economics and finance studies (Acemoglu, Autor, Hazell, and Restrepo, 2022; Braxton and Taska, 2023; Hershbein and Kahn, 2018; Babina, Fedyk, He, and Hodson, 2024; Abis and Veldkamp, 2020). Hershbein and Kahn (2018) compares Lightcast postings with other sources (JOLTS, the Current Population Survey, and Occupational Employment Statistics) and concludes that although Lightcast postings are disproportionately concentrated in certain occupations and industries, the distributions remain relatively stable over time, and the aggregate and industry trends in vacancy quantity track other sources reasonably closely.

This study uses non-internship job postings from the Lightcast U.S. database from 2010 to 2023. I focus on job postings with non-missing employer names and exclude internships. Job postings' employers are then identified in Compustat and CRSP using fuzzy name matching after removing common suffixes in company names such as "Ltd" and "Co". All observations meeting the fuzzy matching criteria are manually verified by comparing the name, address, and business in a random job posting by the employer with the corresponding details in Compustat or CRSP. To verify the matching quality between Lightcast and Compustat, I replicate the AI investment measurement in Babina et al. (2024) and compare the summary statistics of the change in the share of AI workers in Burning Glass from 2010 to 2018. My sample has the same mean (0.0046), the same 25th percentile (0), the same median (0), and a very close 75th percentile (0.0032 versus 0.0034).

2.2 Companies' environmental information for validation tests

2.2.1 Environmental Disclosure Score from Bloomberg

This study uses the annual Bloomberg Environmental Disclosure Score from 2010 to 2023. The score's calculation methodology, originally created in 2010, was updated by Bloomberg in early 2022 to reflect the evolution in corporate reporting. The new method was implemented retroactively for all years and all companies.

This proprietary Bloomberg score measures the amount of environmental data a company reports publicly, rather than the company's performance on any specific data point.

The score ranges from 0, for companies that do not disclose any of the environmental data included in the score, to 100, for those that disclose every data point. Companies not covered by Bloomberg for ESG data will have no score. A consistent list of topics, data fields, and field weights is applied across sectors and regions. The topics include Air Quality, Climate Change, Ecological & Biodiversity Impacts, Energy, Materials & Waste, Supply Chain, and Water.

2.2.2 Toxic Release Inventory data from Environmental Protection Agency

This study uses companies' chemical-by-chemical toxic emissions and associated risk scores from the U.S. Environmental Protection Agency (EPA)'s Toxic Release Inventory (TRI) program over the period 2010-2022. Section 313 of the Emergency Planning and Community Right-to-Know Act (EPCRA) created the TRI. Industrial facilities that meet TRI Program reporting requirements submit their data to the EPA. One of the main requirements is that the facility manufactures (defined to include importing), processes, or uses any EPCRA Section 313 chemical in quantities greater than the established threshold during a calendar year. For facilities with non-missing parent company names, I standardize parent company names using the company name cleaning procedures from Duchin, Gao, and Xu (2022), and merge them with CRSP company names through exact name matching. Then I supplement the exact name-matched sample with the TRI-CRSP mapping table provided by Hsu, Li, and Tsou (2023).

Following Duchin, Gao, and Xu (2022), I focus on two main data fields in the TRI program. One is the total toxic emission of each chemical from each facility in a given year. I further calculate the facility's pollution intensity on the chemical by dividing the total toxic emission by its cumulative production ratio. The other is the RSEI score which measures the relative risk-related impacts to human health from each facility's emission of each chemical in a given year. RSEI Scores are calculated as unitless values that account for the size of a chemical release, the fate and transport of a chemical within the environment, the size and locations of potentially exposed populations, and a chemical's relative toxicity, in order to facilitate comparison over time and across chemicals. RSEI Hazard, also called toxicity-weighted pounds, is a screening-level metric that is intended to be the primary descriptor of relative potential hazard to human health for use in comparative and trend analysis. Unlike RSEI Score, RSEI hazard do not include environmental fate and transport modeling or any adjustments that consider population exposure.

2.2.3 Patent data from Kogan, Papanikolaou, Seru, and Stoffman (2017)

This study uses the mapping table from patent identifier to company identifier in CRSP and patents' Cooperative Patent Classification (CPC) codes provided by Kogan, Papanikolaou, Seru, and Stoffman (2017). The data span from 2010 to 2022.

To identify green patents, this study uses two different green patent classification methods to ensure robustness. The first method considers patents with CPC codes containing 'Y02' or 'Y04' as green patents, following the Y02/Y04S classification scheme for climate change mitigation technologies (CCMTs) by EPO (European Patent Office). It covers seven main categories, namely energy, greenhouse gases (GHG) capture, buildings, industry (including agriculture), transport, and waste and wastewater management (Angelucci, Hurtado-Albir, and Volpe, 2018). I refer this as CPC method.

The second method starts from the list of International Patent Classification (IPC) codes included in the "IPC Green Inventory." This inventory, developed by the IPC Committee of Experts, is designed to facilitate searches for patent information related to Environmentally Sound Technologies (ESTs), as listed by the United Nations Framework Convention on Climate Change (UNFCCC). Next, I convert the IPC codes in the "IPC Green Inventory" to CPC codes using the CPC to IPC concordance table provided by the United States Patent and Trademark Office. If a patent's CPC code matches any of the converted CPC codes from the "IPC Green Inventory," the patent is classified as a green patent. I refer this as IPC method.

2.2.4 Environmental outcome metrics from Bloomberg.

This study uses annual environmental outcome variables in Bloomberg from 2010 to 2023. The metrics include carbon intensity calculated with various denominators for robustness, energy consumption intensity calculated with various denominators, percentage of recycled waste, and percentage of hazardous waste among total waste generated by the company.

2.2.5 Reputational risk exposure related to ESG issues from RepRisk

RepRisk provides each company's daily reputational risk exposure related to ESG issues, measured by the RepRisk Index (RRI). The RRI screens over 100,000 media sources in 23 languages to identify companies associated with ESG risk incidents and quantify the severity and novelty of each incident. The RRI ranges from zero (lowest) to 100 (highest), with higher values indicating greater risk exposure. This study utilizes Current RepRisk Index (RRI) data from January 2010 to December 2022. The Current RRI reflects the

current level of media and stakeholder attention to ESG issues concerning a particular company. The provided daily values are aggregated to the annual level by calculating the annual average.

2.3 Environmental ratings from MSCI KLD, Sustainalytics, and Refinitiv

2.3.1 Environment strengths and concerns from MSCI KLD

The MSCI ESG KLD database assigns a score of 0 or 1 to each company each year in various categories of strength or concern under environmental topics. For example, waste management is a category of strength, and hazardous waste is a category of concern. I calculate a net environmental score following the method of Lins, Servaes, and Tamayo (2017). Specifically, for each company each year, I divide the sum of strengths (or concerns) by the maximum number of strengths (or concerns) possible in that year and then subtract the concerns index from the strengths index. The sample spans from 2010 to 2018.

2.3.2 Environmental Risk Score from Sustainalytics

This study uses monthly Sustainalytics Environmental Risk Score downloaded from Morningstar for the primary share of each U.S. company. This sample spans from 2010 to 2023. Due to a methodology change by Sustainalytics, the scores until August 2019 are not comparable with those after. Therefore, I analyze the periods before and after August 2019 separately.

The score until August 2019 measures a company's environmental sustainability performance by identifying the most relevant environmental issues for each industry and assessing the company on three dimensions: preparedness, disclosure, and performance. The resulting score is on a 1-100 scale, with higher scores representing better performance.

The score after August 2019 represents units of unmanaged ESG risk with lower scores representing less unmanaged risk. Unmanaged Risk is measured on an open-ended scale starting at zero (no risk) and, for 95% of cases, a maximum score below 50. This score represents the portion of the company's exposure that could be managed but currently is not.

2.3.3 Environment pillar subcategory scores from Refinitiv

Refinitiv designs a framework of more than 500 different ESG metrics to measure a company's relative ESG performance, commitment, and effectiveness, based on company-reported data. This study utilizes Refinitiv scores for each of the three subcategories

within the environmental pillar: emissions, innovation, and resource use. The sample period covers 2010 to 2023.

2.4 Funds with sustainable investment mandates

2.4.1 EU SFDR Article 8 and 9 funds holdings from Morningstar

To comply with the European Union (EU) Sustainable Finance Disclosure Regulation (SFDR) 2019/2088, each fund available for sale in the EU must be classified into one of the following three categories. (1) Article 6: Where the financial product does not pursue or promote environmental or social objectives but where sustainability risks may be assessed to determine their impact on the returns of the financial product. (2) Article 8: Where a financial product promotes environmental or social characteristics or a combination of those characteristics, provided that the companies in which the investments are made follow good governance practices. (3) Article 9: Where a financial product has sustainable investment as its objective and complies with the "no significant harm" principle.

Using Bloomberg's fund screening function in January 2024, there are 1061 unique funds under the SFDR Classification Article 9 and 11555 unique funds under the SFDR Classification Article 8 with non-missing ISIN codes. Using the ISIN codes of their primary share classes, I download the quarterly portfolio holding shares of 694 Article 9 funds and 6,544 Article 8 funds from Morningstar, covering the period from 2020 to 2023. I also obtain the portfolio weight of each security, but due to differences in download times and updates to Morningstar's data, I manage to download portfolio weights for 691 Article 9 funds and 6,583 Article 8 funds. This discrepancy contributes to the slight difference in the number of observations in the two panels of Table 6.

2.4.2 U.S. ESG funds holdings from CRSP

For U.S. funds, the criteria for ESG classification lack consensus. To align with EU funds, I follow Bloomberg's criteria, which require a fund's general attribute to include Clean Energy, Climate Change, ESG, Environmentally Friendly, or Socially Responsible. There are 895 unique U.S. ESG funds with non-missing ISIN codes. Using these ISIN codes, I manage to download portfolio holdings for 730 unique funds from CRSP, covering the period between 2010 and 2023.

2.4.3 Fund Sustainability Ratings, net assets, and monthly returns from Morningstar

Using ESG funds' ISIN identifiers from Bloomberg, I download US ESG funds' Sustainability Ratings, net assets, and monthly returns from Morningstar. This sample only contains US funds because these variables will be linked to fund portfolios' average green transition efforts. Since the job postings used to calculate green transition efforts only cover US-listed companies' hiring in the US, funds with few US stocks in holdings end up with insufficient data on most portfolio constituents' green transition efforts. I require at least 50% of a fund's portfolio to be covered by the job posting sample for inclusion in the analysis. This criterion heavily reduces the observations of EU funds. This sample only covers US ESG funds with 758 unique ISINs.

Morningstar assigns Sustainability Ratings by combining a fund portfolio's Corporate Sustainability Rating and Sovereign Sustainability Rating proportional to the relative weight of the (long only) corporate and sovereign positions. Funds are ranked within each peer group categorized by their portfolio assets. Higher ratings indicate that a fund is, on average, invested in fewer companies or sovereign debt with high ESG risk, as assessed by Sustainalytics' ESG Risk and Country Risk methodologies, thus exposed to less risk driven by environmental, social, or governance factors. The top 10% of funds receive five globes, the next 22.5% receive four globes, the next 35% receive three globes, the next 22.5% receive two globes, and the bottom 10% receive one globe.

2.5 Control variables from Compustat, CRSP, and I/B/E/S

This study uses commonly observed company characteristics as control variables. For dependent variables related to company activities, such as Bloomberg disclosure score or toxic chemical emission intensity, the control variables include total assets, book-to-market ratio, leverage ratio, and return on assets. For dependent variables that measure investor beliefs or behaviors, such as portfolio weight or environmental rating, the control variables include market capitalization, book-to-market ratio, 1-month reversal, number of analysts covering the stock, return on assets, leverage ratio, earnings-to-price ratio, and bid-ask spread. The company characteristics are calculated following Green, Hand, and Zhang (2017).

3 Approach to measuring walk efforts and talk efforts

The essence of this approach is to measure the proportion of labor demand aimed at facilitating substantive green transitions versus those intended to merely promote a green corporate image. Online job postings are uniquely suitable for differentiating these two types of labor demand.

To attract the desired job candidates, job advertisements need to provide honest and detailed information about the work tasks involved in the position. These work tasks allow for a relatively objective evaluation of whether the job position is related to substantive action (walk efforts), superficial communication (talk efforts), or neither. For instance, Appendix A presents a job posting for a Chief Sustainability Officer at BP, an oil and gas company, clearly indicating that the position involves significant green transition actions beyond merely projecting a green corporate image. It is challenging to obtain such specific information about a company's work task requirements elsewhere. For example, LinkedIn user profiles contain very limited job descriptions, making it difficult to discern the job responsibilities of a Vice President at JPMorgan Chase & Co.

There are two main concerns about using job postings to depict a company's labor. One concern is that online job postings are advertisements for new hires and thus represent labor demand rather than labor inputs. Some advertised positions may not be filled, and some employees may not be hired through job postings. This study acknowledges these possibilities, although the literature (Babina, Fedyk, He, and Hodson, 2024) documents that current employees (from resumes) and the demand for additional employees (from job postings) are highly correlated, at least for AI-related workers. This study does not require a company's labor demand to be completely consistent with its labor input. Instead, it relies on the assumption that labor demand reflects a company's environment-related business strategy, which I verify through various validation tests using companies' environmental information.

Another concern is that online job postings may be subject to greenwashing, where companies claim to be more environmentally friendly than they are. The incentives for companies to greenwash job postings are not clear. Unlike greenwashing targeting external stakeholders, future employees will become insiders once hired, making the green image bubble easy to burst. Moreover, it is not obvious how greenwashing in job postings can help build a green corporate image, as job postings are not listed as a data source by any well-known ESG rating agency.

In summary, online job postings provide a valuable data source for understanding how firms deploy the two tools, walk efforts and talk efforts. To measure this, first,

I categorize each job posting's occupation into walk-relevant, talk-relevant, or neither and evaluate whether the specific job context is eco-friendly or not. A job posting in a walk-relevant occupation and an eco-friendly context is classified as a walk-relevant job posting. Similarly, a job posting in a talk-relevant occupation and an eco-friendly context is classified as a talk-relevant job posting. Then, I calculate the share of walk-relevant and talk-relevant job postings posted by a company in a given period as the company's walk efforts and talk efforts. Appendix B includes the decision tree diagram used to classify a job posting as walk-relevant, talk-relevant, or other.

3.1 Focusing on green occupations

I only consider job postings in occupations classified as green by the U.S. Department of Labor (DOL) as candidates for job postings related to walk efforts or talk efforts. The DOL lists 204 occupations whose work and worker requirements are potentially affected by the greening of economic activities and technologies. There are three different types of impact that greening of the economy can bring to occupations. The 204 occupations are grouped correspondingly:

(1) Green Increased Demand Occupations. The impact of sustainable economic activities and technologies is an increase in employment demand for an existing occupation. However, this impact does not entail significant changes in the work and worker requirements of the occupation. The work context may change, but the tasks themselves do not.

(2) Green Enhanced Skills Occupations. The impact of sustainable economic activities and technologies results in a significant change in the work and worker requirements of an existing occupation. The essential purposes of the occupation remain the same, but tasks, skills, knowledge, and external elements, such as credentials, have been altered.

(3) Green New and Emerging Occupations. The impact of sustainable economic activities and technologies is sufficient to create the need for unique work and worker requirements, which results in the generation of a new occupation. This new occupation could be entirely novel or "born" from an existing occupation.

The DOL provides the 204 green occupations' O*NET-SOC 2010 codes. Using the Crosswalk from the 2010 code to the 2019 code provided by the O*NET Resource Center and each job posting's O*NET-SOC 2019 code provided by Lightcast, I select job postings that fall into these 204 green occupations. For these job postings, I further conduct two additional steps, separating walk-relevant occupations from talk-relevant occupations and evaluating the eco-friendliness of the job context.

3.2 Separating walk-relevant occupations from talk-relevant occupations

Although walk-relevant and talk-relevant occupations interact closely and ultimately contribute to the green transition together, they specialize in tasks with distinguishable features. The most important distinction is that the tasks of talk-relevant occupations do not directly generate environmental impact. The influence of talk-relevant occupations manifests only by influencing walk-relevant occupations. For example, a public relations specialist hired to handle a pollution scandal does not improve the environment if other parts of the firm remain unchanged. Therefore, if most tasks in a green occupation do not directly change the environment, it is a talk-relevant occupation. Otherwise, it is a walk-relevant occupation.

For green enhanced skills occupations or green new and emerging occupations, the DOL provides the green tasks involved in each occupation, which I use to assess whether most tasks in an occupation can directly change the environment. There are 1398 green tasks in total, covering the entire green transition process. I summarize these tasks into four broad themes: preparation of environment-related metrics, analysis and communication, implementation, and governance of implementation.

Green tasks in the area of "preparation of environment-related metrics" or "analysis for/and communication" do not directly affect the environment, such as emissions metrics auditing, compliance reports, and the marketing of green products. Green tasks in the area of "implementation" or "governance of implementation" directly affect the environment, such as operating bioenergy machines and monitoring their operation. For occupations with less than 50% of green tasks directly influencing the environment, I consider them talk-relevant occupations. For example, all 16 green tasks involved in the occupation "green marketers" do not directly generate environmental impacts, making it a talk-relevant occupation.

For green increased-demand occupations, because work tasks remain the same regardless of whether they are employed in a sustainable or traditional economy, the DOL does not provide corresponding green tasks. However, O*NET OnLine[2], a database of O*NET occupations sponsored by the US Department of Labor, provides detailed tasks involved in each occupation. I use tasks on O*NET OnLine to evaluate whether most tasks in a green increased demand occupation can directly affect the environment. Only one green increased demand occupation, customer service representatives, is classified as a talk-relevant occupation. All other green increased demand occupations are classified as walk-relevant occupations.

[2]www.onetonline.org

Among the 204 green occupations, some are always environmentally friendly in any context, such as chief sustainability officers and wind energy project managers. The environmental orientation of other occupations depends on the context, such as logistics managers and public relations specialists. For example, logistics managers can have a positive or negative environmental impact depending on how they work.

For occupations that are always eco-friendly, if the occupation is walk-relevant, job postings in this occupation are classified as walk-relevant job postings, and likewise for talk-relevant job postings. For occupations whose environmental orientation is context-dependent, job postings in these occupations require further evaluation of the context's environmental orientation using natural language processing techniques.

Table A7 lists the 204 green occupations identified by the DOL, indicating whether each occupation is walk-relevant or talk-relevant, and whether it is always green or context-dependent green.

3.3 Evaluating job postings' environmental orientation

To evaluate whether the context of a job position is eco-friendly, the most transparent and fundamental method is to summarize a list of keywords whose appearances signify an eco-friendly context.

If a job posting explicitly mentions environmentally friendly practices or criticizes non-environmentally friendly practices, it strongly indicates that the position has an environmentally friendly orientation. Employers may highlight these aspects to attract candidates who are aligned with their environmental values and goals. For example, when a job posting mentions "oxidizer scrubber", it suggests that the position involves work related to air pollution control or environmental compliance. While the phrase itself does not explicitly state that the position is environmentally friendly, the use of these technologies is generally associated with efforts to reduce environmental impact and comply with environmental regulations.

However, there are some controversial areas, such as nuclear energy, transition fuels, and natural gas, regarding whether they are conducive to a better environment. To maintain a strict definition of an eco-friendly context, these are not included in the green keywords list.

I start compiling the green keyword list by generating a small list of seed words from Wikipedia entries and phrases under the tag "List of environmental organisations topics"[3] and "List of environmental issues"[4]. Each word or phrase on these two web pages

[3]https://en.wikipedia.org/wiki/List_of_environmental_organisations_topics
[4]https://en.wikipedia.org/wiki/List_of_environmental_issues

has a dedicated Wikipedia page. On the one hand, they provide a comprehensive scope of important environmental topics. On the other hand, these words or phrases express environmental concerns and signify the user's supportive attitude towards environmental responsibility. I remove seed words that are often used in contexts beyond the environment, such as "Population growth" and "Agricultural subsidy", and words that are related to the environment but are too general to signify the word user's attitude towards the environment, such as "Mining" and "Coal". This leaves 294 seed words or phrases in the seed word list.

For each seed word or phrase, I use a word embedding model (details in Appendix B) to select the top 40 closest synonyms. For these synonyms and seed words, I then filter out those whose Google search results do not relate to supporting environmentally friendly practices or criticizing non-environmentally friendly practices. Additionally, I remove words or phrases that appear less than ten times in the analyzed job postings, as their infrequency prevents a reliable evaluation of their effectiveness in assessing the eco-friendly context of job postings.

The final green keyword list contains 742 keywords. Table A8 in the appendix lists the top 120 most frequent green keywords among job postings in context-dependent green occupations. If any of these keywords appear in a job posting, the posting is considered to have an eco-friendly context.

By the end of this step, for each job posting, I have information on whether it belongs to a walk-relevant, talk-relevant, or neither occupation, and whether its context is eco-friendly. A job posting in a walk-relevant occupation and an eco-friendly context is classified as a walk-relevant job posting. Similarly, a job posting in a talk-relevant occupation and an eco-friendly context is classified as a talk-relevant job posting.

I define a company's walk efforts and talk efforts in a given period as the proportion of its job postings that are walk-relevant and talk-relevant, respectively. To alleviate concerns that periods with very few job postings are easily affected by random noise, a firm must have more than ten job postings in the period to be considered a valid observation. Mechanically, the measurements of both walk efforts and talk efforts are bounded between 0 and 1.

3.4 Summary statistics

I examine the descriptive patterns of measured walk and talk efforts among identified Compustat companies. First, both measures show a steadily increasing trend from 2010 to 2023. Figure 1 illustrates this rapid increase, with walk efforts being significantly higher than talk efforts. The average walk efforts rise from 4.28% in 2010 to 7.61% in 2023, while

the average talk efforts increase from 0.55% to 1.42% over the same period. Table 1 Panel "Jobposting-Compustat merged sample" shows more detailed distribution statistics that at least 25% observations are zero for walk efforts and at least 50% observations are zero for talk efforts. In general, companies need a limited number of talk-relevant positions.

Second, there is substantial variation in both walk efforts and talk efforts across individual firms and over time that can provide regression tests using them as independent variables with robust statistical power. Table 2 Panel A shows the standard deviations for the entire sample, between firms, and within each firm over time. Although the variation between companies is larger than the variation within each company, the within-company standard deviation is approximately the same size as the mean for both walk and talk efforts, indicating substantial variation in the data.

Third, different industries exhibit varying magnitudes of walk and talk efforts, suggesting some industries are more crucial to the green transition than others. Figure 3 shows the average efforts for the 49 Fama-French industries in 2023, excluding the unclassified "Other" industry. The utility industry (electric, natural gas, water services) is high in both walk and talk efforts, while the computer software industry has high talk efforts but limited walk efforts. Figure 3 also suggests a weak positive correlation between walk efforts and talk efforts.

Lastly, while contemporaneous walk and talk efforts show a weak positive correlation, talk efforts do not predict future walk efforts. This suggests that talk efforts are not reliable predictors of future walk efforts, highlighting the importance of distinguishing between the two and evaluating true green transition commitment based on walk efforts. Figure 2 presents the Pearson correlations between contemporaneous walk efforts and talk efforts in each year, including raw correlations and correlations adjusted for the Fama-French 49 industry-by-year fixed effects. The correlations range between 0.2 and 0.4, with a decreasing trend over time. To study the lead-lag relationship, Table 2 Panel B provides a panel vector autoregression (VAR) estimation following Abrigo and Love (2016). The coefficients reflect the impact of the row variables on the column variables. The correlation issue between fixed effects and regressors is addressed by removing panel-specific fixed effects with forward orthogonal deviation (FOD) and using the second lag as the GMM-style instrument for all variables. The only significant coefficient is the positive autocorrelation in talk efforts. The insignificant response of walk efforts to the previous year's talk efforts confirms that talk efforts cannot serve as a leading indicator of future walk efforts.

4 Validation of measured walk and talk efforts

Validating walk and talk efforts involves merging the Compustat-job posting sample with various sources of company-level environmental data. The measured efforts correlate intuitively with existing environmental data. For instance, companies that are currently increasing their walk efforts tend to have more green patents in the future, suggesting that walk efforts precede future environmentally friendly innovations. Additionally, the strong and distinct connections between existing environmental data and the measured walk or talk efforts demonstrate that these efforts are informative, despite potential biases from firms outsourcing tasks or not filling job openings. For each firm and each period with measured walk and talk efforts, I estimate the following specifications:

$$\text{Consequence}_{i,t+n} = \beta \cdot \text{walk}_{i,t} + \gamma \cdot \text{talk}_{i,t} + \delta \cdot \text{controls}_{i,t+n} + \text{fixed effect}_i + \text{fixed effect}_{j,t} + \epsilon_{i,t}, \tag{1}$$

where t indexes time, j indexes the first 3-digit SIC industry code, i indexes firm, n represents the number of periods between the time period of the measured walk and talk efforts and the time period of consequence, controls include total assets, book-to-market ratio, leverage ratio, and return on assets. I also estimate the model that replaces industry-by-time fixed effect fixed effect$_{j,t}$ with time fixed effect fixed effect$_t$ to understand the pattern across industries.

Using the model setting in Equation 1, I obtain the following summary of the signs of coefficients β and γ. Here, $+$ indicates a significantly positive coefficient, $-$ indicates a significantly negative coefficient, and insignificance elsewhere. I present the regression results for the first two sets of environmental consequences in this section, with the remaining results provided in Appendix D.

environmental consequence	**walk efforts**	**talk efforts**
future environmental disclosure	+	
future toxic chemical emissions	-	
future number of green patents	+	
future recycled waste	+	
future hazardous waste	-	
future reputational risk exposure	-	+
future carbon or energy intensity		

Some dependent variables, like the number of green patents, are highly skewed. To re-

duce this skewness, I apply the natural logarithm of one plus the original value. Although Cohn, Liu, and Wardlaw (2022) recommend using the Poisson model, it has stricter data requirements and thus excludes substantial observations due to overdispersion or infeasibility in likelihood estimation. Therefore, I present ordinary least squares estimates using the natural logarithm of one plus the original value as the dependent variable.

4.1 Only walk efforts predict environmental disclosure positively

During the sample period of 2010-2023, there were no compulsory environmental disclosure requirements in the U.S. For companies genuinely engaged in eco-friendly initiatives, voluntarily providing detailed reports of their efforts can demonstrate their commitment. As a result, companies with substantial walk efforts are likely to accompany these actions with more comprehensive environmental data.

In contrast, companies focused on cultivating a green image through communication strategies may decide to increase data disclosure only if it supports this image. If the data reflects a positive environmental impact, or if the cost of manipulating the data to appear green is low, these companies are also likely to increase disclosure alongside their talk efforts. However, if the data indicates a negative environmental impact, they are less likely to disclose more information. Instead, such companies might turn to other communication strategies, like selectively promoting initiatives such as small-scale recycling programs or energy-saving campaigns that are not captured by commonly used environmental data metrics. Consequently, the relationship between talk efforts and the completeness of environmental disclosure remains uncertain.

Table 3 supports this hypothesis, showing that only walk efforts are positively correlated with the Bloomberg environmental disclosure score. This correlation is robust whether using contemporaneous or future scores as the dependent variable. However, the correlation weakens when year fixed effects are replaced with industry-by-year fixed effects. This suggests that while walk efforts generally relate to more comprehensive environmental disclosures, the strength of this relationship is largely explained by an industry's overall improvement in disclosure within a given year.

Talk efforts, on the other hand, do not show a significant association with the completeness of environmental information provided. This shows that the measured talk efforts do not capture a company's efforts in improving environmental data transparency.

4.2 Only walk efforts predict toxic chemical emissions negatively.

If measured walk efforts represent tangible actions towards environmental sustainability, they are expected to reduce pollution and health risks. In contrast, talk efforts involve verbal commitments or public declarations that do not necessarily translate into concrete actions or investments. Although talk efforts may raise awareness or signal intentions, they lack the follow-through required to produce patentable innovations. Therefore, talk efforts are not expected to predict future decreases in toxic chemical emissions. Table 4 highlights the different relationships between walk and talk efforts and various toxic chemical emission measurements reported by the Toxic Release Inventory program.

In Panel A, which focuses on pollution and pollution intensity, walk efforts do not show significant correlations with contemporaneous or future pollution. Conversely, talk efforts positively correlate with chemical pollution and pollution intensity, suggesting that companies increase labor demand for environment-related public relations and marketing when anticipating a deteriorating environmental public image.

In Panel B, which examines the RSEI score and RSEI hazard, walk efforts show a robust negative correlation, indicating a tangible reduction in health risks due to genuine green transition actions. Talk efforts, however, do not show significant correlations with these measures, except for a positive correlation in column 1, aligning with the positive correlations seen in Panel A.

These distinct correlations are consistent with the expectation that walk efforts lead to tangible environmental benefits, while talk efforts do not contribute to reducing pollution or health risks.

5 Walk efforts, talk efforts, and ESG fund ownership

After confirming that the measured walk and talk efforts can differentiate between real green transitions and mere promotional strategies, I examine how ESG mutual funds' ownership stake in a stock responds to these efforts.

ESG funds consider environmental, social, and governance impacts when building their portfolios, but they may focus on different aspects of ESG. Unlike funds' financial returns, which are easy to measure, funds' ESG impact is hard to quantify and compare. This makes it difficult for investors to understand what an ESG fund truly supports and weakens accountability for fund managers in their pursuit of sustainability.

If ESG funds favor companies with higher walk efforts, it indicates that their investments support substantive green initiatives. This interpretation aligns with both the engagement and exit strategies that ESG funds might use to generate ESG impact. In

the engagement strategy, effective investment by ESG funds should lead to companies making more substantive environmental improvements (i.e., higher walk efforts). In the exit strategy, companies without actual green transition actions are boycotted by ESG funds and therefore companies with higher walk efforts receive more capital support from ESG funds. Conversely, if ESG funds favor companies with higher talk efforts, it suggests these funds are supporting verbal commitments and promotional activities, which do not predict better future environmental performance or data disclosure, and therefore not directly support substantive green transitions. By clarifying whether ESG funds invest in companies' walk or talk efforts, this analysis can inform investors, policymakers, and companies about the types of green transition efforts ESG funds are promoting, thereby contributing to better accountability for ESG funds' impact.

In the European Union, since 10 March 2021, the Sustainable Finance Disclosure Regulation has been introduced and implemented, which requires financial products available for sale in the EU to be classified into three categories:

- Products with a sustainable investment objective (Article 9, dark green)
- Products promoting environmental or social characteristics (Article 8, light green)
- Non-sustainable products (Article 6, nongreen)

Financial products' sustainability characteristics or objectives must be disclosed in pre-contractual periodic documentation and websites. Whether this regulation successfully prevents funds from pretending to be green is still unknown. Nevertheless, the sustainable goal of the dark green or light green fund is legally binding.

In the U.S., there is not yet a unified national regulatory framework for ESG funds to provide transparency and standardization in how ESG factors are incorporated into investment strategies. The regulatory landscape is rapidly evolving, with new bills being proposed and existing laws being challenged. Since the company-level data in this study pertains to companies listed on U.S. exchanges, and there are ESG funds in both the EU and the U.S. that invest in these companies, I obtained the lists of ESG funds in the U.S. and the lists of Article 9 and Article 8 funds in the EU from Bloomberg to analyze their investments in U.S.-listed companies.

5.1 ESG funds' aggregate ownership stake

Table 5 presents the results of regressing the aggregate ownership stake of Article 8 funds, Article 9 funds, or U.S. ESG funds in a company's stock on the company's walk and talk efforts. For each stock each period that I have the measure walk and talk efforts,

I estimate the following regression model:

$$\text{aggregate ownership}_{i,t+1} = \beta \cdot \text{walk}_{i,t} + \gamma \cdot \text{talk}_{i,t} + \delta \cdot \text{controls}_{i,t} + \text{fixed effect}_{j,t} + \epsilon_{i,t+1}, \quad (2)$$

where t indexes the monthly period, j indexes the first 3-digit SIC industry code, i indexes firm, controls include market capitalization, book-to-market ratio, 1-month reversal, number of analysts covering the stock, return on assets, leverage ratio, earnings-to-price ratio, and bid-ask spread. I also estimate the model that replaces industry-by-time fixed effect fixed effect$_{j,t}$ with time fixed effect fixed effect$_t$ to understand the pattern across industries. The aggregate ownership stake of a certain type of ESG fund in a company's stock is the aggregate number of shares held by this type of fund on a fund portfolio holding report date, scaled by the stock's number of shares outstanding on the same date. The unit is ‰. If a fund does not report its holdings for a particular month, the most recent value from the previous two months is forward-filled for that month.

In Table 5, the aggregate ownership stake for all three types of ESG funds increases with both walk and talk efforts. I focus on the regression models with industry-by-time fixed effects in Columns (2), (4), and (6) to highlight the economic significance. For Article 8 funds, a one-standard-deviation increase in walk efforts is associated with a 0.8904 increase in their aggregate ownership (measured in ‰), representing 5.26% of the mean aggregate ownership. In contrast, a one-standard-deviation increase in talk efforts corresponds to a 0.5042 increase, representing 2.98% of the mean. The significance level of the talk efforts' coefficient is more robust than that of the walk efforts' coefficient.

For Article 9 funds, the positive coefficients remain significant and similar in magnitude when replacing time fixed effects with industry-by-time fixed effects. A one-standard-deviation increase in walk efforts is associated with a 2.2858 increase in Article 9 funds' aggregate ownership, representing 38.48% of the aggregate ownership's mean. Similarly, a one-standard-deviation increase in talk efforts is associated with a 0.9136 increase, representing 15.38% of the mean.

For US ESG funds, the positive coefficients also remain significant and similar in magnitude controlling for different fixed effects. A one-standard-deviation increase in walk efforts is associated with a 0.8277 increase in US ESG funds' aggregate ownership, representing 21.14% of the aggregate ownership's mean, while a one-standard-deviation increase in talk efforts is associated with a 0.2554 increase, representing 6.52% of the mean.

Comparing the three types of ESG funds, it is evident that both walk and talk efforts significantly correlate with ESG funds' aggregate ownership in the company, with walk

efforts showing a generally stronger impact across different fund types. Article 9 funds are the most sensitive to companies' walk and talk efforts, aligning with their strong commitment to sustainable investing. US ESG funds rank second in terms of sensitivity to walk and talk efforts, and Article 8 funds show the weakest while still significant correlations.

5.2 Individual ESG fund portfolio

Table 6 analyzes how an individual ESG fund's portfolio weight or ownership stake in a company's stock relates to the company's walk and talk efforts. Unlike aggregate ownership, which focuses on the aggregate phenomenon and does not differentiate between a single fund holding 10% of a stock and ten funds each holding 1%, analysis at the individual fund portfolio level reflects the prevalence of the pattern across the sample.

For each stock in each period that I have the measured walk and talk efforts, I estimate the following regression model:

$$\text{portfolio weight}_{f,i,t+1} = \beta \cdot \text{walk}_{i,t} + \gamma \cdot \text{talk}_{i,t} + \delta \cdot \text{controls}_{i,t} + \text{fixed effect}_t + \epsilon_{f,i,t+1}, \quad (3)$$

where t indexes time, f indexes fund, i indexes firm, controls include market capitalization, book-to-market ratio, 1-month reversal, number of analysts covering the stock, return on assets, leverage ratio, earnings-to-price ratio, and bid-ask spread. In Panel B, I use fund ownership stake as the dependent variable instead of portfolio weight. I also estimate the model without the time fixed effect fixed effect$_t$.

In Table 6 Panel A, where the individual fund's portfolio weight in a stock is the dependent variable, all three types of ESG funds consistently allocate higher portfolio weights to companies with higher talk efforts. To emphasize the economic significance, I focus on the regression models with time fixed effects in Columns (2), (4), and (6). For Article 8 funds, walk efforts do not yield significant coefficients. However, a one-standard-deviation increase in talk efforts is linked to a 0.0103 rise in fund portfolio weight (measured in percentage), which accounts for 1.95% of the mean portfolio weight in a stock. In the case of Article 9 funds, a one-standard-deviation increase in walk efforts corresponds to a 0.1661 increase in portfolio weight on the stock (measured in percentage), representing 18.50% of the mean. Likewise, a similar increase in talk efforts associates with a 0.0680 rise, making up 7.57% of the mean. For US ESG funds, a one-standard-deviation increase in walk efforts results in a 0.0339 boost in a fund portfolio weight on the stock (measured in percentage), equivalent to 6.54% of the mean. Similarly, a one-standard-deviation increase in talk efforts contributes to a 0.0223 increase, or 4.29% of

the mean.

Panel B presents a similar pattern when the dependent variable shifts to the individual fund's ownership stake in a stock. However, the positive coefficient for talk efforts in Article 9 funds becomes less robust. All three types of ESG funds continue to show a preference for holding larger ownership stakes in companies with higher talk efforts. Again, I focus on the regression models with time fixed effects in Columns (2), (4), and (6) to underscore the economic impact. For Article 8 funds, walk efforts remain insignificant, whereas a one-standard-deviation increase in talk efforts results in a 0.0017 (‰) increase in ownership stake, representing 1.20% of the mean. For Article 9 funds, the coefficient for talk efforts loses significance with the inclusion of time fixed effects, despite being statistically significant without them. Meanwhile, for US ESG funds, a one-standard-deviation increase in walk efforts corresponds to a 0.0293 (‰) rise in ownership stake, which is 13.47% of the mean, whereas a one-standard-deviation increase in talk efforts is associated with a 0.0125 (‰) rise, or 5.73% of the mean.

In summary, the positive correlation between ESG funds' aggregate ownership stake and a company's talk efforts is also evident at the level of individual ESG funds. Notably, Article 8 funds' portfolio weights and ownership stakes are particularly responsive to talk efforts alone.

6 Mechanism behind the positive correlation between ESG fund ownership and talk efforts

Having established that ESG funds invest more in companies with higher talk efforts, I investigate the mechanism behind this phenomenon, particularly why ESG funds align their goals towards higher talk efforts despite their various sustainability mandates and the challenges in measuring their ESG impact.

First, I examine whether this preference for higher talk efforts is reflected in the environmental ratings provided by various ESG rating agencies. Many green investors, lacking in-house teams to monitor each investee's green transition, rely heavily on these environmental ratings to guide their investments. These ratings play a crucial role in directing capital flows toward companies that align with green investors' environmental mandates, acting as proxies for their beliefs and financial support. For example, Rzeźnik, Hanley, and Pelizzon (2021) shows that retail investors heavily rely on Sustainalytics ratings. Consequently, changes in the rating methodology, even without any actual changes in a firm's underlying ESG fundamentals, can significantly impact stock returns. If environmental ratings tend to favor companies with stronger talk efforts, ESG funds aiming to invest in

companies with higher environmental scores inadvertently allocate more capital to these good talkers. Furthermore, considering the well-documented disagreements among different environmental ratings (Berg, Koelbel, and Rigobon, 2022; Billio, Costola, Hristova, Latino, and Pelizzon, 2021; Berg, Koelbel, Pavlova, and Rigobon, 2022; Avramov, Cheng, Lioui, and Tarelli, 2022), if this preference for talk efforts is consistently observed across various ratings, it suggests a broader societal bias, extending beyond just the users of these ratings.

Second, I explore how ESG fund flows in the following month vary with the fund portfolio's average green transition efforts. Fund flow is a well-documented driver of portfolio investment strategies among fund managers (Chevalier and Ellison, 1997; Sirri and Tufano, 1998; Berk and Green, 2004). To gain deeper insights into this relationship, I examine whether the patterns in fund flows align with both fund returns and Morningstar fund Sustainability ratings. Previous research indicates that the introduction of Morningstar fund sustainability ratings significantly impacts fund flows, with higher-rated funds attracting greater net inflows (Hartzmark and Sussman, 2019). Furthermore, mutual funds increase their holdings of sustainable stocks to capture these inflows, though this strategy impairs pecuniary performance, leading to a tradeoff between sustainability and returns (Gantchev, Giannetti, and Li, 2024). By analyzing fund flow, fund return, and Sustainability rating together, I provide a more comprehensive understanding of the mechanism behind the positive correlation between ESG fund ownership and talk efforts.

6.1 Companies with higher talk efforts receive greener environmental ratings.

Table 7 presents the correlation between a firm's environmental ratings and its green transition efforts. For each firm each period that I have the measured walk and talk efforts, I estimate the following specifications:

$$\text{Rating}_{i,t} = \beta \cdot \text{walk}_{i,t} + \gamma \cdot \text{talk}_{i,t} + \delta \cdot \text{controls}_{i,t} + \text{fixed effect}_{j,t} + \epsilon_{i,t}, \tag{4}$$

where t indexes time, j indexes the first 3-digit SIC industry code, i indexes firm, controls include market capitalization, book-to-market ratio, 1-month reversal, number of analysts covering the stock, return on assets, leverage ratio, earnings-to-price ratio, and bid-ask spread. I also estimate the model that replaces industry-by-time fixed effect fixed $\text{effect}_{j,t}$ with time fixed effect fixed effect_t to understand the pattern across industries.

In Table 7, Panel A regresses a firm's overall environmental ratings from MSCI KLD and Sustainalytics on its contemporaneous walk and talk efforts. Due to a methodology change by Sustainalytics in August 2019, the ratings before and after this month are not

directly comparable, so I treat them as distinct ratings. Panel B regresses Refinitiv's three environmental subcategory scores (emissions, innovation, and resource use) on same-year walk and talk efforts.

6.1.1 MSCI KLD

In Panel A, Column (2), controlling for industry-by-time fixed effects, a one-standard-deviation increase in walk efforts is associated with a 0.0135 increase in the MSCI KLD score, which is 13.82% of the score's mean. Similarly, a one-standard-deviation increase in talk efforts results in a 0.0059 increase, or 6.06% of the mean. The stability of these coefficients when switching between time fixed effects and industry-by-time fixed effects suggests that the relationship is not driven by industry-specific shocks.

6.1.2 Sustainalytics until August 2019

The Sustainalytics rating under the old method increases with both walk and talk efforts when controlling for time fixed effects. However, when replacing time fixed effects with industry-by-time fixed effects, the coefficient for talk efforts becomes insignificant, indicating that this correlation is not consistent across all industries. Although the coefficients for talk efforts are larger, the standard deviation of walk efforts is approximately five times that of talk efforts. As a result, a one-standard-deviation increase in walk efforts is still associated with a larger increase in the Sustainalytics rating (old method) compared to talk efforts. In Panel A, Column (4), after controlling for industry-by-time fixed effects, a one-standard-deviation increase in walk efforts corresponds to a 0.8677 increase in the environmental rating, which represents 1.64% of the score's mean and 6.55% of its standard deviation.

6.1.3 Sustainalytics after August 2019

The Sustainalytics score under the new method measures unmanaged environmental risk, where a lower score indicates a greener outcome, which is the opposite of the old method's scoring. Under the new method, the score consistently decreases with talk efforts in regressions using either time fixed effects or industry-by-time fixed effects. However, when controlling for industry-by-time fixed effects, the coefficient for walk efforts becomes insignificant. The significant reduction in coefficient magnitudes, along with a large increase in the adjusted R-squared from below 0.3 to over 0.8, suggests that the new Sustainalytics score primarily reflects the average trend within each industry. Despite this, the continued significance of talk efforts underscores their importance in this scoring

method. In Panel A, Column (6), a one-standard-deviation increase in talk efforts is associated with a 0.1646 decrease in the Sustainalytics unmanaged risk score, representing 2.78% of the score's mean and 2.82% of its standard deviation.

6.1.4 Refinitiv

Refinitiv provides detailed scores for the environmental pillar's three subcategories: emissions, innovation, and resource use. Table 7 Panel B presents regression results of these subcategory scores on walk and talk efforts. Controlling for industry-by-time fixed effects, scores across all three subcategories are notably higher for companies with greater talk efforts, suggesting that such efforts help companies holistically create a greener corporate image among industry peers. A one-standard-deviation increase in walk efforts associates with increases of 0.0259, 0.0324, and 0.0222 in the emissions, innovation, and resource use scores, representing 8.68%, 16.64%, and 7.01% of the respective subcategory means. In contrast, a one-standard-deviation increase in talk efforts relates to smaller increases of 0.0067, 0.0058, and 0.0069 in these subcategories, corresponding to 2.26%, 3.00%, and 2.18% of their means.

In summary, although different environmental ratings use various methodologies to differentiate their products and the literature documents the heterogeneity, divergence, uncertainty, or noise in rating criteria (Berg, Koelbel, and Rigobon, 2022; Billio, Costola, Hristova, Latino, and Pelizzon, 2021; Berg, Koelbel, Pavlova, and Rigobon, 2022; Avramov, Cheng, Lioui, and Tarelli, 2022), there is a robust positive correlation between environmental ratings and talk efforts across different rating agencies. This finding supports and explains ESG funds' preference for companies with strong communication efforts.

These results also clarify the extent to which each rating emphasizes substantive actions versus verbal promotions, aiding green investors in understanding what different environmental ratings capture within a unified framework. This is particularly valuable given the complex weighting and scoring standards often involved in environmental ratings, which can make it challenging for users to distinguish among them.

6.2 ESG fund portfolio's average talk efforts positively predict future fund flow.

The previous section shows that companies with higher talk efforts are perceived as greener by ESG rating agencies, even when controlling for the level of walk efforts. This section examines whether fund portfolios that, on average, invest more in companies with

high talk efforts are more highly valued by fund investors, which in turn attracts higher fund flows, a key incentive for fund managers.

For each fund and each period where I have the measure of walk and talk efforts for stocks that constitute more than 50% of the fund portfolio, I estimate the following specification:

$$\text{Fund Characteristic}_{f,t+1} = \beta \cdot \text{avg\_walk}_{f,t} + \gamma \cdot \text{avg\_talk}_{f,t} + \delta \cdot \text{controls}_{f,t} + \text{fixed effect}_{c,t} + \epsilon_{f,t+1} \quad (5)$$

where t indexes time, f indexes fund, c indexes fund Global Category in Morningstar, and controls include the fund portfolio's average market capitalization, book-to-market ratio, 1-month reversal, number of analysts covering the stock, return on assets, leverage ratio, earnings-to-price ratio, and bid-ask spread. I also estimate the model that replaces fund-category-by-time fixed effect fixed effect$_{c,t}$ with time fixed effect fixed effect$_t$ to understand the pattern across fund categories.

A fund portfolio's average walk and talk efforts are representative only when most securities in the portfolio have these measures available. Since ESG funds for sale in the EU often allocate less than 50% of their portfolio weight to US stocks, many EU ESG funds are not suitable for the above test. Consequently, the remaining small subsample may not accurately represent EU ESG funds. Therefore, the following tests focus exclusively on US ESG funds. Table 8 presents the model estimation using monthly fund flow as the dependent variable. It shows that the average talk efforts in an ESG fund portfolio positively predict fund flow in the following month. This relationship remains robust, with regression coefficients retaining their magnitude when controlling for either time fixed effects or fund-category-by-time fixed effects. In Column (1), a one-standard-deviation increase in average talk efforts predicts a 0.4433 (in percentage points) increase in fund flow in the next month, which represents 46.84% of the fund flow's mean and 6.10% of its standard deviation.

The coefficients of the control variables align with intuition. For instance, the coefficient for the 1-month cumulative return in the previous month, *avg_mom1m*, is significantly positive, indicating that fund investors tend to favor funds holding more past winning stocks, consistent with fund investors' return chasing in Chevalier and Ellison (1997).

The significant positive correlation between a fund portfolio's average talk efforts and future fund flow suggests that ESG fund managers have a clear incentive to invest in companies that put more effort into communicating their environmental aspects. But

the question arises: where does this fund inflow come from? Are these funds attracting higher inflows because they generate better pecuniary returns, or are they more appealing because they are easier to justify as aligning with a sustainability mandate? It is possible that fund investors perceive companies with more communication efforts as greener, making funds that invest in such companies appear more sustainable.

To better understand whether these inflows are driven by the fund's financial returns or its sustainability evaluation, I examine fund monthly returns and fund Morningstar Sustainability Ratings as dependent variables in model 5 in the following analysis.

6.3 ESG fund portfolio's average talk efforts positively predict future fund return.

Table 9 examines how US ESG fund returns in the following month vary with the fund portfolio's average green transition efforts. The results show that while the average walk efforts are not significantly correlated with future returns, the average talk efforts have a significant positive correlation with future returns when controlling for time fixed effects. In Column (1), a one-standard-deviation increase in the portfolio's average talk efforts is associated with a 0.0688 increase in fund return, which accounts for 6.61% of the return's mean and 1.53% of its standard deviation.

The predictive power of talk efforts disappears when controlling for fund-category-by-time fixed effects. This decrease in significance is also observed among other control variables, indicating that the variation in average returns across different fund categories plays a crucial role in explaining cross-sectional fund returns. Morningstar's global categories classify funds based on investment style, asset class, geographic focus, and sector focus, so it is expected that there would be limited variation within a category in any given month. However, the Morningstar Sustainability Rating, which compares funds' sustainability aspects within the same category each month, suggests that funds in the same category are expected to differ in sustainability aspects. Therefore, the fact that the coefficient for talk efforts becomes insignificant implies that its predictive power on future fund returns is relatively weak when controlling for category-specific factors.

6.4 ESG fund portfolio's average talk efforts positively predict future Morningstar fund Sustainability Rating.

Table 9 shows that the pecuniary return associated with talk efforts contributes to ESG funds' preference for companies with higher talk efforts. To fully explain the strong correlation between a portfolio's average talk efforts and future fund flows, I further test

whether the Morningstar Sustainability Rating can account for the attractiveness of a high portfolio average talk effort level.

Since the Morningstar Sustainability Rating is based on the average Sustainalytics rating of securities in a fund's portfolio, and Table 7 indicates that higher talk efforts are associated with greener Sustainalytics ratings, it is expected that a portfolio with higher average talk efforts would achieve a higher Morningstar Sustainability Rating. Due to the methodology change in Sustainalytics in August 2019, I test the subperiods before and after this date to ensure robustness. As of April 2024, the historical time series for the Morningstar Sustainability Rating is only available starting from August 2018, even though the rating was introduced in 2016 and earlier studies used data from before 2018. Because of this limitation in data availability and Morningstar only assigning a Sustainability Rating when a fund portfolio invests more than 67% of its weight in eligible securities, the test on the Morningstar Sustainability Rating includes much fewer observations than the tests on fund flow and return.

Table 10 presents the results of regressing a fund's Morningstar Sustainability Rating or rank on the portfolio's average walk and talk efforts. The Rating is from 1 to 5 globes, with 5 being the most sustainable, while the rank is from 1 to 100, with 1 being the most sustainable. Panel A uses Morningstar Sustainability Rating as the dependent variable in the model 5 and Panel B uses the fund's Corporate Sustainability Percent Rank in the same fund category as the dependent variable. Both panels show consistent results: the short period from August 2018 to August 2019 does not exhibit a significant pattern, but the full sample and the sample starting from September 2019 indicate that portfolios with higher average talk efforts have significantly higher sustainability ratings and achieve better ranks. The subsample for the period from August 2018 to August 2019 has coefficients with the same sign as those in the other samples, indicating consistency across different periods. The lack of significance in this subsample may be due to the smaller number of observations.

In the whole sample results in Panel A, Column (1), a one-standard-deviation increase in portfolio average walk efforts is linked to a 0.3224 decrease in the Sustainability Rating, which is 8.26% of the rating's mean and 28.26% of its standard deviation. Conversely, a one-standard-deviation increase in average talk efforts corresponds to a 0.2567 increase in the rating, equivalent to 6.58% of the mean and 22.50% of the standard deviation. In Panel B, Column (1), the whole sample shows that a one-standard-deviation increase in average walk efforts links to a 6.8904 increase in rank, representing 25.10% of the rank's mean and 25.06% of its standard deviation. Meanwhile, a one-standard-deviation increase in average talk efforts is associated with a 5.5117 decrease in rank, accounting for 20.08%

of the mean and 20.05% of the standard deviation.

Combining the results from Panels A and B, a fund portfolio's average walk efforts are negative indicators for future Sustainability Ratings, while average talk efforts positively predict them. This aligns with the results in Table 7 Panel A, Column (5), where higher walk efforts are associated with higher unmanaged environmental risk, and higher talk efforts are linked to lower risk, as measured by Sustainalytics under the new methodology. Since the Morningstar Sustainability Rating is based on the average Sustainalytics ratings of the securities within a fund, portfolios with more companies that have higher talk efforts, which tend to receive greener Sustainalytics ratings, will mechanically achieve a higher portfolio-level overall rating.

Morningstar Sustainability Rating is commonly used by mutual fund investors to assess the sustainability of ESG funds. However, this finding raises concerns about it as a reliable standard for evaluating a fund's commitment to sustainability. On the one hand, the negative coefficient for walk efforts in Table 10 Panel A suggests that funds actively supporting companies making substantive green transitions, especially those in traditionally brown industries, may receive lower Morningstar Sustainability Ratings and might not be valued by fund investors seeking to contribute to environmental progress. This outcome supports existing literature that highlights how companies actively transitioning to green practices and becoming key clean tech innovators may be excluded from green investing (Cohen et al., 2020). On the other hand, the positive coefficient for a portfolio's average talk efforts implies that ESG funds investing in companies with strong communication strategies are more favorably evaluated by Morningstar and are therefore more likely to attract capital from investors.

The contrast between the effects of portfolio average walk and talk efforts is concerning. While effective communication is important, it should not overshadow actual sustainability impact. Fund investors need to critically assess whether a fund's portfolio truly aligns with their sustainability values. Likewise, fund rating agencies should refine their criteria to ensure they capture substantive actions rather than merely rewarding effective storytelling.

7 Conclusion

Concerns over self-proclaimed sustainable funds not fulfilling their claims have led regulators to mandate or propose detailed disclosures on how these funds implement sustainability goals. However, the absence of standardized criteria to evaluate these funds' commitment to corporate green transitions persists, largely due to the diversity of sustain-

ability goals and severe information asymmetry between investee companies and external observers. Given that what gets measured gets managed, this paper proposes a unified framework to evaluate sustainable investment mandates and environmental ratings, assessing the extent to which green investors support substantive green transitions versus merely promoting a green image.

The findings reveal that all three types of ESG funds in both the US and the EU, as well as all three major ESG rating agencies, respond positively to companies' green image promotion efforts, even though these do not correlate with future improvements in environmental performance or disclosure completeness. Consequently, capital intended for environmental performance improvements is diverted by talk efforts, as walk and talk efforts are not highly correlated. More concerning is that ESG funds lack the incentive to correct this behavior, since Morningstar evaluates them based on the average ESG ratings of their portfolio companies, which tend to favor companies with higher talk efforts.

This study aims to hold green investors accountable by establishing measurable standards across various sustainability goals, encouraging future research and policies to ensure that the green investing industry fulfills its promises of supporting substantive green transition. The finding that companies' communication strategies effectively attract green investors highlights the need for more objective, transparent information sources to be used by rating agencies and green investors, with job postings being one such example. The proposed approach of separately measuring companies' walk and talk efforts can be applied to other research questions, such as understanding the drivers behind these efforts, assessing the impact of climate-related initiatives on these efforts, evaluating how banks and other sustainable finance participants respond to these efforts, and exploring asset pricing implications. This approach offers a valuable tool for future academic research and helps practitioners ensure that the journey toward a green transition truly walks the walk.

References

Abis, S. and L. Veldkamp (2020). The changing economics of knowledge production. *Available at SSRN 3570130*.

Abrigo, M. R. and I. Love (2016). Estimation of panel vector autoregression in stata. *The Stata Journal 16*(3), 778–804.

Acemoglu, D., D. Autor, J. Hazell, and P. Restrepo (2022). Artificial intelligence and jobs: Evidence from online vacancies. *Journal of Labor Economics 40*(S1), S293–S340.

Angelucci, S., F. J. Hurtado-Albir, and A. Volpe (2018). Supporting global initiatives on climate change: The epo's "y02-y04s" tagging scheme. *World Patent Information 54*, S85–S92.

Atta-Darkua, V., S. Glossner, P. Krueger, and P. Matos (2023). Decarbonizing institutional investor portfolios: Helping to green the planet or just greening your portfolio. *SSRN Electronic Journal*.

Avramov, D., S. Cheng, A. Lioui, and A. Tarelli (2022). Sustainable investing with esg rating uncertainty. *Journal of financial economics 145*(2), 642–664.

Babina, T., A. Fedyk, A. He, and J. Hodson (2024). Artificial intelligence, firm growth, and product innovation. *Journal of Financial Economics 151*, 103745.

Berg, F., F. Heeb, and J. F. Kölbel (2022). The economic impact of esg ratings. *Available at SSRN 4088545*.

Berg, F., J. F. Koelbel, A. Pavlova, and R. Rigobon (2022). Esg confusion and stock returns: Tackling the problem of noise. Technical report, National Bureau of Economic Research.

Berg, F., J. F. Koelbel, and R. Rigobon (2022). Aggregate confusion: The divergence of esg ratings. *Review of Finance 26*(6), 1315–1344.

Berk, J. and J. H. Van Binsbergen (2021). The impact of impact investing.

Berk, J. B. and R. C. Green (2004). Mutual fund flows and performance in rational markets. *Journal of political economy 112*(6), 1269–1295.

Biais, B. and A. Landier (2022). Emission caps and investment in green technologies. *Available at SSRN 4100087*.

Billio, M., M. Costola, I. Hristova, C. Latino, and L. Pelizzon (2021). Inside the esg ratings:(dis) agreement and performance. *Corporate Social Responsibility and Environmental Management 28*(5), 1426–1445.

Bolton, P., M. T. Kacperczyk, and M. Wiedemann (2022). The co2 question: Technical progress and the climate crisis. *Available at SSRN*.

Braxton, J. C. and B. Taska (2023). Technological change and the consequences of job loss. *American Economic Review 113*(2), 279–316.

Broccardo, E., O. Hart, and L. Zingales (2022). Exit versus voice. *Journal of Political Economy 130*(12), 3101–3145.

Chen, H. (2023). Talk or walk the talk? the real impact of esg investing. *The Real Impact of ESG Investing (May 19, 2023)*.

Chevalier, J. and G. Ellison (1997). Risk taking by mutual funds as a response to incentives. *Journal of political economy 105*(6), 1167–1200.

Chowdhry, B., S. W. Davies, and B. Waters (2019). Investing for impact. *The Review of Financial Studies 32*(3), 864–904.

Cohen, L., U. G. Gurun, and Q. H. Nguyen (2020). The esg-innovation disconnect: Evidence from green patenting. Technical report, National Bureau of Economic Research.

Cohn, J. B., Z. Liu, and M. I. Wardlaw (2022). Count (and count-like) data in finance. *Journal of Financial Economics 146*(2), 529–551.

Cremers, M., T. B. Riley, and R. Zambrana (2023). The complex materiality of esg ratings: Evidence from actively managed esg funds. *Timothy Brandon and Zambrana, Rafael, The Complex Materiality of ESG Ratings: Evidence from Actively Managed ESG Funds (December 5, 2023)*.

Darendeli, A., K. Law, and M. Shen (2021). Green new hiring. *Review of Accounting Studies, Forthcoming*.

Delmas, M. A. and V. C. Burbano (2011). The drivers of greenwashing. *California management review 54*(1), 64–87.

Diouf, D. and O. Boiral (2017). The quality of sustainability reports and impression management: A stakeholder perspective. *Accounting, Auditing & Accountability Journal*.

Duchin, R., J. Gao, and Q. Xu (2022). Sustainability or greenwashing: Evidence from the asset market for industrial pollution. *Available at SSRN 4095885*.

Dyck, A., K. V. Lins, L. Roth, and H. F. Wagner (2019). Do institutional investors drive corporate social responsibility? international evidence. *Journal of financial economics 131*(3), 693–714.

Edmans, A., D. Levit, and J. Schneemeier (2022). *Socially responsible divestment*. Centre for Economic Policy Research.

Gantchev, N., M. Giannetti, and R. Li (2022). Does money talk? divestitures and corporate environmental and social policies. *Review of Finance 26*(6), 1469–1508.

Gantchev, N., M. Giannetti, and R. Li (2024). Sustainability or performance? ratings and fund managers' incentives. *Journal of Financial Economics 155*, 103831.

Green, J., J. R. Hand, and X. F. Zhang (2017). The characteristics that provide independent information about average us monthly stock returns. *The Review of Financial Studies 30*(12), 4389–4436.

Hartzmark, S. M. and K. Shue (2022). Counterproductive sustainable investing: The impact elasticity of brown and green firms. *Available at SSRN 4359282*.

Hartzmark, S. M. and A. B. Sussman (2019). Do investors value sustainability? a natural experiment examining ranking and fund flows. *The Journal of Finance 74*(6), 2789–2837.

Heeb, F., J. F. Kölbel, F. Paetzold, and S. Zeisberger (2023). Do investors care about impact? *The Review of Financial Studies 36*(5), 1737–1787.

Hege, U., K. Li, and Y. Zhang (2023). Climate innovation and carbon emissions: Evidence from supply chain networks. *Available at SSRN 4557447*.

Hershbein, B. and L. B. Kahn (2018). Do recessions accelerate routine-biased technological change? evidence from vacancy postings. *American Economic Review 108*(7), 1737–1772.

Hsu, P.-H., K. Li, and C.-Y. Tsou (2023). The pollution premium. *The Journal of Finance 78*(3), 1343–1392.

Ilhan, E., P. Krueger, Z. Sautner, and L. T. Starks (2023). Climate risk disclosure and institutional investors. *The Review of Financial Studies 36*(7), 2617–2650.

Jevons, W. S. (1866). *The coal question; an inquiry concerning the progress of the nation and the probable exhaustion of our coal-mines*. Macmillan.

Kogan, L., D. Papanikolaou, A. Seru, and N. Stoffman (2017). Technological innovation, resource allocation, and growth. *The quarterly journal of economics 132*(2), 665–712.

Landier, A. and S. Lovo (2020). Esg investing: How to optimize impact? *HEC Paris Research Paper No. FIN-2020-1363*.

Lewellen, J. and K. Lewellen (2022). Institutional investors and corporate governance: The incentive to be engaged. *The Journal of Finance 77*(1), 213–264.

Lins, K. V., H. Servaes, and A. Tamayo (2017). Social capital, trust, and firm performance: The value of corporate social responsibility during the financial crisis. *the Journal of Finance 72*(4), 1785–1824.

Lowry, M., P. Wang, and K. D. Wei (2023). Are all esg funds created equal? only some funds are committed. *Only Some Funds Are Committed (March 15, 2022). European Corporate Governance Institute–Finance Working Paper* (874).

Marquis, C., M. W. Toffel, and Y. Zhou (2016). Scrutiny, norms, and selective disclosure: A global study of greenwashing. *Organization Science 27*(2), 483–504.

Mikolov, T., I. Sutskever, K. Chen, G. S. Corrado, and J. Dean (2013). Distributed representations of words and phrases and their compositionality. *Advances in neural information processing systems 26*.

Oehmke, M. and M. M. Opp (2024). A theory of socially responsible investment. *Review of Economic Studies*, rdae048.

Parise, G. and M. Rubin (2023). Green window dressing. In *Proceedings of the EUROFIDAI-ESSEC Paris December Finance Meeting*.

Pástor, L., R. F. Stambaugh, and L. A. Taylor (2020). Fund tradeoffs. *Journal of Financial Economics 138*(3), 614–634.

Rzeźnik, A., K. W. Hanley, and L. Pelizzon (2021). Investor reliance on esg ratings and stock price performance.

Sirri, E. R. and P. Tufano (1998). Costly search and mutual fund flows. *The journal of finance 53*(5), 1589–1622.

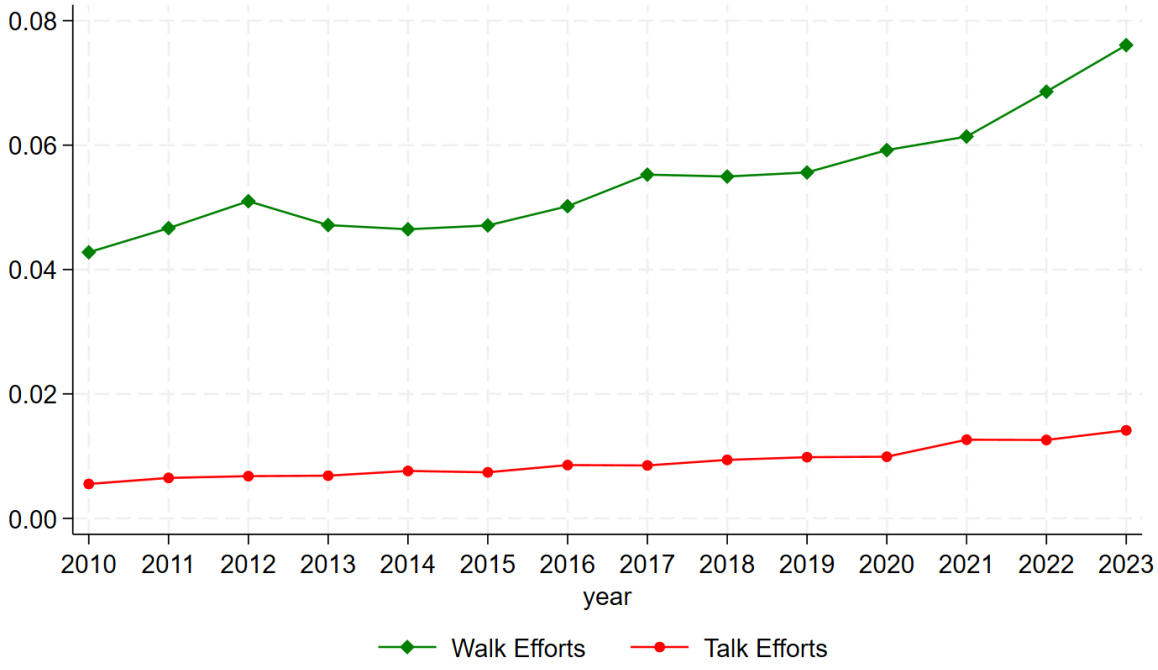

Figure 1: Average walk and talk efforts of identified Compustat companies over time

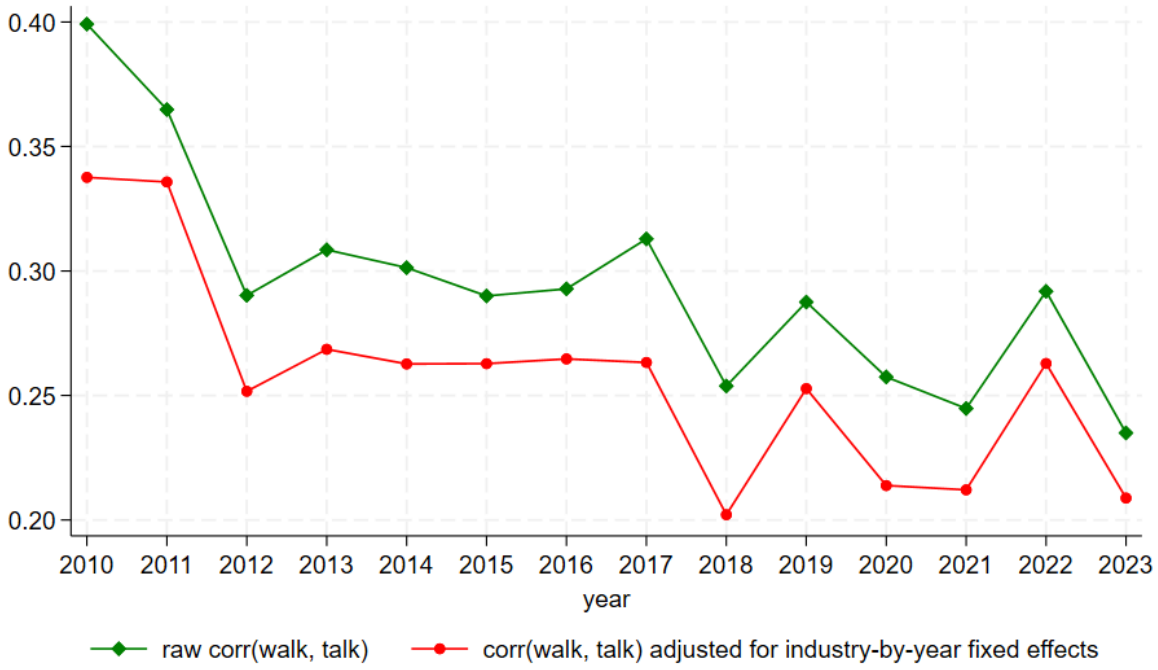

Figure 2: Correlation between walk and talk efforts by year

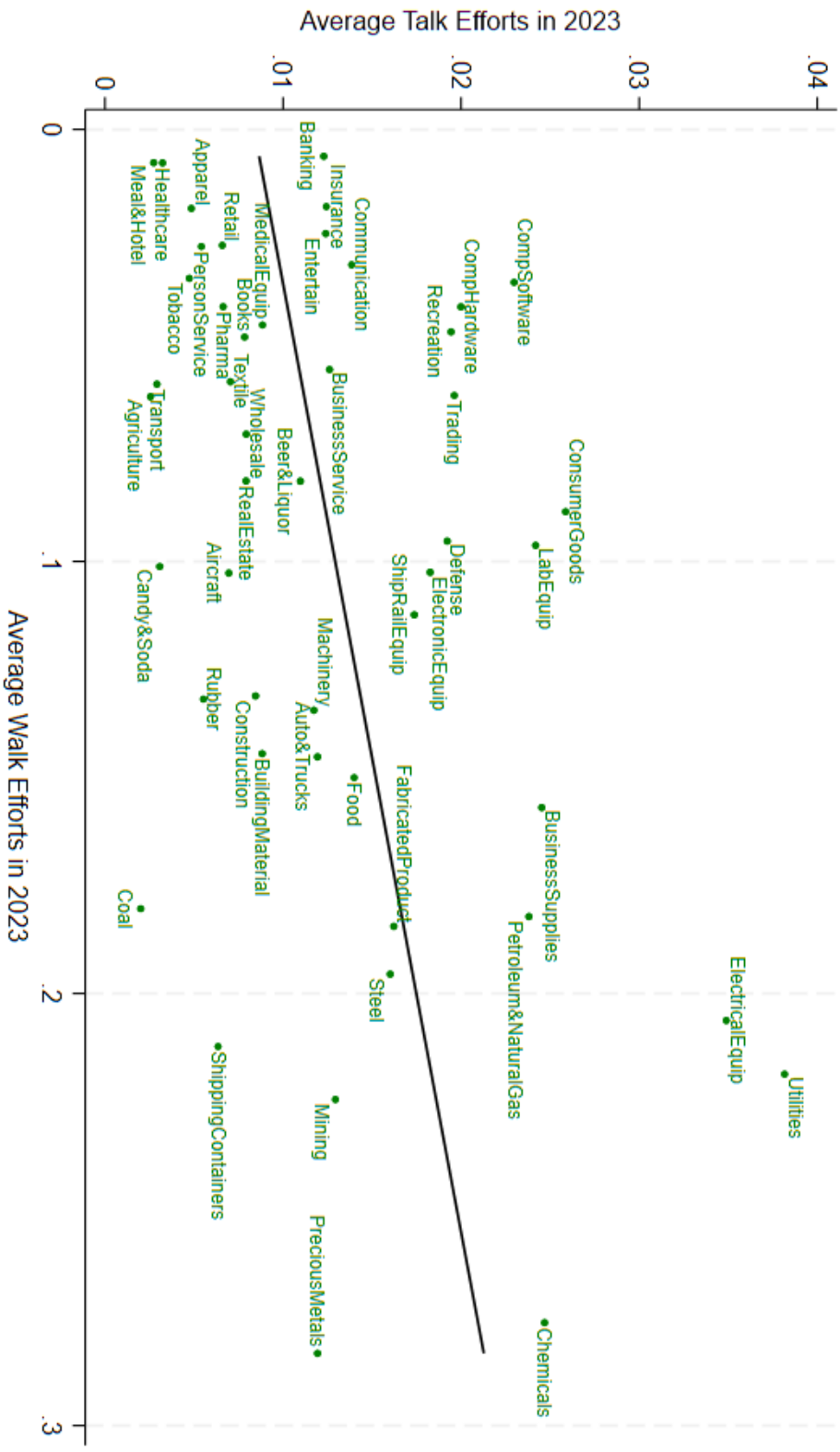

Figure 3: Average walk and talk efforts of Fama-French 49 industries

Table 1: Summary Statistics

This table presents summary statistics of variables used in this study. Variables are defined in Table A6 in the appendix.

Var.	mean	sd	p25	p50	p75	count
Jobposting-Compustat merged sample						
walk	0.0555	0.1002	0.0000	0.0104	0.0625	37825
talk	0.0094	0.0273	0.0000	0.0000	0.0063	37825
Sample in Bloomberg environmental disclosure score data						
disclose	13.4609	19.5876	0.0000	0.4228	23.2558	19769
walk	0.0555	0.0981	0.0000	0.0123	0.0624	19769
talk	0.0095	0.0271	0.0000	0.0001	0.0070	19769
log_at	7.9102	1.9125	6.5616	7.8109	9.1217	19769
bm_fyear	0.4924	0.4208	0.2035	0.4060	0.7014	19769
lev_fyear	1.7505	2.9585	0.2280	0.5535	1.5005	19769
roa_fyear	0.0021	0.0371	0.0007	0.0077	0.0192	19769
Sample in TRI pollution data						
pollution	5.8287	3.8010	2.4159	6.1759	8.9228	162910
walk	0.1807	0.1550	0.0652	0.1364	0.2479	162910
talk	0.0149	0.0237	0.0016	0.0067	0.0206	162910
Sample in TRI intensity data						
intensity	5.8411	3.8310	2.4535	6.1612	8.9412	162296
walk	0.1805	0.1550	0.0651	0.1357	0.2479	162296
talk	0.0149	0.0237	0.0016	0.0067	0.0204	162296
Sample in TRI RSEI data						
RSEIScore	2.3048	2.8296	0.0613	0.9881	3.8240	143960
RSEIHazard	11.3342	4.8590	8.2715	11.4260	14.6412	143960
walk	0.1812	0.1529	0.0663	0.1402	0.2480	143960
talk	0.0152	0.0241	0.0016	0.0071	0.0213	143960
Sample in US ESG aggregate fund ownership stake data						
US ESG agg.	3.9162	7.4999	0.2503	0.9770	3.8953	160956
walk	0.0489	0.0914	0.0000	0.0087	0.0526	160956
talk	0.0080	0.0248	0.0000	0.0000	0.0050	160956
mve	14.5852	1.7156	13.3867	14.5252	15.7563	160956
bm	0.5011	0.3820	0.2371	0.4293	0.6991	160956
mom1m	0.0119	0.0985	-0.0425	0.0107	0.0634	160956
nanalyst	10.4804	8.1445	4.0000	8.0000	16.0000	160956
roa	0.0077	0.0306	0.0019	0.0093	0.0208	160956
lev	1.5861	2.7269	0.2302	0.5398	1.3832	160956
ep	0.0201	0.1152	0.0154	0.0442	0.0645	160956
baspread	0.0285	0.0134	0.0191	0.0254	0.0346	160956

Table 1: Summary Statistics (continued)

This table presents summary statistics of variables used in this study. Variables are defined in Table A6 in the appendix.

Var.	mean	sd	p25	p50	p75	count
Sample in Article 8 aggregate fund ownership stake data						
Article8 agg.	16.9231	19.1411	2.3377	9.9426	25.0596	87081
walk	0.0624	0.1029	0.0010	0.0182	0.0728	87081
talk	0.0120	0.0310	0.0000	0.0014	0.0110	87081
Sample in Article 9 aggregate fund ownership stake data						
Article9 agg.	5.9402	12.6606	0.3490	1.3182	4.6306	43181
walk	0.0772	0.1136	0.0063	0.0288	0.0952	43181
talk	0.0144	0.0286	0.0000	0.0042	0.0148	43181
Sample in US ESG individual fund portfolio holding data						
US ESG share	0.2176	0.8141	0.0050	0.0231	0.1003	3712974
US ESG weight	0.5188	0.8426	0.0400	0.1300	0.6100	3712974
walk	0.0632	0.0983	0.0037	0.0216	0.0773	3712974
talk	0.0119	0.0268	0.0000	0.0029	0.0114	3712974
Sample in Article 8 individual fund portfolio weight data						
Article8 weight	0.5294	0.8695	0.0378	0.1477	0.6097	7653265
walk	0.0691	0.1006	0.0083	0.0293	0.0836	7653265
talk	0.0149	0.0276	0.0012	0.0059	0.0161	7653265
Sample in Article 8 individual fund ownership stake data						
Article8 share	0.1440	0.4671	0.0035	0.0191	0.0766	7612708
walk	0.0693	0.1007	0.0083	0.0294	0.0838	7612708
talk	0.0150	0.0276	0.0012	0.0060	0.0161	7612708
Sample in Article 9 individual fund portfolio weight data						
Article9 weight	0.8982	1.1767	0.0822	0.3404	1.3395	646701
walk	0.0869	0.1197	0.0121	0.0380	0.1097	646701
talk	0.0190	0.0328	0.0019	0.0079	0.0205	646701
Sample in Article 9 individual fund ownership stake data						
Article9 share	0.3354	1.2244	0.0069	0.0252	0.0842	653176
walk	0.0871	0.1198	0.0122	0.0381	0.1099	653176
talk	0.0190	0.0328	0.0019	0.0079	0.0207	653176
Sample in MSCI KLD data						
MSCI KLD	0.0976	0.2053	0.0000	0.0000	0.1667	11960
walk	0.0502	0.0917	0.0000	0.0096	0.0554	11960
talk	0.0078	0.0231	0.0000	0.0000	0.0052	11960

Table 1: Summary Statistics (continued)

This table presents summary statistics of variables used in this study. Variables are defined in Table A6 in the appendix.

Var.	mean	sd	p25	p50	p75	count
Sample in Sustainalytics old-method environmental rating data						
Sus Old	52.7818	13.2483	42.0000	51.0000	62.0000	47653
walk	0.0584	0.0915	0.0029	0.0182	0.0727	47653
talk	0.0083	0.0189	0.0000	0.0018	0.0076	47653
Sample in Sustainalytics new-method environmental rating data						
Sus New	5.9212	5.8341	1.4940	3.6480	9.2130	36321
walk	0.0724	0.1052	0.0068	0.0284	0.0912	36321
talk	0.0132	0.0253	0.0006	0.0045	0.0140	36321
Sample in Refinitiv environmental pillar subcategory score data						
Emissions	0.2985	0.3196	0.0000	0.1824	0.5512	15785
Innovation	0.1948	0.2856	0.0000	0.0000	0.3772	15785
Resource Use	0.3173	0.3360	0.0000	0.2088	0.6022	15785
walk	0.0567	0.0971	0.0005	0.0141	0.0660	15785
talk	0.0098	0.0271	0.0000	0.0008	0.0081	15785
Sample in US ESG fund flow data						
US ESG fund flow	0.9463	7.2660	-1.1517	-0.0593	1.1940	40848
avg_walk	0.0566	0.0255	0.0437	0.0529	0.0628	40848
avg_talk	0.0115	0.0056	0.0080	0.0105	0.0142	40848
avg_mve	17.2162	1.0766	16.8052	17.4952	17.9749	40848
avg_bm	0.3243	0.1204	0.2366	0.3112	0.3999	40848
avg_mom1m	0.0163	0.0460	-0.0094	0.0185	0.0433	40848
avg_nanalyst	20.9884	5.2086	18.6626	22.6197	24.3378	40848
avg_roa	0.0203	0.0080	0.0165	0.0209	0.0252	40848
avg_lev	1.1795	0.6733	0.7366	1.0673	1.4781	40848
avg_ep	0.0440	0.0182	0.0349	0.0455	0.0551	40848
avg_baspread	0.0225	0.0077	0.0171	0.0205	0.0260	40848
Sample in US ESG fund monthly return data						
US ESG fund return	1.0403	4.5032	-1.3754	1.3957	3.6613	40863
avg_walk	0.0566	0.0255	0.0437	0.0529	0.0628	40863
avg_talk	0.0115	0.0056	0.0080	0.0105	0.0142	40863

Table 1: Summary Statistics (continued)

This table presents summary statistics of variables used in this study. Variables are defined in Table A6 in the appendix.

Var.	mean	sd	p25	p50	p75	count
Sample in US ESG fund Morningstar Sustainability Rating 2018 Aug - 2023 Dec						
Sustainability Rating	3.9017	1.1408	3.0000	4.0000	5.0000	8217
avg_walk	0.0674	0.0390	0.0494	0.0579	0.0696	8217
avg_talk	0.0145	0.0074	0.0105	0.0132	0.0164	8217
Sample in US ESG fund Morningstar Sustainability Rating 2018 Aug - 2019 Aug						
Sustainability Rating	3.9378	1.1782	3.0000	4.0000	5.0000	1705
avg_walk	0.0612	0.0344	0.0457	0.0532	0.0615	1705
avg_talk	0.0119	0.0066	0.0089	0.0104	0.0127	1705
Sample in US ESG fund Morningstar Sustainability Rating 2019 Sep - 2023 Dec						
Sustainability Rating	3.8922	1.1307	3.0000	4.0000	5.0000	6512
avg_walk	0.0690	0.0400	0.0507	0.0593	0.0710	6512
avg_talk	0.0152	0.0074	0.0114	0.0139	0.0170	6512
Sample in US ESG fund Morningstar Sustainability Rank 2018 Aug - 2023 Dec						
Sustainability Rank	27.4490	27.4957	6.0000	16.0000	40.0000	8220
avg_walk	0.0674	0.0390	0.0494	0.0579	0.0697	8220
avg_talk	0.0145	0.0074	0.0105	0.0132	0.0164	8220
Sample in US ESG fund Morningstar Sustainability Rank 2018 Aug - 2019 Aug						
Sustainability Rank	26.9009	28.6912	5.0000	12.0000	43.0000	1705
avg_walk	0.0612	0.0344	0.0457	0.0532	0.0615	1705
avg_talk	0.0119	0.0066	0.0089	0.0104	0.0127	1705
Sample in US ESG fund Morningstar Sustainability Rank 2019 Sep - 2023 Dec						
Sustainability Rank	27.5903	27.1690	7.0000	17.0000	40.0000	6515
avg_walk	0.0690	0.0400	0.0507	0.0593	0.0710	6515
avg_talk	0.0152	0.0074	0.0114	0.0140	0.0170	6515

Table 2: Descriptive statistics of walk and talk efforts

This table presents descriptive statistics of walk and talk efforts. Panel A reports the standard deviation decomposition. Panel B reports the lead-lag relationship using a panel vector autoregression (VAR) framework. Reported numbers show the coefficients of regressing the row variables on the column variables. Z-statistics are in parentheses, and *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Standardard deviation decomposition							
Variable		Mean	Standard Deviation	Min	Max		No. obs
walk	overall	0.0555	0.1002	0	0.9179	N =	37825
	between		0.0937	0	0.8780	n =	5408
	within		0.0491	-0.5907	0.6923	T-bar =	6.9943
talk	overall	0.0094	0.0273	0	0.7500	N =	37825
	between		0.0231	0	0.4167	n =	5408
	within		0.0186	-0.3941	0.5186	T-bar =	6.9943

Panel B: Lead-lag relationship in a VAR framework		
	Response to	
	walk at T-1	talk at T-1
walk at T	-2.746	-0.612
	(-1.400)	(-0.977)
talk at T	-0.229	0.621***
	(-1.097)	(2.975)
No. obs	26411	
No. panels	4151	

Table 3: Green transition efforts and Bloomberg environmental disclosure score

This table shows the relationship between a firm's annual Bloomberg environmental disclosure score and its annual walk and talk efforts. Specifically, the firm's environmental disclosure score in year i, *disclose_i*, is regressed on its walk and talk efforts from the same year or prior years, controlling for other firm characteristics in year i. The control variables include total assets (*log_at*), book-to-market ratio (*bm_fyear*), leverage ratio (*lev_fyear*), and return on assets (*roa_fyear*). To maintain simplicity, the control variable names do not include the year label, as it is always consistent with the dependent variable's year. Columns (1), (3), and (5) include firm fixed effects and year fixed effects. Columns (2), (4), and (6) include firm fixed effects and industry-by-year fixed effects. T-statistics (with standard errors clustered by firm) are in parentheses, and *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. The overall adjusted R^2 is reported.

Dep. Var.	disclose_ T	disclose_ T	disclose_ T+1	disclose_ T+1	disclose_ T+2	disclose_ T+2
	(1)	(2)	(3)	(4)	(5)	(6)
walk_T	9.888***	1.872	10.12***	4.033*	11.80***	5.247*
	(3.769)	(0.761)	(3.919)	(1.673)	(4.514)	(1.956)
talk_T	-1.461	1.377	-4.952	-1.954	-5.181	-1.628
	(-0.312)	(0.322)	(-1.022)	(-0.436)	(-1.144)	(-0.377)
log_at	-0.327	0.886**	-0.107	1.248***	0.0902	1.311***
	(-0.786)	(2.109)	(-0.237)	(2.741)	(0.194)	(2.767)
bm_fyear	-0.579	-1.247**	-0.682	-1.456***	-1.309**	-1.975***
	(-1.221)	(-2.574)	(-1.361)	(-2.823)	(-2.506)	(-3.665)
lev_fyear	-0.0770	0.00182	-0.110	0.0328	-0.156*	0.0637
	(-0.933)	(0.0236)	(-1.256)	(0.412)	(-1.683)	(0.760)
roa_fyear	-2.104	-4.174	-3.756	-7.045	-1.086	-3.294
	(-0.444)	(-0.900)	(-0.733)	(-1.404)	(-0.200)	(-0.606)
Firm FE	Y	Y	Y	Y	Y	Y
Year FE	Y		Y		Y	
Ind-Year FE		Y		Y		Y
No. obs	19,532	18,696	17,470	16,710	15,620	14,921
Adj. R^2	0.830	0.863	0.840	0.871	0.852	0.878

Table 4: Green transition efforts and pollution or RSEI score in the TRI program

This table analyzes the relationship between a firm's annual TRI chemical pollution or RSEI score and its walk and talk efforts. Panel A regresses pollution levels (*pollution_i*) or pollution intensity (*intensity_i*) on the firm's walk and talk efforts from the same year or prior years. Here, *pollution_i* represents the total toxic emissions of each chemical for each facility in year i, while *intensity_i* refers to the facility's pollution intensity for the chemical in year i. Panel B regresses two human health risk measurements on the firm's walk and talk efforts. *RSEIScore_i* is a facility's human health risk score for a single chemical emission in year i, and *RSEIHazard_i* is the corresponding toxicity-weighted chemical quantity in year i. All regressions control for four firm characteristics in year i: total assets, book-to-market ratio, leverage ratio, and return on assets. All regressions control for facility-by-chemical fixed effects and chemical-by-industry-by-year fixed effects. T-statistics (with standard errors clustered by firm) are in parentheses, and *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. The overall adjusted R^2 is reported.

Panel A: pollution or pollution intensity from year T to T+2

Dep. Var.	pollution_T	pollution_T+1	pollution_T+2	intensity_T	intensity_T+1	intensity_T+2
	(1)	(2)	(3)	(4)	(5)	(6)
walk_T	-0.0869	0.0741	-0.0550	-0.0526	0.0170	-0.0402
	(-0.997)	(0.740)	(-0.541)	(-0.602)	(0.171)	(-0.398)
talk_T	1.216***	0.223	-0.0606	0.982***	0.742**	0.416
	(3.291)	(0.655)	(-0.179)	(2.761)	(2.221)	(1.248)
Controls	Y	Y	Y	Y	Y	Y
Fac-Chem FE	Y	Y	Y	Y	Y	Y
Chem-Ind-Year FE	Y	Y	Y	Y	Y	Y
No. obs	145,007	142,748	140,203	144,440	142,191	139,659
Adj. R^2	0.924	0.924	0.924	0.924	0.924	0.924

Panel B: RSEI Score or RSEI Hazard from year T to T+2

Dep. Var.	RSEIScore_T	RSEIScore_T+1	RSEIScore_T+2	RSEIHazard_T	RSEIHazard_T+1	RSEIHazard_T+2
	(1)	(2)	(3)	(4)	(5)	(6)
walk_T	-0.102*	-0.00319	-0.139**	-0.180*	-0.268**	-0.585***
	(-1.932)	(-0.0551)	(-2.290)	(-1.700)	(-2.293)	(-4.750)
talk_T	0.845***	-0.0853	-0.264	0.412	-0.296	-0.291
	(4.101)	(-0.425)	(-1.310)	(1.388)	(-0.890)	(-0.773)
Controls	Y	Y	Y	Y	Y	Y
Fac-Chem FE	Y	Y	Y	Y	Y	Y
Chem-Ind-Year FE	Y	Y	Y	Y	Y	Y
No. obs	129,611	127,577	125,178	129,611	127,577	125,178
Adj. R^2	0.955	0.955	0.955	0.953	0.953	0.953

Table 5: Green transition efforts and ESG funds' aggregate ownership stake

This table presents the regressions of a firm's aggregate ownership stake by ESG funds at the end of month T on its green transition efforts during months T-12 to T-1. *Article8 agg.*, *Article9 agg.*, and *US ESG agg.* represent the firm's aggregate ownership stakes by Article 8, Article 9, and US ESG funds, respectively. All regressions include eight firm characteristics available at the end of the previous month as control variables: market capitalization (*mve*), book-to-market ratio (*bm*), 1-month reversal (*mom1m*), number of analysts covering the stock (*nanalyst*), return on assets (*roa*), leverage ratio (*lev*), earnings-to-price ratio (*ep*), and bid-ask spread (*baspread*). Columns (1), (3), and (5) include firm fixed effects and year fixed effects. Columns (2), (4), and (6) include firm fixed effects and industry-by-year fixed effects. T-statistics (with standard errors clustered by firm) are in parentheses, and *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. The overall adjusted R^2 is reported.

Dep. Var.	Article8 agg.	Article8 agg.	Article9 agg.	Article9 agg.	US ESG agg.	US ESG agg.
	(1)	(2)	(3)	(4)	(5)	(6)
walk	4.587	8.654*	28.58***	20.12***	8.994***	9.059***
	(1.247)	(1.849)	(6.089)	(3.431)	(5.245)	(4.409)
talk	20.30**	16.25**	34.37*	31.98*	13.70**	10.30**
	(2.105)	(1.965)	(1.754)	(1.706)	(2.545)	(2.132)
mve	2.688***	2.509***	-1.371***	-0.993***	0.796***	0.857***
	(10.48)	(8.888)	(-4.480)	(-3.098)	(8.455)	(8.393)
bm	-5.862***	-3.994***	-3.425***	-2.050*	-0.357	-0.245
	(-8.588)	(-5.064)	(-3.782)	(-1.869)	(-1.334)	(-0.866)
mom1m	-3.528***	-2.540***	0.632	0.118	-0.752***	-0.716***
	(-6.739)	(-4.230)	(1.095)	(0.175)	(-4.493)	(-3.791)
nanalyst	0.426***	0.543***	0.0213	0.0524	0.0697***	0.0878***
	(7.772)	(9.267)	(0.554)	(1.150)	(3.839)	(4.604)
roa	-45.89***	-15.10*	-0.0193	-4.100	-3.974*	-3.063
	(-6.148)	(-1.819)	(-0.00379)	(-0.712)	(-1.763)	(-1.325)
lev	-0.889***	-0.440***	-0.205**	-0.290**	-0.167***	-0.149***
	(-9.312)	(-3.369)	(-2.188)	(-2.134)	(-6.043)	(-3.107)
ep	-3.739***	-3.909**	-2.650	-5.183**	-0.564	-0.681
	(-2.859)	(-2.577)	(-1.279)	(-2.105)	(-1.334)	(-1.369)
baspread	16.21	4.074	23.71	58.43**	-12.37*	3.250
	(1.017)	(0.214)	(0.877)	(2.061)	(-1.743)	(0.409)
Time FE	Y		Y		Y	
Ind-Time FE		Y		Y		Y
No. obs	87,081	83,548	43,181	40,143	258,328	246,071
Adj. R^2	0.246	0.310	0.138	0.260	0.094	0.134

Table 6: Green transition efforts and individual ESG fund portfolio

This table shows how an individual ESG fund's portfolio weight or ownership stake in a company's stock relates to the company's green transition efforts. Panel A presents regressions of a fund's portfolio weight in a company's stock on the company's walk and talk efforts. The variables *Article 8 weight*, *Article 9 weight*, and *US ESG weight* represent the portfolio weight of an individual Article 8, Article 9, and US ESG fund in a particular stock, respectively. Panel B presents regressions of a fund's ownership stake in a company's stock on the company's walk and talk efforts. The variables *Article 8 share*, *Article 9 share*, and *US ESG share* represent the ownership stake of an individual Article 8, Article 9, and US ESG fund in a particular stock, respectively. All regressions control for eight firm characteristics available at the end of the previous month: market capitalization, book-to-market ratio, 1-month reversal, number of analysts covering the stock, return on assets, leverage ratio, earnings-to-price ratio, and bid-ask spread. Columns (2), (4), and (6) include time fixed effects. T-statistics (with standard errors clustered by firm) are in parentheses, and *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. The overall adjusted R^2 is reported.

Panel A: individual fund's portfolio weight						
Dep. Var.	Article8 weight	Article8 weight	Article9 weight	Article9 weight	US ESG weight	US ESG weight
	(1)	(2)	(3)	(4)	(5)	(6)
walk	-0.0278	-0.0369	1.429***	1.388***	0.326***	0.345***
	(-1.092)	(-1.447)	(13.07)	(12.67)	(3.689)	(3.822)
talk	0.362***	0.374***	2.124***	2.071***	0.642***	0.830***
	(6.323)	(6.539)	(8.844)	(8.359)	(4.219)	(5.328)
Controls	Y	Y	Y	Y	Y	Y
Time FE		Y		Y		Y
No. obs	7,653,265	7,653,265	646,701	646,701	3,712,974	3,712,974
Adj. R^2	0.101	0.103	0.072	0.077	0.121	0.130
Panel B: individual fund's ownership stake						
Dep. Var.	Article8 share	Article8 share	Article9 share	Article9 share	US ESG share	US ESG share
	(1)	(2)	(3)	(4)	(5)	(6)
walk	-0.00409	-0.00191	0.586***	0.576***	0.292***	0.298***
	(-0.189)	(-0.0880)	(3.214)	(3.124)	(2.746)	(2.776)
talk	0.0771**	0.0627*	0.653*	0.466	0.426**	0.465***
	(2.207)	(1.788)	(1.937)	(1.337)	(2.330)	(2.597)
Controls	Y	Y	Y	Y	Y	Y
Time FE		Y		Y		Y
No. obs	7,612,708	7,612,708	653,176	653,176	3,712,974	3,712,974
Adj. R^2	0.067	0.068	0.142	0.144	0.014	0.016

Table 7: Green transition efforts and environmental ratings

This table presents the correlation between a firm's environmental ratings and its green transition efforts. Panel A regresses a firm's overall environmental ratings from MSCI KLD and Sustainalytics on its contemporaneous walk and talk efforts. *MSCI KLD* is the annual net environmental score calculated as Lins, Servaes, and Tamayo (2017), regressed on same-year walk and talk efforts. *Sus Old* is the monthly Sustainalytics environmental score until August 2019, and *Sus New* is the score after August 2019, reflecting a methodology change. Both are regressed on walk and talk efforts over the past 12 months. Panel B regresses Refinitiv's three environmental subcategory scores (*emissions*, *innovation*, and *resource use*) on same-year walk and talk efforts. All regressions control for eight firm characteristics as of the previous month: market capitalization, book-to-market ratio, 1-month reversal, number of analysts covering the stock, return on assets, leverage ratio, earnings-to-price ratio, and bid-ask spread. Columns (1), (3), and (5) include time fixed effects, while columns (2), (4), and (6) include industry-by-time fixed effects. T-statistics (with standard errors clustered by firm) are in parentheses, and *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. The overall adjusted R^2 is reported.

Panel A: MSCI KLD, Sustainalytics old-method, and new-method environmental rating

Dep. Var.	MSCI KLD	MSCI KLD	Sus Old	Sus Old	Sus New	Sus New
	(1)	(2)	(3)	(4)	(5)	(6)
walk	0.180***	0.147***	12.46***	9.484**	25.25***	0.830
	(5.022)	(3.860)	(3.008)	(2.347)	(11.31)	(0.599)
talk	0.346***	0.256**	32.76**	18.06	-23.61***	-6.514*
	(2.581)	(2.292)	(2.182)	(1.301)	(-3.901)	(-1.739)
Controls	Y	Y	Y	Y	Y	Y
Time FE	Y		Y		Y	
Ind-Time FE		Y		Y		Y
No. obs	11,960	11,288	47,653	47,491	36,321	36,303
Adj. R^2	0.236	0.344	0.221	0.514	0.284	0.812

Panel B: Refinitiv environmental pillar subcategory score

Dep. Var.	Emissions	Emissions	Innovation	Innovation	Resource Use	Resource Use
	(1)	(2)	(3)	(4)	(5)	(6)
walk	0.585***	0.267***	0.702***	0.334***	0.521***	0.229***
	(12.94)	(5.539)	(11.70)	(5.640)	(10.52)	(4.381)
talk	0.194	0.249*	0.319**	0.216*	0.0994	0.256**
	(1.280)	(1.910)	(1.989)	(1.649)	(0.787)	(2.065)
Controls	Y	Y	Y	Y	Y	Y
Time FE	Y		Y		Y	
Ind-Time FE		Y		Y		Y
No. obs	15,785	14,858	15,785	14,858	15,785	14,858
Adj. R^2	0.431	0.516	0.223	0.388	0.405	0.514

Table 8: US ESG fund's future fund flow and portfolio average green transition efforts

This table shows how US ESG fund flows in the next month vary with the fund portfolio's average green transition efforts. The dependent variable, *US ESG fund flow*, is the fund flow in month T+1. It is regressed on the weighted average walk efforts, talk efforts, and other characteristics—market capitalization, book-to-market ratio, 1-month reversal, number of analysts, return on assets, leverage ratio, earnings-to-price ratio, and bid-ask spread—available at the end of month T for all stocks in the fund portfolio. The fund portfolio is included in the sample only if stocks representing over 50% of the portfolio weight have non-missing walk and talk efforts. Column (1) includes time fixed effects, while column (2) includes fund category-by-time fixed effects. T-statistics (with standard errors clustered by fund) are in parentheses, and *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. The overall adjusted R^2 is reported.

Dep. Var.	US ESG fund flow	
	(1)	(2)
avg_walk	0.0557	-1.471
	(0.0111)	(-0.230)
avg_talk	78.66***	75.73***
	(3.251)	(3.231)
avg_mve	-0.297	-0.608
	(-0.849)	(-1.519)
avg_bm	-5.638***	-7.096***
	(-2.728)	(-3.046)
avg_mom1m	16.33***	16.74***
	(6.224)	(5.918)
avg_nanalyst	-0.0326	-0.00873
	(-0.559)	(-0.137)
avg_roa	11.09	6.867
	(0.649)	(0.367)
avg_lev	0.915***	0.951***
	(3.266)	(3.071)
avg_ep	1.605	3.163
	(0.217)	(0.399)
avg_baspread	28.45	-4.506
	(0.863)	(-0.109)
Time FE	Y	N
Cat-Time FE	N	Y
No. obs	40,848	40,102
Adj. R^2	0.014	0.013

Table 9: US ESG fund's future return and portfolio average green transition efforts

This table shows how US ESG fund returns in the next month vary with the fund portfolio's average green transition efforts. The dependent variable, *US ESG fund return*, is the fund's net return in month T+1. It is regressed on the weighted average walk efforts, talk efforts, and other characteristics—market capitalization, book-to-market ratio, 1-month reversal, number of analysts, return on assets, leverage ratio, earnings-to-price ratio, and bid-ask spread—available at the end of month T for all stocks in the fund portfolio. The fund portfolio is included in the sample only if stocks representing over 50% of the portfolio weight have non-missing walk and talk efforts. Column (1) includes time fixed effects, while column (2) includes fund category-by-time fixed effects. T-statistics (with standard errors clustered by fund) are in parentheses, and *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. The overall adjusted R^2 is reported.

Dep. Var.	US ESG fund return	
	(1)	(2)
avg_walk	-0.423	0.0110
	(-0.423)	(0.00629)
avg_talk	12.20**	9.683
	(2.469)	(1.455)
avg_mve	-0.213***	-0.226**
	(-4.625)	(-2.036)
avg_bm	-0.453	-0.507
	(-1.586)	(-0.695)
avg_mom1m	1.807*	1.169
	(1.902)	(0.405)
avg_nanalyst	0.0431***	0.0469**
	(5.668)	(2.539)
avg_roa	-3.497	-4.734
	(-1.275)	(-0.803)
avg_lev	0.0811**	0.0572
	(2.135)	(0.878)
avg_ep	-3.897***	-1.463
	(-2.939)	(-0.538)
avg_baspread	-19.16***	-16.15
	(-3.158)	(-0.805)
Time FE	Y	N
Cat-Time FE	N	Y
No. obs	40,863	40,118
Adj. R^2	0.892	0.914

Table 10: US ESG fund's future Morningstar Sustainability Rating/Rank and portfolio average green transition efforts

This table examines how US ESG fund Morningstar Sustainability Ratings or Ranks in the next month vary with portfolio's average green transition efforts. Panel A regresses *Sustainability Rating*, which is the fund's Rating in month T+1, on the portfolio's weighted average walk efforts, talk efforts, and other characteristics —market capitalization, book-to-market ratio, 1-month reversal, number of analysts, return on assets, leverage ratio, earnings-to-price ratio, and bid-ask spread—available at the end of month T. The sample includes only portfolios where stocks representing over 50% of the weight have non-missing walk and talk efforts. The analysis covers all periods available in Morningstar as of April 2024, with data starting from August 2018 (Columns (1-2)). Subsamples are analyzed separately before and after August 2019 in Columns (3-4) and Columns (5-6), respectively, due to changes in the Sustainalytics rating methodology, which Sustainability Rating is based on. Columns (1), (3), and (5) include time fixed effects, while columns (2), (4), and (6) include fund category-by-time fixed effects. Panel B uses the dependent variable *Sustainability Rank*, which is the fund's Corporate Sustainability Percent Rank in the same fund category. The Rating is from 1 to 5 globes, with 5 being the most sustainable, while the rank is from 1 to 100, with 1 being the most sustainable. T-statistics (with standard errors clustered by fund) are in parentheses, and *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. The overall adjusted R^2 is reported.

Panel A: Morningstar Sustainability Rating as dependent variable						
Period	2018 Aug - 2023 Dec		2018 Aug - 2019 Aug		2019 Sep - 2023 Dec	
	(1)	(2)	(3)	(4)	(5)	(6)
avg_walk	-8.265***	-10.92***	-6.141	-5.626	-8.657***	-11.76***
	(-2.810)	(-3.224)	(-1.350)	(-0.895)	(-2.698)	(-3.275)
avg_talk	34.86**	53.85***	5.838	22.54	41.83***	58.95***
	(2.410)	(3.661)	(0.251)	(0.938)	(2.600)	(3.517)
Controls	Y	Y	Y	Y	Y	Y
Time FE	Y	N	Y	N	Y	N
Cat-Time FE	N	Y	N	Y	N	Y
No. obs	8,217	7,881	1,705	1,625	6,512	6,256
Adj. R^2	0.193	0.209	0.182	0.173	0.202	0.225
Panel B: Morningstar Corporate Sustainability Percent Rank as dependent variable						
Period	2018 Aug - 2023 Dec		2018 Aug - 2019 Aug		2019 Sep - 2023 Dec	
	(1)	(2)	(3)	(4)	(5)	(6)
avg_walk	176.6**	218.3**	150.6	112.6	182.6**	235.1***
	(2.510)	(2.638)	(1.367)	(0.732)	(2.381)	(2.701)
avg_talk	-748.5**	-1,129***	-65.52	-460.5	-936.4**	-1,249***
	(-2.203)	(-3.240)	(-0.112)	(-0.792)	(-2.505)	(-3.209)
Controls	Y	Y	Y	Y	Y	Y
Time FE	Y	N	Y	N	Y	N
Cat-Time FE	N	Y	N	Y	N	Y
No. obs	8,220	7,884	1,705	1,625	6,515	6,259
Adj. R^2	0.182	0.200	0.200	0.197	0.183	0.205

Appendix A: An excerpt of a sample job posting

This excerpt comes from a job posting by the company BP for the work location "Chicago, Illinois, United States", posted on September 29, 2022, under the job title "Sustainability Manager - Bio Feeds". The Lightcast database assigns the O*NET code "11-1011.03" and the O*NET title "chief sustainability officers" to it.

Sustainability Manager - Bio Feeds

Key accountabilities

- Take lead role in executing and continuously improving the bp sustainability compliance programme in RPT-A, including certification under various schemes, procedures, processes, systems, GHG tools, training and communications.
- Support surveillance audits, working with the trading operations teams to ensure all sustainability management requirements are kept timely and with the appropriate control process.
- Collaborate with the central Regulatory Affairs team in communicating with CARB/ EPA/ etc and to get support when applying for pathways/ISCC certs as needed.
- Identify new market opportunities, advising analytics/traders on reg changes or competitor activity, and being the bench point person on reg advocacy discussions.
- Provide cross bench support to the biofuels trading teams with daily regulatory queries, focusing on GHG optimisation.
- Proactively identify and communicate possible risks faced by the business, proactively putting steps in place to effectively mitigate them in coordination with Global biofuel sustainability manager.
- Provide support to T&S low carbon growth agenda, including implementation of certified supply chains in the region.
- Develop intelligence and expertise around advanced/development feedstocks and biofuels legislation.

Essential Education:

- Degree in engineering, finance or a commercial field.
- Educational profile is less important than behaviours and a track history of high relationship management and performance.

Essential experience and job requirements:

The successful candidate will have:

- Extensive commercial and leadership skills. Experience and knowledge of trading and/or supply business and operations in energy value chains.
- Background on certification/auditing programmes, in particular ISCC system and

similar would be highly beneficial.

- Experience guiding deals through pathway processes with regulatory bodies such as CARB, DEQ, EPA, etc.
- Strong track record of delivering projects and/or working to deadlines; Willing to speak-up and be able to lead and influence a broad range of collaborators both internally and externally.
- Strong background in Commercial/Operations or Finance & Risk subject area, with breadth of experience.
- Must be a great teammate able to operate within a complex and dynamic trading business, possessing the interpersonal and decision-making skills, coupled with sound commercial judgement to build credible relationships across T&S and 3rd parties.
- Self-motivated and highly drive.
- Understanding of BP's reputational risks, the intent of BP's Code of Conduct, and compliance commitments demonstrated by a track record of supporting actions.

Desirable criteria and qualifications

The successful candidate will also be expected to demonstrate the following:

- Commercially astute and innovative
- Performance bias, with an ability to overcome obstacles and inspire change. Strategically aware, with an ability to translate strategies into actions and the timely delivery of business results
- Experience with life-cycle greenhouse gas analysis
- Strong influencing skills, with an ability to build consensus and engagement across teams, functions and geographies
- Strong customer relationship building and management skills. Able to build relationships in a short period of time with new external parties

Appendix B: Decision Tree to Classify a Job Posting into Walk-Relevant, Talk-Relevant, or Other

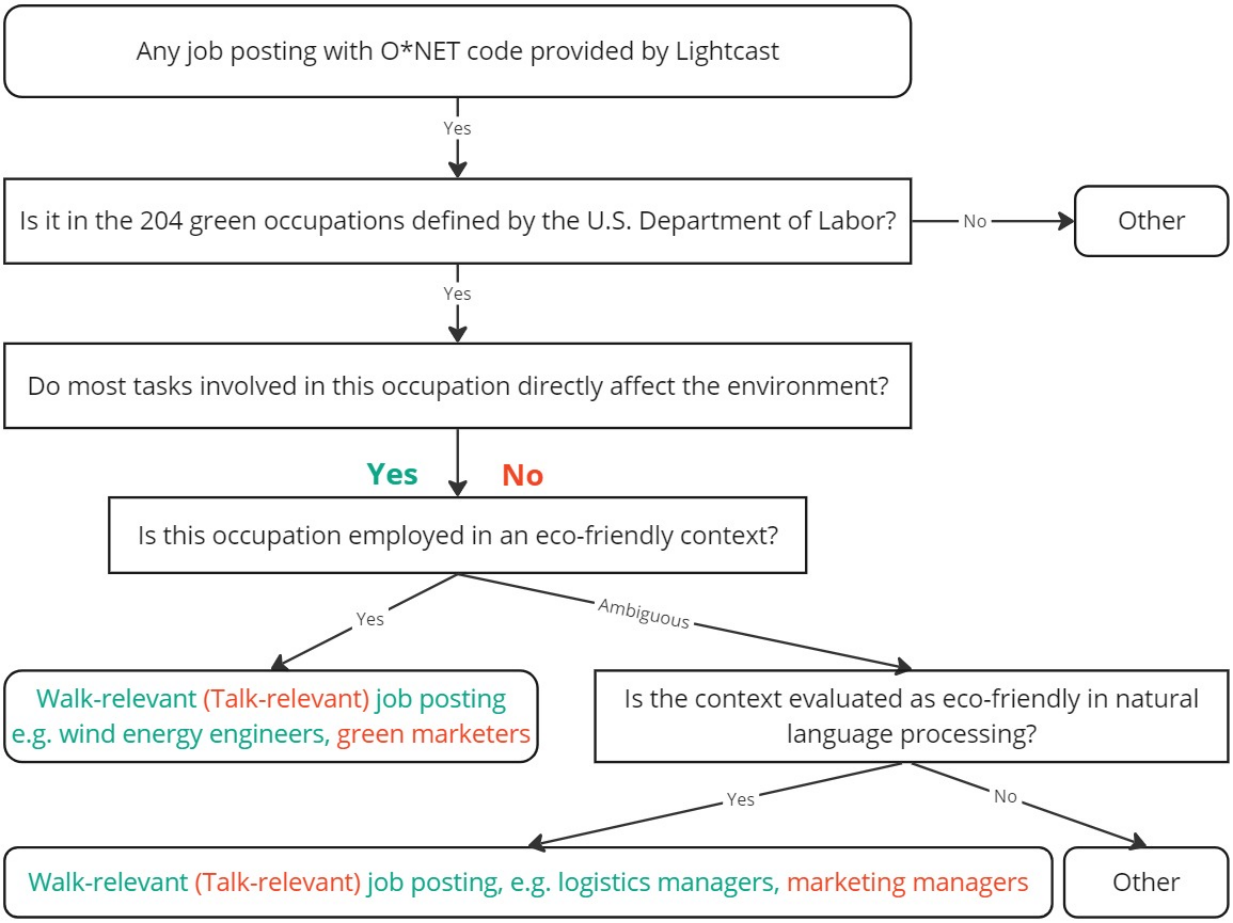

Figure 4: The decision tree for categorizing any job posting

Figure 4 outlines the steps for categorizing any job posting with an O*NET code provided by Lightcast. First, check if the O*NET code corresponds to one of the 204 green occupations defined by the U.S. Department of Labor. If it does not, the job posting is classified as "Other." If it does, determine whether most tasks in this occupation directly impact the environment. If the tasks do have a direct environmental impact, the job posting is considered a candidate for a walk-relevant classification. If not, it is a candidate for a talk-relevant classification. Next, assess whether the occupation is performed in an eco-friendly context. If it is, the candidate (walk or talk) becomes the final classification. If the context is not eco-friendly, the job posting is categorized as "Other." Note that some occupations are clearly eco-friendly, while others are uncertain and require natural language processing methods for evaluation.

Appendix C: Word embedding model

Word embeddings are learned vector representations of each particular word or phrase. It allows words and phrases with similar meaning to have a similar representation. For example, "sustainable investing" and "ESG investing" have very similar meanings and should have very similar vector representations. Word embedding models learn these vector representations from a corpus of text through machine learning tasks, and then the similarity between vectors represents the semantic similarity between words.

In this study, I apply a widely-used algorithm based on neural networks, Word2vec, with the Gensim package. The semantic similarity between words in a corpus can be learned by two ways, Continuous-bag-of-words (CBOW) or Skip-grams (SG). CBOW method takes the context of each word as the input and tries to predict the word corresponding to the context. For example, in the sentence "Sustainable investing makes contribution to green transition", the word "sustainable" is covered in the input and the output is the covered word "sustainable". A Neural Network model is trained to generate the output from the input. During the process, the model learns the vector representations. The SG method flips the input and output of the CBOW method. The word "sustainable" is the input and the model tries to predict the context words of "sustainable". According to Mikolov, Sutskever, Chen, Corrado, and Dean (2013), the SG method represents rare words well, while the CBOW method represents better for more frequent words. As environment-related words are relatively rare in online job postings, I use the SG method.

As the model's goal is to predict a target word's context words, what we care is not whether the model can accurately predict the context but whether the parameters trained during the process can capture words' semantic similarities. Therefore, I test the model by giving it a particular word and asking for the Top 40 closest synonyms in the corpus. As we can see from the examples below, the model functions well. "gri" is the acronym for "Global Reporting Initiative". "sbti" is the acronym for "Science-Based Targets Initiative". Although there are unrelated phrases such as "mergers acquisitions" and "macroeconomic", these will be removed in the step of manually checking the meaning of the words and phrases using Google search results.

Top 40 closest synonyms to "sustainability": sustainable, gri aca, ghg emissions, greenhouse gas, carbon neutrality, ghg emission, circularity, esg, sbti, tcfd sasb, ghg carbon, ghg reduction, biodiversity, conservation, ghg, gri cdp, decarbonization, higg, green, ghg protocol, tcfd cdp, roots theinvention, carbon, djsi, index ftsegood, calculator forscherwelt, environmental stewardship, cdp gri, sedex, cdp tcfd, disclosures tcfd,

climate, global, breeam, ecovadis, tcfd, dcehs, resiliency watershed, modern slavery, gri sasb.

Top 40 closest synonyms to "esg": tcfd, sasb, sasb gri, gri sasb, sdgs, tcfd sasb, frameworks sasb, gri cdp, sustainalytics, corporates, ungc, mergers acquisitions, tcfd cdp, disclosures tcfd, iss esg, cdp tcfd, sbti, gresb gri, greenhouse gas, ghg emissions, msci esg, ecovadis, sasb tcfd, ghg, advisory, msci sustainalytics, iss msci, strategist, trucost, lob, governance, blackrock, materiality, cdp gri, decarbonization, issuer, restructuring, macroeconomic, valuation, dji.

Appendix D: Additional validation tests

Only walk efforts predict the number of green patents positively.

If measured walk efforts represent tangible actions towards environmental sustainability, they should positively correlate with future patents. Allocating resources to substantive green transitions often involves developing new technologies or improving processes, leading to patentable innovations. These commitments increase the likelihood of receiving green patents. In contrast, talk efforts involve verbal commitments or public declarations that do not necessarily translate into concrete actions or investments. Although talk efforts may raise awareness or signal intentions, they lack the follow-through required to produce patentable innovations. Therefore, talk efforts are not expected to correlate with future patents.

Table A2 shows a robust, positive correlation between walk efforts and the future number of green patents for both green patent classification methods. Additionally, there is a significant lag of at least four years between walk efforts and the subsequent increase in green patents. According to the USPTO's 2023 agency financial report, it takes an average of 20.8 months from patent application to the first action on the application. Thus, the significant lag between walk efforts and the grant of green patents is reasonable. In contrast, there is no significant correlation between talk efforts and the number of green patents, except for a positive correlation at the 10% significance level in Panel B Column (4).

Only walk efforts predict recycled waste positively and predict hazardous waste negatively.

Similar to the green patents scenario, if walk efforts represent substantive actions and talk efforts represent verbal promotion, walk efforts should correlate with concrete eco-

friendly shifts, such as increased recycling and reduced hazardous waste. In contrast, talk efforts are not expected to improve these outcomes.

Table A3 shows a significant positive correlation between walk efforts and the percentage of recycled waste, and a significant negative correlation between walk efforts and the percentage of hazardous waste. Conversely, talk efforts are not correlated with the percentage of recycled or hazardous waste.

Walk efforts negatively correlate with reputational risk exposures, while talk efforts positively correlate.

Companies facing high reputational risks are more likely to engage in talk efforts to manage their image. When under scrutiny for their environmental practices, these companies may emphasize environmental commitments through verbal promises to appease stakeholders and the public without necessarily making substantive changes. This strategy allows them to appear proactive and concerned about environmental issues, attempting to mitigate reputational damage. Therefore, talk efforts are expected to increase with a company's reputational risk exposure to environmental issues.

Reprisk provides a company's reputational risk exposure to ESG issues broadly, not specifically to environmental issues. Therefore, it would be an overreach to assume a company would increase environmental public relations efforts when faced with scandals related to corporate governance. To better align a company's reputational risk exposure with walk and talk efforts focused on environmental issues, I concentrate on companies in the top 21 3-digit SIC industry codes with the highest numbers of green patents, where green transition is particularly important for the company, listed in Table A9.

Table A4 shows that walk efforts exhibit a robust, negative correlation with current or future reputational risk exposures. This indicates that companies engaging in substantive, tangible green transition efforts are likely to experience reduced reputational risk over time. In contrast, there is a robust, positive correlation between talk efforts and reputational risk exposures. This suggests that companies under reputational scrutiny are more likely to engage in talk efforts to manage their image.

These correlations highlight the distinct roles that walk and talk efforts play in relation to a company's reputational risk, reinforcing the notion that talk efforts are more about managing perception rather than driving real environmental change.

Carbon and energy intensities do not decrease with walk or talk efforts over time. However, firms with higher talk efforts or lower walk efforts tend to have lower intensities.

Table A5 Panels A and B show that within a company over time, the relationship between a company's walk efforts and its carbon emissions or energy consumption intensity is weak or insignificant. Similarly, talk efforts show no significant correlation. In contrast, Table A5 Panels C and D, which remove firm fixed effects and compare different companies within the same period or industry, show robust but unexpected correlations. Companies with higher walk efforts tend to have higher carbon emissions and energy consumption intensity, while those with higher talk efforts tend to have lower emissions and energy intensity.

If the measured walk and talk efforts did not capture company behaviors related to carbon emissions and energy consumption, all four panels in Table A5 would show insignificant results. The strong connections shown in Table A5 Panels C and D suggest that the measured walk and talk efforts are indeed relevant and point to other potential mechanisms driving these results.

For example, the results are consistent with the rebound effect, where fossil energy savings induce a larger demand for energy (also known as the Jevons paradox from Jevons (1866)). Bolton et al. (2022) also document that green innovation does not predict future reductions in carbon emissions of innovating firms and predicts higher indirect emissions in related industries. However, the lack of reduction in carbon emissions for innovating firms does not mean there is no environmental improvement for society as a whole. Hege, Li, and Zhang (2023) argue that many climate patents are product innovations, and thus the emission benefits should accrue to the customers who use the innovator's products.

Another explanation could be that companies with intensive energy consumption are more motivated to engage in walk efforts, which often involve long-term projects that do not provide immediate reductions in emissions or energy use. These companies might be in the early, resource-intensive stages of their sustainability projects. Also, companies with business models that do not involve heavy energy consumption from the start might capitalize on society's green demand by selecting a green image as their marketing highlight.

Overall, the strong correlations, being opposite in sign for walk and talk efforts, confirm that walk and talk efforts capture different aspects of a company's behavior related to carbon emissions and energy consumption. This test aims to validate the measured walk and talk efforts, and the findings show that they effectively capture different dimensions in green transition efforts.

Table A1: Summary Statistics of variables in additional validation tests

This table presents summary statistics of variables used in additional validation tests. Variables are defined in Table A6 in the appendix.

Var.	mean	sd	p25	p50	p75	count
Sample in patent data						
IPC	0.3008	0.7352	0.0000	0.0000	0.0000	7464
CPC	0.5238	0.9874	0.0000	0.0000	0.6931	7464
walk	0.0613	0.0964	0.0045	0.0240	0.0696	7464
talk	0.0103	0.0219	0.0000	0.0017	0.0098	7464
Sample in Bloomberg hazardous waste data						
hazard	14.9888	22.2644	0.4815	4.8922	18.9573	2002
walk	0.1150	0.1235	0.0250	0.0700	0.1633	2002
talk	0.0137	0.0226	0.0004	0.0048	0.0156	2002
Sample in Bloomberg recycled waste data						
recycle	51.9217	27.8957	30.9050	55.1543	75.0000	2482
walk	0.0995	0.1188	0.0155	0.0511	0.1382	2482
talk	0.0132	0.0243	0.0004	0.0040	0.0137	2482
Sample in Reprisk Index data						
RRI	7.4504	10.0067	0.0000	0.7319	14.4192	4198
walk	0.0491	0.0961	0.0000	0.0084	0.0437	4198
talk	0.0092	0.0235	0.0000	0.0000	0.0067	4198
Sample in Bloomberg carbon emission intensity data						
G/at	3.3294	1.9059	1.8705	3.3063	4.7301	5947
G/sales	3.7813	1.9297	2.3622	3.5167	5.0939	5947
walk	0.0897	0.1169	0.0092	0.0408	0.1245	5947
talk	0.0134	0.0267	0.0002	0.0039	0.0137	5947
Sample in Bloomberg energy consumption intensity data						
E/at	4.2645	2.0990	2.8499	4.2733	5.6633	5114
E/sales	4.7749	1.9692	3.3724	4.4750	5.9292	5114
walk	0.0902	0.1173	0.0096	0.0413	0.1253	5114
talk	0.0129	0.0245	0.0002	0.0038	0.0135	5114

Table A2: Green transition efforts and green patents

This table examines the regressions of a firm's number of granted green patents on its annual walk and talk efforts. *CPC_i* is the natural logarithm of 1 plus a firm's number of granted green patents in year i using CPC method to label green patents. *IPC_i* is the natural logarithm of 1 plus a firm's number of granted green patents in year i using IPC method to label green patents. All regressions control for four other firm characteristics in year i: total assets, book-to-market ratio, leverage ratio, and return on assets. All regressions include firm fixed effects and industry-by-year fixed effects. T-statistics (with standard errors clustered by firm) are in parentheses, and *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. The overall adjusted R^2 is reported.

Panel A: green patent classified via CPC method from year T to T+5						
Dep. Var.	CPC_T	CPC_T+1	CPC_T+2	CPC_T+3	CPC_T+4	CPC_T+5
	(1)	(2)	(3)	(4)	(5)	(6)
walk_T	0.143	0.0445	-0.108	0.233	0.462***	0.602***
	(0.854)	(0.246)	(-0.583)	(1.342)	(2.712)	(2.592)
talk_T	-0.482	-0.168	-0.113	-0.534	0.0287	0.338
	(-1.501)	(-0.456)	(-0.309)	(-1.302)	(0.0603)	(0.622)
Controls	Y	Y	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y	Y	Y
Ind-Year FE	Y	Y	Y	Y	Y	Y
No. obs	6,607	5,784	5,014	4,334	3,659	3,034
Adj. R^2	0.812	0.810	0.813	0.812	0.810	0.806
Panel B: green patent classified via IPC method from year T to T+5						
Dep. Var.	IPC_T	IPC_T+1	IPC_T+2	IPC_T+3	IPC_T+4	IPC_T+5
	(1)	(2)	(3)	(4)	(5)	(6)
walk_T	0.0922	-0.0320	0.252	0.123	0.547**	0.819***
	(0.465)	(-0.148)	(1.190)	(0.525)	(2.142)	(3.139)
talk_T	-0.235	0.125	-0.406	1.117*	0.908	0.457
	(-0.502)	(0.238)	(-0.822)	(1.772)	(1.193)	(0.643)
Controls	Y	Y	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y	Y	Y
Ind-Year FE	Y	Y	Y	Y	Y	Y
No. obs	6,607	5,784	5,014	4,334	3,659	3,034
Adj. R^2	0.790	0.786	0.778	0.772	0.762	0.757

Table A3: Green transition efforts and recycled or hazardous waste

This table examines the regressions of a firm's annual recycled or hazardous waste percentage on its annual walk and talk efforts. *recycle_i* is the percentage of waste that is recycled in year i. *hazard_i* is the percentage of hazardous waste in year i. All regressions control for four other firm characteristics in year i: total assets, book-to-market ratio, leverage ratio, and return on assets. Columns (1), (3), and (5) include firm fixed effects and year fixed effects. Columns (2), (4), and (6) include firm fixed effects and industry-by-year fixed effects. T-statistics (with standard errors clustered by firm) are in parentheses, and *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. The overall adjusted R^2 is reported.

Panel A: percentage of recycled waste from year T to T+2						
Dep. Var.	recycle_T	recycle_T	recycle_T+1	recycle_T+1	recycle_T+2	recycle_T+2
	(1)	(2)	(3)	(4)	(5)	(6)
walk_T	7.196	-1.574	12.68**	14.89	16.43**	26.54**
	(1.070)	(-0.124)	(2.267)	(1.443)	(2.436)	(2.174)
talk_T	-8.051	18.99	-13.52	3.000	-19.68	-51.58
	(-0.321)	(0.417)	(-0.596)	(0.0710)	(-1.019)	(-1.237)
Controls	Y	Y	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y	Y	Y
Year FE	Y		Y		Y	
Ind-Year FE		Y		Y		Y
No. obs	2,368	1,856	2,269	1,779	2,140	1,672
Adj. R^2	0.799	0.828	0.803	0.831	0.806	0.836
Panel B: percentage of hazardous waste from year T to T+2						
Dep. Var.	hazard_T	hazard_T	hazard_T+1	hazard_T+1	hazard_T+2	hazard_T+2
	(1)	(2)	(3)	(4)	(5)	(6)
walk_T	-3.901	-6.742	-6.459*	-7.086	-6.076*	-12.41*
	(-1.037)	(-1.227)	(-1.797)	(-1.227)	(-1.737)	(-1.843)
talk_T	-8.380	2.882	-4.819	14.55	13.52	30.83
	(-0.299)	(0.0883)	(-0.160)	(0.543)	(0.462)	(0.971)
Controls	Y	Y	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y	Y	Y
Year FE	Y		Y		Y	
Ind-Year FE		Y		Y		Y
No. obs	1,928	1,519	1,827	1,440	1,711	1,343
Adj. R^2	0.850	0.829	0.849	0.825	0.845	0.822

Table A4: Green transition efforts and annual average Reprisk Index

This table examines the regressions of a firm's annual average Current Reprisk Index on its annual walk and talk efforts. *RRI_i* is a company's average Current Reprisk Index in year i. The sample only includes companies in industries with high numbers of green patents, where green transition is particularly important for the company. All regressions control for four other firm characteristics in year i: total assets, book-to-market ratio, leverage ratio, and return on assets. Columns (1), (3), and (5) include firm fixed effects and year fixed effects. Columns (2), (4), and (6) include firm fixed effects and industry-by-year fixed effects. T-statistics (with standard errors clustered by firm) are in parentheses, and *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. The overall adjusted R^2 is reported.

Dep. Var.	RRI_T	RRI_T	RRI_T+1	RRI_T+1	RRI_T+2	RRI_T+2
	(1)	(2)	(3)	(4)	(5)	(6)
walk_T	3.556	0.522	-10.72**	-12.89**	-19.07***	-16.22**
	(0.950)	(0.103)	(-2.343)	(-2.548)	(-2.911)	(-2.456)
talk_T	5.973	12.46	23.56*	37.82**	11.80	30.33**
	(0.614)	(1.163)	(1.743)	(2.264)	(0.814)	(2.092)
Controls	Y	Y	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y	Y	Y
Year FE	Y		Y		Y	
Ind-Year FE		Y		Y		Y
No. obs	1,158	1,091	1,045	991	945	897
Adj. R^2	0.703	0.710	0.709	0.716	0.724	0.726

Table A5: Green transition efforts and carbon emission intensity or energy consumption intensity

This table examines the regressions of a firm's annual carbon emission or energy consumption intensity on its annual walk and talk efforts. *G/at_i* represents a company's total Scope 1 and Scope 2 carbon emissions scaled by total assets in year i, while *G/sales_i* scales these emissions by sales revenue. Similarly, *E/at_i* is energy consumption scaled by total assets, and *E/sales_i* scales energy consumption by sales revenue. Panels A and C use the two carbon emission intensity measures as the dependent variable, while Panels B and D use the two energy consumption intensity measures. All regressions control for four other firm characteristics in year i: total assets, book-to-market ratio, leverage ratio, and return on assets. Panels A and B include firm fixed effects and industry-by-year fixed effects, whereas Panels C and D include only industry-by-year fixed effects. T-statistics (with standard errors clustered by firm) are in parentheses, and *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. The overall adjusted R^2 is reported.

Panel A: Carbon emission intensity from year T to T+2, with firm fixed effects						
Dep. Var.	G/at_T	G/at_T+1	G/at_T+2	G/sales_T	G/sales_T+1	G/sales_T+2
	(1)	(2)	(3)	(4)	(5)	(6)
walk_T	0.288*	0.288*	0.172	0.256*	0.127	0.0610
	(1.920)	(1.888)	(1.229)	(1.651)	(0.808)	(0.432)
talk_T	-0.218	-0.362	-0.431	0.0935	-0.230	-0.106
	(-0.528)	(-0.943)	(-1.336)	(0.209)	(-0.554)	(-0.272)
Controls	Y	Y	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y	Y	Y
Ind-Year FE	Y	Y	Y	Y	Y	Y
No. obs	5,065	4,787	4,509	5,065	4,790	4,512
Adj. R^2	0.981	0.982	0.982	0.981	0.981	0.981
Panel B: Energy consumption intensity from year T to T+2, with firm fixed effects						
Dep. Var.	E/at_T	E/at_T+1	E/at_T+2	E/sales_T	E/sales_T+1	E/sales_T+2
	(1)	(2)	(3)	(4)	(5)	(6)
walk_T	0.148	0.123	0.0329	0.0841	-0.0566	-0.126
	(0.752)	(0.659)	(0.177)	(0.420)	(-0.301)	(-0.635)
talk_T	-0.466	-0.296	0.319	-0.281	-0.236	0.623
	(-0.841)	(-0.450)	(0.388)	(-0.466)	(-0.340)	(0.709)
Controls	Y	Y	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y	Y	Y
Ind-Year FE	Y	Y	Y	Y	Y	Y
No. obs	4,249	4,032	3,827	4,251	4,034	3,829
Adj. R^2	0.960	0.960	0.961	0.951	0.951	0.951

Table A5: Green transition efforts and carbon emission intensity or energy consumption intensity (Continued)

This table examines the regressions of a firm's annual carbon emission or energy consumption intensity on its annual walk and talk efforts. *G/at_i* represents a company's total Scope 1 and Scope 2 carbon emissions scaled by total assets in year i, while *G/sales_i* scales these emissions by sales revenue. Similarly, *E/at_i* is energy consumption scaled by total assets, and *E/sales_i* scales energy consumption by sales revenue. Panels A and C use the two carbon emission intensity measures as the dependent variable, while Panels B and D use the two energy consumption intensity measures. All regressions control for four other firm characteristics in year i: total assets, book-to-market ratio, leverage ratio, and return on assets. Panels A and B include firm fixed effects and industry-by-year fixed effects, whereas Panels C and D include only industry-by-year fixed effects. T-statistics (with standard errors clustered by firm) are in parentheses, and *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. The overall adjusted R^2 is reported.

Panel C: Carbon emission intensity from year T to T+2, without firm fixed effects						
Dep. Var.	G/at_T	G/at_T+1	G/at_T+2	G/sales_T	G/sales_T+1	G/sales_T+2
	(1)	(2)	(3)	(4)	(5)	(6)
walk_T	1.739***	1.716***	1.844***	1.706***	1.672***	1.826***
	(4.458)	(3.864)	(4.186)	(4.429)	(3.860)	(4.200)
talk_T	-4.600***	-4.564***	-5.206***	-4.145***	-4.393***	-4.909***
	(-3.141)	(-2.802)	(-3.546)	(-2.803)	(-2.797)	(-3.049)
Controls	Y	Y	Y	Y	Y	Y
Firm FE	N	N	N	N	N	N
Ind-Year FE	Y	Y	Y	Y	Y	Y
No. obs	5,260	4,986	4,697	5,261	4,987	4,698
Adj. R^2	0.767	0.763	0.762	0.772	0.767	0.765
Panel D: Energy consumption intensity from year T to T+2, without firm fixed effects						
Dep. Var.	E/at_T	E/at_T+1	E/at_T+2	E/sales_T	E/sales_T+1	E/sales_T+2
	(1)	(2)	(3)	(4)	(5)	(6)
walk_T	2.102***	2.050***	2.245***	2.164***	2.112***	2.325***
	(4.188)	(3.978)	(4.263)	(4.386)	(4.180)	(4.550)
talk_T	-6.048***	-5.590***	-6.146***	-5.688***	-5.272**	-5.974***
	(-3.135)	(-2.828)	(-3.097)	(-2.814)	(-2.552)	(-2.931)
Controls	Y	Y	Y	Y	Y	Y
Firm FE	N	N	N	N	N	N
Ind-Year FE	Y	Y	Y	Y	Y	Y
No. obs	4,433	4,220	4,012	4,433	4,220	4,012
Adj. R^2	0.712	0.712	0.712	0.683	0.680	0.682

Appendix E: Additional tables

Table A6: List of variables and definitions

Var.	Name	Definition
walk	12-month walk efforts	The proportion of job postings relevant to substantive environmental improvements among all job postings posted by a company in a year T
talk	12-month talk efforts	The proportion of job postings relevant to environmental communication among all job postings posted by a company in a year T
disclose	disclosure completeness	Bloomberg environmental disclosure score of a company in a year
pollution	toxic chemical emission	The natural logarithm of one plus the total toxic chemical emission reported to TRI by a company in a year, each chemical is separately reported
intensity	toxic chemical emission intensity	The natural logarithm of one plus the TRI toxic chemical emission intensity by a company in a year, intensity is the total toxic chemical emission divided by the cumulative production ratio
RSEIScore	RSEI health risk score	The natural logarithm of one plus the relative risk-related impacts to human health from each facility's emission of each chemical in a year
RSEIHazard	RSEI toxicity-weighted pounds	RSEI Modeled Hazard is a screening-level metric designed to be the primary descriptor of relative potential hazard to human health, used for comparative and trend analysis. In this study, I use the natural logarithm of one plus the original RSEI Modeled Hazard.
Article8 agg.	Aggregate ownership stake by Article 8 funds	The aggregate number of shares held by Article 8 funds on a fund portfolio holding report date, scaled by the stock's shares outstanding on the same date. The unit is ‰. If a fund does not report its holdings for a particular month, the most recent value from the previous two months is forward-filled for that month.
Article9 agg.	Aggregate ownership stake by Article 9 funds	The aggregate number of shares held by Article 9 funds on a fund portfolio holding report date, scaled by the stock's shares outstanding on the same date. The unit is ‰. If a fund does not report its holdings for a particular month, the most recent value from the previous two months is forward-filled for that month.
US ESG agg.	Aggregate ownership stake by US ESG funds	The aggregate number of shares held by US ESG funds on a fund portfolio holding report date, scaled by the stock's shares outstanding on the same date. The unit is ‰. If a fund does not report its holdings for a particular month, the most recent value from the previous two months is forward-filled for that month.

Table A6: List of variables and definitions (continued)

Var.	Name	Definition
Article8 weight	Portfolio weight of individual Article 8 fund	The percentage of an Article 8 fund's portfolio that is invested in a specific stock on the report date. The unit is %. If a fund does not report its holdings for a particular month, the most recent value from the previous two months is forward-filled for that month.
Article9 weight	Portfolio weight of individual Article 9 fund	The percentage of an Article 9 fund's portfolio that is invested in a specific stock on the report date. The unit is %. If a fund does not report its holdings for a particular month, the most recent value from the previous two months is forward-filled for that month.
US ESG weight	Portfolio weight of individual US ESG fund	The percentage of a US ESG fund's portfolio that is invested in a specific stock on the report date. The unit is %. If a fund does not report its holdings for a particular month, the most recent value from the previous two months is forward-filled for that month.
Article8 share	Ownership stake by individual Article 8 fund	The number of shares an Article 8 fund holds on a stock at a fund portfolio report date, scaled by the stock's shares outstanding on the same date. The unit is ‰.
Article9 share	Ownership stake by individual Article 9 fund	The number of shares an Article 9 fund holds on a stock at a fund portfolio report date, scaled by the stock's shares outstanding on the same date. The unit is ‰.
US ESG share	Ownership stake by individual US ESG fund	The number of shares a US ESG fund holds on a stock at a fund portfolio report date, scaled by the stock's shares outstanding on the same date. The unit is ‰.
MSCI	MSCI KLD environmental rating	Net environmental score calculated with MSCI KLD data following the method of Lins, Servaes, and Tamayo (2017), which first divides the sum of strengths (concerns) by the maximum number of strengths (concerns) possible in reporting year and then subtracts the concerns index from the strengths index.
Sus New	Sustainalytics environmental score - new method	Monthly Sustainalytics environmental risk score from Morningstar. This subsample, starting from September 2019, measure a company's unmanaged environmental risk.
Sus Old	Sustainalytics environmental score - old method	Monthly Sustainalytics environmental risk score from Morningstar. This subsample, until August 2019, measure a company's environmental performance.
emissions	Refinitiv score on emissions	Score on emissions subcategory given by Refinitiv for a company in a year
innovation	Refinitiv score on innovation	Score on innovation subcategory given by Refinitiv for a company in a year
resource use	Refinitiv score on resource use	Score on resource use subcategory given by Refinitiv for a company in a year

Table A6: List of variables and definitions (continued)

Var.	Name	Definition
US ESG fund flow	monthly fund flow	Monthly AUM at time T minus (monthly AUM at time T-1*(1+0.01*monthly fund return at time T), scaled by monthly AUM at T-1. The value is in percentage points.
US ESG fund return	monthly fund return	Monthly fund return at time T, net of fund expenses, expressed in percentage points.
Sustainability Rating	Morningstar Sustainability Rating	Morningstar assigns Sustainability Ratings by combining a fund portfolio's Corporate Sustainability Rating and Sovereign Sustainability Rating proportional to the relative weight of the (long only) corporate and sovereign positions. Funds are ranked within each peer group categorized by their portfolio assets. The value ranges from 1 to 5, with 5 being the most sustainable.
Sustainability Rank	Corporate Sustainability Percent Rank	A portfolio's percent rank within its Global Category, based on its Portfolio Corporate Sustainability Score, provided by Morningstar.
log_at	total assets	Natural log of average quarterly total assets in a year
bm_fyear	book-to-market ratio - fiscal year	Book value of equity (ceq) divided by end of fiscal year-end market capitalization
lev_fyear	leverage ratio - fiscal year	Total liabilities (lt) divided by fiscal year-end market capitalization
roa_fyear	return on assets - fiscal year	Income before extraordinary items (ibq) divided by one quarter lagged total assets (atq)
mve	market capitalization	Natural log of market capitalization at end of month t -1
bm	book-to-market ratio - investor	Book value of equity (ceq) divided by end of fiscal year-end market capitalization, the lastest value at end of month t-1
mom1m	1-month reversal	1-month cumulative return in month t-1
nanalyst	number of analysts	Number of analyst forecasts from most recently available I/B/E/S summary files in month t-1. nanalyst set to zero if not covered in I/B/E/S summary file
roa	return on assets - investor	Income before extraordinary items (ibq) divided by one quarter lagged total assets (atq), the latest value at end of month t-1
lev	leverage ratio - investor	Total liabilities (lt) divided by fiscal year-end market capitalization, the latest value at end of month t-1
ep	earnings-to-price ratio	Annual income before extraordinary items (ib) divided by end of fiscal year market cap, the latest value at end of month t-1
baspread	bid-ask spread	Monthly average of daily (bid-ask spread divided by average of bid and ask) in month t-1

Table A6: List of variables and definitions (continued)

Var.	Name	Definition
IPC	green patent via IPC method	The natural logarithm of one plus the number of green patents granted to a company in a year, green patents are classified with the IPC method
CPC	green patent via CPC method	The natural logarithm of one plus the number of green patents granted to a company in a year, green patents are classified with the CPC method
G/at	carbon intensity - assets	The natural logarithm of one plus the metric tonnes of greenhouse gases per million of assets in the company's reporting currency. The ratio is calculated as Total GHG Emissions*1000 / Total Assets, or Total CO2 Emissions*1000 / Total Assets by Bloomberg
G/sales	carbon intensity - revenue	The natural logarithm of one plus the metric tonnes of greenhouse gases emitted per million of sales revenue in the company's reporting currency. The ratio is calculated as Total GHG Emissions*1000 / Sales, or Total CO2 Emissions*1000 / Sales by Bloomberg
E/at	energy consumption intensity - assets	The natural logarithm of one plus the megawatt hours of energy consumed per million of assets in the company's reporting currency. The ratio is calculated as Energy Consumption*1000 / Total Assets by Bloomberg
E/sales	energy consumption intensity - revenue	The natural logarithm of one plus the megawatt hours of energy consumed per million of sales revenue in the company's reporting currency. The ratio is calculated as Energy Consumption*1000 / Sales by Bloomberg
recycle	recycled waste percentage	Percentage of waste generated by the company that is recycled. Taken as reported by the company or if not disclosed, calculated as: (Waste Recycled / Total Waste) * 100 by Bloomberg
hazard	hazardous waste percentage	Percentage of hazardous waste out of total waste the company discards in the reporting year. Taken as reported by the company or if not disclosed, calculated as: (Hazardous Waste / Total Waste) * 100 by Bloomberg
RRI	annual average Reprisk Index	Average daily Current Reprisk Index of a company in a year

Table A7: List of 204 green occupations.

Efforts	Always	O*NET Title	O*NET code
Talk	0	marketing managers	11-2021.00
Talk	0	regulatory affairs managers	11-9199.01
Talk	0	regulatory affairs specialists	13-1041.07
Talk	0	financial analysts	13-2051.00
Talk	0	personal financial advisors	13-2052.00
Talk	0	financial quantitative analysts	13-2099.01
Talk	0	risk management specialists	13-2099.02
Talk	0	investment underwriters	13-2099.03
Talk	0	reporters and correspondents	27-3022.00
Talk	0	public relations specialists	27-3031.00
Talk	0	energy brokers	41-3099.01
Talk	0	sales representatives wholesale and manufacturing technical and scientific products	41-4011.00
Talk	0	customer service representatives	43-4051.00
Talk	0	shipping receiving and traffic clerks	43-5071.00
Talk	1	green marketers	11-2011.01
Talk	1	energy auditors	13-1199.01
Talk	1	environmental economists	19-3011.01
Talk	1	solar sales representatives and assessors	41-4011.07
Walk	0	general and operations managers	11-1021.00
Walk	0	industrial production managers	11-3051.00
Walk	0	transportation managers	11-3071.01
Walk	0	storage and distribution managers	11-3071.02
Walk	0	logistics managers	11-3071.03
Walk	0	farm and ranch managers	11-9013.02
Walk	0	construction managers	11-9021.00
Walk	0	architectural and engineering managers	11-9041.00
Walk	0	natural sciences managers	11-9121.00
Walk	0	compliance managers	11-9199.02
Walk	0	supply chain managers	11-9199.04
Walk	0	buyers and purchasing agents farm products	13-1021.00
Walk	0	wholesale and retail buyers except farm products	13-1022.00
Walk	0	logistics engineers	13-1081.01
Walk	0	logistics analysts	13-1081.02
Walk	0	training and development specialists	13-1151.00
Walk	0	software developers systems software	15-1133.00
Walk	0	geospatial information scientists and technologists	15-1199.04
Walk	0	geographic information systems technicians	15-1199.05
Walk	0	architects except landscape and naval	17-1011.00
Walk	0	landscape architects	17-1012.00
Walk	0	aerospace engineers	17-2011.00
Walk	0	chemical engineers	17-2041.00
Walk	0	civil engineers	17-2051.00
Walk	0	transportation engineers	17-2051.01
Walk	0	electrical engineers	17-2071.00

Table A7: The list of 204 green jobs (continued).

Efforts	Always	O*NET Title	O*NET code
Walk	0	electronics engineers except computer	17-2072.00
Walk	0	industrial engineers	17-2112.00
Walk	0	mechanical engineers	17-2141.00
Walk	0	fuel cell engineers	17-2141.01
Walk	0	automotive engineers	17-2141.02
Walk	0	biochemical engineers	17-2199.01
Walk	0	validation engineers	17-2199.02
Walk	0	manufacturing engineers	17-2199.04
Walk	0	mechatronics engineers	17-2199.05
Walk	0	microsystems engineers	17-2199.06
Walk	0	photonics engineers	17-2199.07
Walk	0	robotics engineers	17-2199.08
Walk	0	nanosystems engineers	17-2199.09
Walk	0	architectural drafters	17-3011.01
Walk	0	electronics engineering technicians	17-3023.01
Walk	0	electrical engineering technicians	17-3023.03
Walk	0	electromechanical technicians	17-3024.00
Walk	0	robotics technicians	17-3024.01
Walk	0	industrial engineering technicians	17-3026.00
Walk	0	automotive engineering technicians	17-3027.01
Walk	0	electrical engineering technologists	17-3029.02
Walk	0	electromechanical engineering technologists	17-3029.03
Walk	0	electronics engineering technologists	17-3029.04
Walk	0	industrial engineering technologists	17-3029.05
Walk	0	manufacturing engineering technologists	17-3029.06
Walk	0	mechanical engineering technologists	17-3029.07
Walk	0	photonics technicians	17-3029.08
Walk	0	manufacturing production technicians	17-3029.09
Walk	0	fuel cell technicians	17-3029.10
Walk	0	nanotechnology engineering technologists	17-3029.11
Walk	0	nanotechnology engineering technicians	17-3029.12
Walk	0	chemists	19-2031.00
Walk	0	materials scientists	19-2032.00
Walk	0	geoscientists except hydrologists and geographers	19-2042.00
Walk	0	remote sensing scientists and technologists	19-2099.01
Walk	0	urban and regional planners	19-3051.00
Walk	0	transportation planners	19-3099.01
Walk	0	agricultural technicians	19-4011.01
Walk	0	chemical technicians	19-4031.00
Walk	0	geophysical data technicians	19-4041.01
Walk	0	geological sample test technicians	19-4041.02
Walk	0	remote sensing technicians	19-4099.03
Walk	0	arbitrators mediators and conciliators	23-1022.00
Walk	0	farm and home management advisors	25-9021.00
Walk	0	commercial and industrial designers	27-1021.00

Table A7: The list of 204 green jobs (continued).

Efforts	Always	O*NET Title	O*NET code
Walk	0	occupational health and safety specialists	29-9011.00
Walk	0	occupational health and safety technicians	29-9012.00
Walk	0	securities and commodities traders	41-3031.03
Walk	0	freight forwarders	43-5011.01
Walk	0	dispatchers except police fire and ambulance	43-5032.00
Walk	0	production planning and expediting clerks	43-5061.00
Walk	0	firstline supervisors of logging workers	45-1011.05
Walk	0	firstline supervisors of agricultural crop and horticultural workers	45-1011.07
Walk	0	agricultural inspectors	45-2011.00
Walk	0	boilermakers	47-2011.00
Walk	0	construction carpenters	47-2031.01
Walk	0	rough carpenters	47-2031.02
Walk	0	cement masons and concrete finishers	47-2051.00
Walk	0	construction laborers	47-2061.00
Walk	0	operating engineers and other construction equipment operators	47-2073.00
Walk	0	electricians	47-2111.00
Walk	0	pipe fitters and steamfitters	47-2152.01
Walk	0	plumbers	47-2152.02
Walk	0	roofers	47-2181.00
Walk	0	sheet metal workers	47-2211.00
Walk	0	structural iron and steel workers	47-2221.00
Walk	0	helperscarpenters	47-3012.00
Walk	0	construction and building inspectors	47-4011.00
Walk	0	railtrack laying and maintenance equipment operators	47-4061.00
Walk	0	service unit operators oil gas and mining	47-5013.00
Walk	0	continuous mining machine operators	47-5041.00
Walk	0	firstline supervisors of mechanics installers and repairers	49-1011.00
Walk	0	electrical and electronics repairers commercial and industrial equipment	49-2094.00
Walk	0	automotive specialty technicians	49-3023.02
Walk	0	bus and truck mechanics and diesel engine specialists	49-3031.00
Walk	0	heating and air conditioning mechanics and installers	49-9021.01
Walk	0	refrigeration mechanics and installers	49-9021.02
Walk	0	industrial machinery mechanics	49-9041.00
Walk	0	millwrights	49-9044.00
Walk	0	electrical powerline installers and repairers	49-9051.00
Walk	0	maintenance and repair workers general	49-9071.00
Walk	0	helpersinstallation maintenance and repair workers	49-9098.00
Walk	0	firstline supervisors of production and operating workers	51-1011.00
Walk	0	aircraft structure surfaces rigging and systems assemblers	51-2011.00
Walk	0	electrical and electronic equipment assemblers	51-2022.00

Table A7: The list of 204 green jobs (continued).

Efforts	Always	O*NET Title	O*NET code
Walk	0	engine and other machine assemblers	51-2031.00
Walk	0	structural metal fabricators and fitters	51-2041.00
Walk	0	team assemblers	51-2092.00
Walk	0	computer controlled machine tool operators metal and plastic	51-4011.00
Walk	0	cutting punching and press machine setters operators and tenders metal and plastic	51-4031.00
Walk	0	drilling and boring machine tool setters operators and tenders metal and plastic	51-4032.00
Walk	0	machinists	51-4041.00
Walk	0	welders cutters and welder fitters	51-4121.06
Walk	0	solderers and brazers	51-4121.07
Walk	0	power distributors and dispatchers	51-8012.00
Walk	0	power plant operators	51-8013.00
Walk	0	stationary engineers and boiler operators	51-8021.00
Walk	0	chemical plant and system operators	51-8091.00
Walk	0	chemical equipment operators and tenders	51-9011.00
Walk	0	separating filtering clarifying precipitating and still machine setters operators and tenders	51-9012.00
Walk	0	mixing and blending machine setters operators and tenders	51-9023.00
Walk	0	inspectors testers sorters samplers and weighers	51-9061.00
Walk	0	bus drivers transit and intercity	53-3021.00
Walk	0	heavy and tractortrailer truck drivers	53-3032.00
Walk	0	locomotive engineers	53-4011.00
Walk	0	railroad conductors and yardmasters	53-4031.00
Walk	0	transportation vehicle equipment and systems inspectors except aviation	53-6051.07
Walk	0	industrial truck and tractor operators	53-7051.00
Walk	0	laborers and freight stock and material movers hand	53-7062.00
Walk	1	chief sustainability officers	11-1011.03
Walk	1	geothermal production managers	11-3051.02
Walk	1	biofuels production managers	11-3051.03
Walk	1	biomass power plant managers	11-3051.04
Walk	1	methanel and fill gas collection system operators	11-3051.05
Walk	1	hydroelectric production managers	11-3051.06
Walk	1	biofuels biodiesel technology and product development managers	11-9041.01
Walk	1	water resource specialists	11-9121.02
Walk	1	wind energy operations managers	11-9199.09
Walk	1	wind energy project managers	11-9199.10
Walk	1	brownfield redevelopment specialists and site managers	11-9199.11
Walk	1	sustainability specialists	13-1199.05

Table A7: The list of 204 green jobs (continued).

Efforts	Always	O*NET Title	O*NET code
Walk	1	environmental engineers	17-2081.00
Walk	1	water waste water engineers	17-2081.01
Walk	1	industrial safety and health engineers	17-2111.01
Walk	1	nuclear engineers	17-2161.00
Walk	1	energy engineers	17-2199.03
Walk	1	wind energy engineers	17-2199.10
Walk	1	solar energy systems engineers	17-2199.11
Walk	1	environmental engineering technicians	17-3025.00
Walk	1	soil and plant scientists	19-1013.00
Walk	1	zoologists and wildlife biologists	19-1023.00
Walk	1	soil and water conservationists	19-1031.01
Walk	1	atmospheric and space scientists	19-2021.00
Walk	1	environmental scientists and specialists including health	19-2041.00
Walk	1	climate change analysts	19-2041.01
Walk	1	environmental restoration planners	19-2041.02
Walk	1	industrial ecologists	19-2041.03
Walk	1	hydrologists	19-2043.00
Walk	1	nuclear equipment operation technicians	19-4051.01
Walk	1	environmental science and protection technicians including health	19-4091.00
Walk	1	forest and conservation technicians	19-4093.00
Walk	1	precision agriculture technicians	19-4099.02
Walk	1	fish and game wardens	33-3031.00
Walk	1	forest and conservation workers	45-4011.00
Walk	1	solar energy installation managers	47-1011.03
Walk	1	insulation workers floor ceiling and wall	47-2131.00
Walk	1	solar photovoltaic installers	47-2231.00
Walk	1	hazardous materials removal workers	47-4041.00
Walk	1	solar thermal installers and technicians	47-4099.02
Walk	1	weatherization installers and technicians	47-4099.03
Walk	1	wind turbine service technicians	49-9081.00
Walk	1	geothermal technicians	49-9099.01
Walk	1	nuclear power reactor operators	51-8011.00
Walk	1	biofuels processing technicians	51-8099.01
Walk	1	methanelandfill gas generation system technicians	51-8099.02
Walk	1	biomass plant technicians	51-8099.03
Walk	1	hydroelectric plant technicians	51-8099.04
Walk	1	recycling and reclamation workers	51-9199.01
Walk	1	recycling coordinators	53-1021.01
Walk	1	refuse and recyclable material collectors	53-7081.00

Table A8: 120 most frequent green keywords in job postings of the occupations whose greenness depends on context.

keyword	frequency	keyword	frequency	keyword	frequency
environmental	3160416	solar energy	29942	emission control system	11569
sustainability	728494	carbon footprint	29878	wind farm	10943
ecosystem	544264	energy saving	29556	conserving resource	10876
waste management	459134	material safety data sheet	26812	carbon dioxide	10669
epa	433908	hazardous waste management	25881	pollution control	10337
solar	399518	agronomy	25854	efficient energy use	10121
ehs	392383	eco friendly	24867	greenhouse gas	10047
recycling	390621	good laboratory practice	24734	enviva	9934
environmental health safety	262336	wildlife	23117	solar wind	9676
hazardous waste	237442	emission control	23058	sdgs	9575
wastewater	231425	recyclable material	23018	stormwater management	9575
renewable	226409	sustainable development	22603	energy waste	9386
environmentally	218038	waste recycling	21536	phmsa	9316
good manufacturing practice	194670	alternative fuel	20989	rwe	9142
renewable energy	147408	waste reduction	19693	sustainable transport	9109
water wastewater	142947	environmental remediation	19145	ghg	8845
conservation	121456	wind solar	19057	clean technology	8596
cleaner safer	120731	industrial hygienist	18597	net zero carbon	8406
energy efficiency	114695	photovoltaic	18584	sustainable practice	8390
clean energy	88181	environmental social governance	16803	spcc	8383
recycle	69370	alternative energy	16729	nepa	8330
environmental stewardship	69040	contaminant	16264	biogas	8230
energy conservation	68147	green initiative	16264	sustainable agriculture	7803
esg	68050	waste energy	16053	save energy	7796
renewables	62207	erosion control	15842	hydroelectric	7512
wastewater treatment	54667	cleaner energy	15482	one health	7099
fuel cell	53892	green building	15350	sustainable packaging	7081
waste based energy	50593	hazard analysis critical control point	15294	clean air act	7067
zero emission	50098	landfill gas	14923	sustainable material	7046
air quality	48740	dow jones sustainability index	14451	emission reduction	6932
electrification	48490	vehicle emission	13053	sustainable waste	6893
leed	46345	swppp	12660	nuclear safety	6834
covanta	44916	disposal recycling	12606	brownfield	6769
hazwoper	42673	energy transition	12530	landfill transfer	6733
climate change	37612	radiation safety	12351	iaq	6699
wind energy	33567	agronomic	12186	biodiesel	6691
recyclable	33553	renewable resource	12138	pollution prevention	6677
rcra	33443	sustainable development goal	12051	wetland	6674
wind turbine	31567	decarbonization	12034	psm rmp	6671
pollution	31422	indoor air quality	11932	greenhouse gas emission	6565

Table A9: Top 21 3-digit SIC industry codes with the highest number of green patents

SIC	Industry
131	Crude Petroleum & Natural Gas
138	Drilling Oil & Gas Wells, Oil & Gas Field Exploration Services, Oil & Gas Field Services, NEC
282	Plastic Material, Synthetic Resin/Rubber, Cellulosic (No Glass), Plastic Materials, Synthetic Resins & Nonvulcan Elastomers
283	Medicinal Chemicals & Botanical Products, Pharmaceutical Preparations, In Vitro & In Vivo Diagnostic Substances, Biological Products (No Diagnostic Substances)
287	Agricultural Chemicals
291	Petroleum Refining
351	Engines & Turbines
353	Construction, Mining & Materials Handling Machinery & Equipment, Construction Machinery & Equipment, Mining Machinery & Equipment (No Oil & Gas Field Machinery & Equipment), Oil & Gas Field Machinery & Equipment, Industrial Trucks, Tractors, Trailers & Stackers
355	Special Industry Machinery (No Metalworking Machinery), Printing Trades Machinery & Equipment, Special Industry Machinery, NEC
357	Computer & Office Equipment, Electronic Computers, Computer Storage Devices, Computer Terminals, Computer Communications Equipment, Computer Peripheral Equipment, NEC, Calculating & Accounting Machines (No Electronic Computers), Office Machines, NEC
365	Household Audio & Video Equipment, Phonograph Records & Prerecorded Audio Tapes & Disks
367	Electronic Components & Accessories, Printed Circuit Boards, Semiconductors & Related Devices, Electronic Coils, Transformers & Other Inductors, Electronic Connectors, Electronic Components, NEC
369	Miscellaneous Electrical Machinery, Equipment & Supplies, Magnetic & Optical Recording Media
371	Motor Vehicles & Passenger Car Bodies, Truck & Bus Bodies, Motor Vehicle Parts & Accessories, Truck Trailers, Motor Homes
372	Aircraft & Parts, Aircraft Engines & Engine Parts, Aircraft Parts & Auxiliary Equipment, NEC
376	Guided Missiles & Space Vehicles & Parts
384	Surgical & Medical Instruments & Apparatus, Orthopedic, Prosthetic & Surgical Appliances & Supplies, Dental Equipment & Supplies, X-Ray Apparatus & Tubes & Related Irradiation Apparatus, Electromedical & Electrotherapeutic Apparatus
386	Photographic Equipment & Supplies
481	Radiotelephone Communications, Telephone Communications (No Radiotelephone)
506	Wholesale-Electrical Apparatus & Equipment, Wiring Supplies, Wholesale-Electrical Appliances, TV & Radio Sets, Wholesale-Electronic Parts & Equipment, NEC
737	Services-Computer Programming, Data Processing, Etc., Services-Computer Programming Services, Services-Prepackaged Software, Services-Computer Integrated Systems Design, Services-Computer Processing & Data Preparation, Services-Computer Rental & Leasing