

Implications of introducing investor-focused ESG reporting

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Abstract: Firms and jurisdictions are increasingly adopting ESG reporting, driving a growing empirical literature on the consequences of ESG reporting for investors, firms, and other stakeholders. We develop a model to understand the nuanced effects of the introduction of outcome-based ESG reporting. In our model, a firm provides ESG and financial reports, which investors use to price the firm's stock, influencing management's real and reporting incentives. We characterize how investors respond to new ESG reporting; how the introduction of ESG reports affects stock prices and market responses to financial disclosures; and trace these effects to managerial decisions, ESG performance, expected cash flows, and misreporting. We provide conditions under which the introduction of ESG reporting discourages corporate ESG, and under which it encourages corporate ESG but lowers the equity price at the same time. Comparative statics show how investor preferences (e.g., concern for ESG) affect real outcomes and market responses to reports. We discuss empirical implications of our results and how our model can be applied to settings involving non-ESG disclosures.

Keywords: ESG reporting, ESG valuation, stock price, earnings response coefficients

JEL Classification: G11, G23, G34, M14, M40

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1 Introduction

Mandatory environmental, social, and governance (ESG) disclosures by corporations are becoming a reality in jurisdictions around the world.¹ The effects of the adoption of ESG reporting are of interest to policy-makers, standard-setters, researchers, and corporate managers.² But despite the good intentions of the various parties behind the spread of ESG reporting, many of the potential effects of ESG reporting—on cash flows, ESG performance, stock prices, greenwashing, and financial misreporting incentives—are nuanced and may be subject to unintended consequences or erroneous inferences.

To better understand the potential effects and implications of ESG reporting, we develop a stylized model that captures what we believe are the key forces relevant to ESG reporting in a capital market setting. A publicly traded firm faces different types of investors: all investors value cash flows, and a subset of investors also directly value ESG performance. The firm’s manager, who cares about the firm’s stock price, takes actions that affect both ESG and cash flow performance, and issues financial and ESG reports to investors. The focal action improves cash flows but can have ESG effects that are either positive (e.g., a low-cost renewable electricity source) or negative (e.g., a high-polluting production process).

Our first set of analyses explores a benchmark in which the firm issues only a financial report regarding financial performance, consistent with the current mandatory reporting environment in the U.S. and for many firms globally. Absent ESG reporting, investors use

¹For instance, the Corporate Sustainability Reporting Directive (CSRD) in the European Union has entered into force ([European Commission, 2024](#)); climate disclosure and assurance in California are effective for large companies as of 2026 ([Ernst & Young, 2026](#)); in China, three main stock exchanges require large companies to publish sustainability reports by 2026 (e.g. [Lee, 2024](#); [Ernst & Young, 2025](#)); roughly 30 jurisdictions worldwide have either adopted or taken steps to adopt IFRS Sustainability Standards into their mandatory reporting environment ([Deloitte, 2025](#)); the SEC in 2024 adopted a rule requiring certain climate-related disclosures starting in 2026, but the rule was stayed, and in May 2026 the SEC proposed to rescind these rules ([Berry, 2026](#)).

Note that while we use the term ESG, our analysis can also be interpreted as capturing aspects of corporate sustainability, corporate social responsibility (CSR), specific dimensions of environmental or social performance, or other externalities potentially valued by some investors. Recently, such activities have also been referred to as related to ‘resilience’ ([Khan, 2025](#)).

²For discussions of the recent ESG literature, see [Grewal and Serafeim \(2020\)](#), [Christensen et al. \(2021\)](#), and [Friedman and Ormazabal \(2024\)](#).

the financial report to learn about both cash flows and the ESG performance of the firm: cash-flow-only-interested investors learn about financial performance; ESG-valuing investors make inferences about the firm’s ESG performance through its relation with reported cash flows. The price reaction to the financial report combines these two learning channels and feeds back into the manager’s action choice. The manager adjusts her actions both to influence cash flows and to influence the inference that ESG-valuing investors make about ESG performance from the cash flow information contained in financial reports.

Next, we introduce outcome-based ESG reporting. Because investors can learn about realized ESG performance from the financial report, the ESG report provides an incremental rather than a completely novel signal about firm performance.³ Furthermore, because underlying corporate activities affect both cash flows and ESG performance, the ESG report is informative about cash flows as well. As with any additional signal, the ESG report can thus change how investors use the financial report, i.e., how they update beliefs based on it and consequently how prices react to it. The underlying symmetry is straightforward: if a financial report is informative about ESG performance, then an ESG report will convey information about financial performance.⁴

To provide guidance on how newly introduced ESG reporting can affect firms and investors, we compare equilibria for the financial-report-only and financial-and-ESG-reports settings. We describe when and why, i.e., for what parameters: 1) market reactions to ESG reports (ESG response coefficients, ESG-RCs) are positive or negative; 2) market reactions to financial reports (earnings response coefficients, ERCs) increase or decrease; and 3) stock prices are expected to increase or decrease.

ESG reports are higher, in expectation, when the firm’s ESG performance is higher. However, because ESG reports also convey information about cash flows, ESG-RCs can be

³This is a nontrivial point that has recently been emphasized in the empirical literature, notably contrasting Bolton and Kacperczyk (2021, 2023) with Zhang (2025), where the former find that emissions predict returns, while the latter finds that this effect is attributable to the relation between emissions data released at a significant lag and financial performance (e.g., sales).

⁴The presence of a capital market with ESG-valuing investors distinguishes our model from prior models featuring multiple performance signals (e.g. Holmstrom and Milgrom, 1991; Feltham and Xie, 1994).

negative if the correlation between ESG and cash flow performance is negative and investors, in aggregate, care more about the cash flow implications than the ESG implications. This happens, in particular, when the fraction of ESG-valuing investors is relatively low. In turn, when the fraction is high, the ESG-RC can be positive even when the implications for cash flows are negative, because investors' net reaction is driven by the ESG implications of the report.

The effects of introducing ESG reporting on ERCs are more nuanced, because they depend on a set of forces. In particular, when cash flows and ESG performance are positively correlated, all investors reduce their weight on the financial report when they also have an ESG report available. However, when ESG externalities are negative, this is no longer the case; the ERC can increase as a result of introducing ESG reporting. The reason is that ESG investors, without an ESG report, place a negative weight on the financial report. When the ESG report is released, this negative weight is reduced, and the ERC increases. That is, the ERC increases not because the financial report is more informative about cash flows, but because it provides less incremental information about the firm's ESG performance.

We examine implications of introducing ESG reporting for ex-ante price, i.e., the stock price before the release of disclosures. Focusing on ex-ante price allows us to abstract away from the average effects of disclosures on prices and increases in price driven by straightforward reductions in risk premiums. Our results emphasize how prices change in anticipation of ESG reporting, which can be empirically affected by variation in plans and probabilities of future ESG reporting mandates, for instance.

We find that the effects of introducing ESG reporting on ex-ante stock price are driven by changes in expected cash flow and ESG performance. These in turn are determined by changes in market incentives that our focal firm faces due to anticipated market reactions to financial and ESG reports. Nonetheless, the relations between the three focal outcomes (ESG-RC, ERC, and ex-ante prices) can be nuanced.

In a setting where the manager can only affect cash flows, the price of the firm tends

to be positively related to the ERC. In our setting, this need not be the case. Specifically, when improving cash flows carries a negative externality (i.e., decreases the firm’s ESG performance) and a sufficient proportion of investors care about ESG, an increase in the ERC arises together with a positive ESG-RC. The manager will then increase the firm’s expected ESG performance by lowering cash flows, possibly beyond what the average investor prefers. As a result, an increased ERC can occur together with a decrease in expected cash flows and a decrease in price. This potential for ESG reporting to decrease *ex-ante* price (while increasing ESG performance) is our most surprising theoretical result.

Many empirical studies have examined consequences of introducing ESG reporting (e.g., [Chen et al., 2018](#); [Grewal et al., 2022](#); [Krueger et al., 2024](#)). Our results so far suggest caution when interpreting documented effects of ESG reporting. First, changes in ERCs should not be seen as *prima facie* evidence of changes in the quality of financial reporting; ERCs change when the ESG report is introduced even though we hold the quality of financial reporting fixed.⁵ Second, a positive stock price reaction to the introduction of ESG reporting does not imply that investors, on average, would like greater ESG performance. This is explicitly not the case when the firm’s action has a moderately negative ESG impact. Third, the ESG-RC may not be directly informative about whether the underlying activity is good for ESG or financial performance. Instead, the ESG-RC depends on what information is provided *incrementally*, not in isolation.

An important driver of variation in our results is the effect of the firm’s activities on ESG performance (e.g., positive or negative externalities), which has non-trivial policy implications. If a policy-maker’s goal is to provide ESG-relevant information to investors, then mandatory ESG reporting might seem more important when the firm’s actions have larger externalities (positive or negative). However, large ESG effects of the firm’s activities imply that financial reports are already informative about the firm’s externalities. This reduces the incremental informativeness of new ESG-specific reports. If the policy goal is instead

⁵See [Petrov and Stocken \(2024\)](#), discussed below, for an alternative model in which the introduction of ESG reporting can explicitly and directly improve the quality of financial reporting.

to encourage ESG activities, such as greenhouse-gas-emissions reductions, our implications are more subtle. ESG reporting can backfire when the ESG report is used primarily to infer cash-flow losses: in that case, market incentives may lead the manager to increase the cash-flow-enhancing action, reducing ESG performance. Thus, the model cautions against targeting ESG-reporting mandates solely on the basis of externality size.

In addition to real effects of introducing ESG reporting, we study implications for financial misreporting and greenwashing/greenhushing (i.e., ESG report manipulation). We find that introducing ESG reporting tends to provide incentives to improve ESG performance and greenwash negative externalities. That is, ESG performance and greenwashing increase in the ESG-RC. This implies that corporations' exaggeration of their ESG performance is more likely when their actual ESG efforts are also higher.⁶ In contrast, financial misreporting is primarily motivated by the ERC. Introducing ESG reporting tends to exacerbate (mitigate) financial misreporting when it is associated with an increase (decrease) in the ERC. This implies that firms with very negative externalities will increase financial misreporting and at the same time greenwash their ESG reports, whereas firms with positive externalities will greenwash their ESG reports but reduce their financial misreporting. In other words, for empirical studies on the impact of mandatory ESG reporting on misreporting, it is important to account for the impact of the firms' activities on their ESG performance.

In the last part of the paper, we discuss empirical applications of the predictions from our model. As noted above, we complement the growing empirical literature exploring the introduction of ESG reporting. Several of the mandated ESG reporting rules are amenable to empirical exploration, as they feature size-based thresholds useful for regression discontinuity designs or have advanced in stages, which allows for exploration of market reactions to changes in the probability of passage or degree of reporting required (e.g., from court challenges or regulatory adjustments such as the EU Sustainability Omnibus passed in February 2026).

⁶For an example of investors and regulators realizing this phenomenon, see [AMBA \(2023\)](#).

We also discuss applications outside of the ESG space. The key elements of our model are: 1) investor disagreement about the value implications of certain corporate activities; and 2) disclosures about these activities. These key elements plausibly apply in several other domains, in which the ‘certain corporate activities’ featuring disagreement and disclosure could be, for instance, R&D investments, long-term moonshots, tax-planning strategies, digital asset holdings, or executive compensation.

2 Related Literature

Our model builds on the recent and rapidly expanding literature on ESG reporting. It also incorporates features from other literature streams involving multiple performance measures, investor disagreement, and real effects.

We begin our review of related literature with a discussion of ESG investors. Central to our analysis is that some investors who receive reports incorporate their beliefs about the firm’s ESG when forming their demand, as in [Friedman and Heinle \(2016\)](#). [Pástor et al. \(2020\)](#) show that investors’ tastes for green holdings affect asset prices in equilibrium, and their effects on returns can be represented by a green factor. [Zerbib \(2022\)](#) develops an asset-pricing model where ESG performance is priced due to the impact of two investor groups: those that exclude certain assets from their investment options and those that internalize private costs of externalities in their expected returns. These investors cause two types of premia to occur: taste premia and exclusion premia. [Pedersen et al. \(2020\)](#) analyze an economy where the ESG score contains information related to firm fundamentals and some investors have preferences about firms’ non-financial performance. They show that in equilibrium, prices of assets satisfy a four-fund separation theorem incorporating both financial and ESG performance. [Chowdhry et al. \(2019\)](#), [Oehmke and Opp \(2025\)](#), and [Friedman et al. \(2026\)](#) derive conditions for impact investment to affect social outcomes when some investors value impact as well as cash flows. Experimental and survey evidence supports

the existence of such preferences: [Riedl and Smeets \(2017\)](#) attribute socially responsible holdings to social preferences and social signaling rather than financial motives, and [Bauer et al. \(2021\)](#) find that two-thirds of pension fund members favor sustainable investment even when they expect lower returns.

Prior studies have examined how trading activity and investor engagement affect firms’ ESG performance. [Landier and Lovo \(2025\)](#) show how the policy of an ESG fund encourages companies to internalize (at least partially) their externalities, focusing on the importance of whether underlying investors’ preferences are driven by values-alignment or impact-seeking. [Green and Roth \(2025\)](#) derive optimal strategies for social investors to maximize social welfare in an environment of competition between commercial and social investors. [De Angelis et al. \(2022\)](#) show how companies’ greenhouse gas emissions can be reduced through the increase in the cost of capital for those companies, wherein the cost of capital becomes more sensitive to emissions as the share of green investors and environmental stringency increase. Concurrent studies have also incorporated real effects of investor, competitor, and customer responses to firms’ ESG disclosures (see, e.g., [Goldstein et al. \(2022\)](#) and [Xue \(2025\)](#), which feature rational expectations equilibria, and [Fritz \(2023\)](#), which focuses on disclosures to customers and competitors). Our model features real effects whereby price responses to reports encourage both real activities and reporting choices (e.g., [Kanodia, 2007](#)). Our analysis illustrates how market reactions to ESG reports, in the presence of financial reports that also provide information about the firm’s ESG performance, can provide incentives to managers to alter their firms’ ESG performance.⁷

⁷Several studies have noted potential unintended consequences of disclosure and capital market pressure related to ESG performance, including inefficient investment or risk sharing, shifting of emissions to geographic areas, subsidiaries, suppliers, peer firms, or unlisted competitors where they are less likely to be scrutinized (e.g., [Aghamolla and An, 2024](#); [Bartram et al., 2022](#); [Hartzmark and Shue, 2022](#); [Laux and Mahieux, 2026](#); [Mahieux et al., 2025](#); [Smith, 2023](#); [Xiong and Jiang, 2025](#)). Evidence from other stakeholder markets is more mixed. [Bartling et al. \(2015\)](#) find a price premium for clean products that survives seller competition and limited consumer information, while [Hainmueller et al. \(2015\)](#) show that a similar premium is thin and collapses as prices rise; [Leonelli et al. \(2025\)](#) and [Beyer et al. \(2024\)](#) find that consumer responses to ESG disclosure are generally small and depend heavily on the format of the information. In labor markets, [Burbano \(2016\)](#) finds that workers accept substantially lower wages once they learn that an employer is socially responsible, while [Colonnelli et al. \(2024\)](#) show that highlighting corporate responsibility can backfire when it draws attention to a dimension on which priors are negative.

Our results are consistent with prior studies’ evidence on the real effects of ESG disclosures. A number of studies show that companies subject to mandatory or standardized ESG disclosure regimes reduced their emissions (Chen et al., 2018; Grewal et al., 2022; Downar et al., 2021; Yang et al., 2021; Bochkay et al., 2023) and improved ESG performance (Fiechter et al., 2022; Christensen et al., 2019), consistent with our prediction that the introduction of ESG reporting can increase expected ESG performance as long as the effect of ESG performance on the firm’s cash flows is not too negative. Consistent with our setup, Yang et al. (2021) find that stock prices can motivate firms to change their ESG-related behavior. Wang (2023) finds similar results when focusing on lending-related incentives: corporate U.S. borrowers of non-U.S. banks that are exposed to ESG disclosure regulations improve their environmental and social performance.⁸ Thomas et al. (2022) highlight the trade-off between cash flows and ESG performance that some companies face, and how the pressure to beat a financial reporting benchmark pushes the firms to choose financial over non-financial performance. Banerjee et al. (2025) show how investment in projects with systematic factor (e.g., climate) exposure alters the content of price feedback the manager receives: the price informs the manager both about the project’s cash flows and its discount rate. How systematic factor exposure affects investment behavior differs substantially depending on the firm manager’s objective function.

Our contribution to the ESG literature comes via explicitly considering the introduction of ESG reports. We analyze how price and market reactions to the reports vary with the cash flow-ESG performance relations and investor composition. Our study supports and offers a mechanism to explain existing empirical findings. We demonstrate how investors, even if they do not inherently value ESG, can learn cash-flow relevant information from ESG reports, consistent with Amel-Zadeh and Serafeim (2018)’s evidence that one of the most frequent reasons for investors using ESG data is to improve financial performance. Experimental markets support this channel: Martin and Moser (2016) show that investors bid more for

⁸While we do not focus on debt channels per se, the intuition behind our results applies for both equity and debt securities.

a green investment once it is disclosed, even though the investment does not affect cash flows, and [Elliott et al. \(2014\)](#) show that ESG performance shifts investors’ estimates of fundamental value absent any cash-flow channel, an effect that weakens when investors are prompted to assess ESG performance explicitly. The introduction of value-relevant ESG disclosures in our model can cause positive price reactions, consistent with the results of [Arif et al. \(2022\)](#). Relatedly, [Bonnenfon et al. \(2025\)](#) find that investors’ willingness to pay is close to linear in the magnitude of a firm’s externalities, while [Heeb et al. \(2023\)](#) find that experienced private investors show little sensitivity to the magnitude of impact. [Matsumura et al. \(2014\)](#) find that investors can “penalize” firms for low ESG performance; this penalty is dampened if companies provide more detailed ESG disclosures. Broadly, we address calls for research to better understand implications of ESG reporting ([Christensen et al., 2019](#); [Grewal and Serafeim, 2020](#); [Bochkay et al., 2025](#)).

[Petrov and Stocken \(2024\)](#) also model the introduction of ESG/non-financial reporting. However, their main feature is that ESG reporting can directly affect the quality of financial reporting, particularly in an integrated reporting environment. While this is an interesting mechanism, we focus on how the introduction of ESG reporting changes investor learning about multiple dimensions of firm performance, which does not require spillovers (positive or negative) onto the financial reporting process or the integration of financial and ESG reporting. [Göx and Wagenhofer \(2025\)](#) show that the introduction of emissions reporting can provide incentives to the manager to overinvest in an emissions-reducing technology, even relative to a social planner. Although not explicitly in the context of ESG disclosure, [Antle et al. \(1994\)](#) show how the presence of other information sources may change how investors react to financial disclosure.

We focus on implications of ESG reporting, which requires a model with multiple performance measures (e.g., [Lambert, 2001](#)) and real effects (e.g., [Kanodia, 2007](#)). Although many prior papers have studied multiple performance measures, (e.g., [Datar et al., 2001](#); [Feltham and Xie, 1994](#); [Holmstrom and Milgrom, 1991](#)), they mainly focus on weights on

performance measures in a contract. And while prior studies have examined price as a performance measure in a contract, the focus is often on whether price subsumes other potential performance measures. For instance, [Paul \(1992\)](#) highlights that investors disregard the productivity of (predictable) actions when they aggregate information and, instead, emphasize value-relevant components outside of the manager’s control. Furthermore, although the contracting models feature managerial decisions generating real effects, they tend not to feature investor disagreement (highlighted in [Hong and Stein, 2007](#)). In contrast, our paper and many of the ESG-related studies cited above feature investor disagreement about the value of ESG performance and the potential for managerial actions to generate real effects. The nature of these effects, which may be externalities from the firm’s purely financial perspective, drive the potential for investor disagreement.

In the main model, we focus on noisy reports. In an extension, we allow for strategic misreporting (e.g., [Dye and Sridhar, 2004](#); [Fischer and Verrecchia, 2000](#)). Our model extends the literature on earnings management (e.g., [Dye and Sridhar, 2008](#)) by allowing the firm to also manipulate its ESG report, i.e., to engage in greenwashing and financial misreporting. This allows us to examine how the two types of misreporting interact. There is relatively little existing theoretical research on greenwashing or on misreporting across multiple performance measures. [Fischer and Verrecchia \(2000\)](#), for instance, show how uncertainty around the manager’s incentives creates the potential for misreporting that the manager can benefit from *ex-ante*, without a consideration of how additional metrics change the manager’s incentives. More closely related to our paper, [Lyon and Maxwell \(2011\)](#) provide a model of greenwashing. However, their model is based on discretionary disclosure of favorable signals (e.g., [Jung and Kwon, 1988](#)), in contrast to our model of greenwashing as reporting bias with uncertain costs, which interacts with financial reporting bias. Despite the relative paucity of theoretical research, there exists rich empirical evidence of ESG misreporting (e.g., [Bingler et al., 2022](#); [Basu et al., 2022](#); [Delmas and Burbano, 2011](#); [Marquis et al., 2016](#); [Raghunandan and Rajgopal, 2022](#)), as well as numerous examples from the popular and business press

(e.g., [Brogger and Marsh, 2021](#); [Kowsmann and Brown, 2021](#)).

3 Model

3.1 Model Setup

We build our model to capture the following key aspects of introducing outcome-based ESG reporting: (1) a non-financial dimension of the firm’s performance, (2) some investors who value this dimension in addition to the firm’s cash flows, and (3) the presence of a pre-existing report about the firm’s cash flows.

The model features a firm whose manager makes production and reporting choices and a continuum of investors who allocate their wealth between shares in the firm and a risk-free asset that is assumed to have a gross return of 1. The timeline is as follows. First, the manager chooses her action. Second, the manager’s action and exogenous factors determine the firm’s cash flows and ESG performance, which are reported to investors in noisy reports. Investors trade the firm’s shares in a competitive market and establish a stock price. Finally, firm performance is revealed and all parties consume.

The firm has two dimensions of stochastic output: cash flows, $\tilde{x}$, and ESG performance, $\tilde{y}$. The outputs are defined as functions of the manager’s chosen action ($e \in \mathbb{R}$), exogenous random factors outside the manager’s control, and known parameters. Specifically, $\tilde{x} = \theta(e + \tilde{\phi}) + \tilde{\varepsilon}_x$, and $\tilde{y} = \eta(e + \tilde{\phi}) + \tilde{\varepsilon}_y$. In this formulation, the manager’s action, e , affects both cash flows and ESG. The random factor affecting both cash flows and ESG is $\tilde{\phi} \sim N(\bar{\phi}, \sigma_{\phi}^2)$,⁹ while $\tilde{\varepsilon}_x \sim N(0, \sigma_x^2)$ and $\tilde{\varepsilon}_y \sim N(0, \sigma_y^2)$ capture shocks to only cash flows and ESG, respectively, that are outside the manager’s control. We assume that these shocks are mutually independent.

The commonly-known parameters θ and η capture the sensitivities (or productivities),

⁹Alternatively, the random factor can be interpreted as investors’ uncertainty about the manager’s incentives when choosing e . Investor uncertainty about incentives for (unproductive) action is modeled similarly in the earnings management literature (e.g., [Dye and Sridhar, 2004](#)).

respectively, of cash flows and ESG to e and $\tilde{\phi}$, as well as the relation between the firm's cash flows and ESG performance. We assume that $\theta > 0$, and $\eta \in \mathbb{R}$, such that higher values of the manager's action lead to higher cash flows (e.g., productive effort or expansion of the firm's business activities) but can have positive or negative effects on ESG performance, depending on the nature of the production function as parameterized by η . ESG implications of corporate activities are often viewed as externalities: $\eta > 0$ implies that the firm produces a positive externality, e.g., from profitable investments in employee well-being; while $\eta < 0$ implies a negative externality, e.g., from production processes that emit local pollutants or contribute to global warming. Alternatively, green production can be characterized by $\eta > 0$, while $\eta < 0$ would reflect a brown technology.

We assume that the continuum of investors has unit mass and that the supply of shares is fixed at 1, implying one share per capita. The risk-free asset (money) serves as the numeraire in which investors can borrow or lend. It is supplied elastically, such that its price and gross return, both 1, are not affected by demand. Investors are heterogeneous with regard to their preferences over the firm's ESG performance but have homogeneous preferences with regard to cash flows. Specifically, although all investors value cash flows and are risk averse with respect to their cash holdings, a λ -fraction of investors also value the firm's ESG performance. To simplify the analysis, we assume that the ESG-valuing investors are risk-neutral with respect to ESG performance. We discuss risk neutrality in ESG performance and other key assumptions below.

Let q_i and l_i denote the amounts of shares and money, respectively, held by investor i . We denote type-1 investors as those who care only about cash flows. Their utility is $u_1 = -\exp[-\rho(q_1\tilde{x} + l_1)]$. Type-2 investors, who also value the firm's ESG performance (in risk-neutral expectation), have utility defined by $u_2 = -\exp[-\rho(q_2(\tilde{x} + E[\tilde{y}|\Omega]) + l_2)]$. Ω is the information on which investors condition their expectations.

The firm's manager is concerned about her firm's stock price and bears a quadratic cost

of her action. Specifically, the manager's utility is:

$$u_m = p - \frac{c}{2}e^2, \quad (1)$$

where c parameterizes the cost of action, e . This cost could reflect disutility from exerting effort or capital adjustment costs, for instance.¹⁰

Investors learn about the firm's financial and ESG performance from two reports: one about financial performance and the other about ESG performance. The financial report, f , provides a noisy measure of the firm's cash flows, x : $\tilde{f} = \tilde{x} + \tilde{\varepsilon}_f$, with $\tilde{\varepsilon}_f \sim N(0, \sigma_f^2)$. The noise in the financial report, $\tilde{\varepsilon}_f$, captures any exogenous factors that prevent the report from truthfully revealing the company's actual cash flows, such as inherent limitations of the accounting system. Paralleling the financial report, the ESG report, $\tilde{r}$, provides a noisy measure of the firm's ESG performance, $\tilde{y}$. As such, the ESG report disclosed to investors is $\tilde{r} = \tilde{y} + \tilde{\varepsilon}_r$, where $\tilde{\varepsilon}_r \sim N(0, \sigma_r^2)$ represents exogenous idiosyncratic noise. An example of such noise can be measurement error in the systems used to measure or estimate CO₂ emissions. While our insights apply to qualitative disclosures, the model directly captures a quantitative report about ESG performance.

Our model can be augmented to capture a variety of other features in the ESG disclosure setting. First, we can add actions that affect only the firm's cash flows or only ESG to capture operating decisions that do not affect ESG and ESG activities that do not affect cash flows. Second, we can separate the relations between cash flows and ESG through manager-controlled action (e) versus through exogenous factors ($\tilde{\phi}$), instead of having a single parameterized effect; specifically, we could have $\tilde{x} = \theta_e e + \theta_\phi \tilde{\phi} + \tilde{\varepsilon}_x$ and $\tilde{y} = \eta_e e + \eta_\phi \tilde{\phi} + \tilde{\varepsilon}_y$ with θ_ϕ not necessarily the same as θ_e , and η_ϕ not necessarily the same as η_e . Third, we

¹⁰A weight of 1 on price in equation (1) is without loss of generality, relative to the cost of action, since the cost parameter, c , can be viewed as scaling the importance of the action cost relative to the importance of stock price. In addition, making the action costly to the manager and not to the firm implies that the parameter θ represents the net benefit (i.e., after investment cost) of the action for the firm's cash flows. Alternatively, we can explicitly model separate costs to the firm and the manager. We believe our results would still hold under reasonable cost functions.

could have the manager’s objective directly affected by investor preferences as reflected by λ . While each of these would add additional effects, none change the qualitative nature of our equilibrium or key takeaways.¹¹

3.2 Modeling assumptions and scope

Our model is intentionally stylized to isolate effects of the introduction of ESG reporting on investor learning from corporate disclosures, market-based managerial incentives, and resulting corporate activities. The market response to both financial and ESG reports plays a central role. We make several assumptions that help isolate and illustrate the causal paths. In this section, we discuss the interpretation and scope of four of these assumptions: that the relation between corporate activity and ESG performance, η , is known; that some investors value ESG performance in proportion to their holdings while others do not value ESG; that investors are risk neutral with respect to ESG performance; and that the fraction of investors who value ESG performance, λ , is exogenous.

First, we assume that η , which maps the firm’s underlying activity into ESG performance, is commonly known. Therefore, investors are uncertain about realized ESG performance, y , but not about how strongly the firm’s activity generates ESG outcomes. As a result, the model best applies to outcome-based ESG reporting, where the report provides a noisy measure of an ESG outcome, rather than reporting intended activities or the “greenness” of the firm’s production technology. Examples of outcome-based reports include GHG emissions, workplace injuries, and water usage, as well as myriad other quantitative measures or qualitative descriptions of realized environmental or social performance.

In settings with outcome uncertainty only, investors know the nature of the firm’s production process and the relation between its activities and ESG outcomes while remaining uncertain about realized outcomes due to underlying shocks, measurement noise, or unobserved corporate activities. The distinction between process uncertainty and outcome

¹¹Analysis of these extensions was included in earlier versions of the paper and is available from the authors.

uncertainty is important because uncertainty about η would introduce an additional and economically different learning problem. If investors were uncertain about the mapping from corporate activities to ESG outcomes, an ESG report could reveal not only realized ESG performance but also information about the firm’s underlying ESG technology. For example, investors could use repeated observations of reported ESG outcomes to learn whether a firm’s production process is inherently more or less environmentally harmful than previously believed. Such learning would change the information conveyed by both ESG and financial reports and, consequently, the response coefficients that generate managerial incentives in our model. It would also broaden the interpretation of greenwashing: whereas our extension in Section 7 concerns bias in a report of realized ESG performance, uncertainty about η would permit firms to influence beliefs about the effectiveness or greenness of their underlying activities. Modeling this additional learning channel substantially changes the structure of the model. We therefore maintain known η to focus on reporting about realized outcomes and the interaction between ESG and financial information.

Second, in the model, type-2 investors value ESG performance in addition to cash flows, whereas type-1 investors value only cash flows. One interpretation is that type-2 investors have a nonpecuniary preference for ESG performance. Several studies support this view. [Bauer et al. \(2021\)](#) find that two-thirds of the pension fund members they survey are willing to sacrifice financial benefits to invest in firms aligned with the United Nations’ Sustainable Development Goals, and [Heath et al. \(2023\)](#) show that socially responsible funds tilt toward firms with strong ESG performance. [Barber et al. \(2021\)](#), [Bolton and Kacperczyk \(2021\)](#), and [Bonnefon et al. \(2025\)](#) document warm glow utility and trade-offs between ESG and market performance in investors’ preferences. In our specification, the nonpecuniary benefit from ESG is proportional to investors’ holdings: an investor derives greater ESG-related utility both from stronger ESG performance and from holding more shares of a high-ESG firm. The model therefore captures a preference for owning firms with desirable ESG characteristics, rather than a benefit from an aggregate social externality enjoyed independently of

ownership. If investors instead valued total ESG outcomes regardless of their holdings, they could benefit from ESG improvements while leaving other investors to bear any financial sacrifice associated with supporting those outcomes. Such a specification could generate free riding and change the model’s equilibrium predictions. An alternative interpretation, which does not require investors to derive utility from ESG outcomes per se, is that investors disagree about the long-run value consequences of ESG performance. Some may believe that stronger environmental or social performance generates financial benefits through lower regulatory costs, stronger customer or employee relationships, or lower exposure to future ESG-related liabilities, while others do not. Consistent with this view, [Krueger et al. \(2020\)](#) show that many institutional investors view climate risks as material for their portfolios’ cash flows. Under this interpretation, $E[y|\Omega]$ is a reduced-form representation of value that type-2 investors expect ESG performance to generate beyond cash flows captured by x , with the perceived financial benefit accruing in proportion to their holdings. Under either interpretation, both types of investors update rationally using the information in financial and ESG reports, conditional on their respective valuation models. An important feature facilitating our mechanism is heterogeneous investor valuation of corporate ESG. This difference causes the same reports to have different valuation implications across investors and is the source of the λ -weighted ESG component in equilibrium price.

Third, we assume that ESG-valuing investors are risk neutral with respect to ESG performance. This assumption allows us to focus on how reporting affects expectations of ESG outcomes rather than how it affects the allocation and pricing of ESG risk. Importantly, the assumption does not imply that financially material ESG risks are absent from the model. To the extent that ESG-related uncertainty affects the firm’s cash flows, it is incorporated through investors’ risk aversion over x . What the assumption rules out is a separate premium for uncertainty about ESG outcomes independent of their cash-flow consequences. Allowing risk aversion over ESG outcomes, as in [Friedman and Heinle \(2016\)](#), would introduce an additional force: more precise ESG reporting would reduce the ESG uncertainty borne

by ESG-valuing investors and make the firm’s shares more attractive to them, generating clientele effects. Reporting precision would then affect not only investor learning and the response coefficients emphasized here, but also equilibrium risk sharing and ownership. The information and incentive effects we study would continue to operate, but their equilibrium implications would be combined with changes in the investor base. We therefore abstract from ESG risk aversion to keep the interaction between ESG and financial reporting transparent.

Finally, we treat λ , the fraction of investors who value ESG performance, as exogenous. This allows us to characterize separately how the introduction of ESG reporting affects equilibrium outcomes for a given investor population and, in Section 6, how those outcomes vary with investor interest in ESG. In practice, ESG reporting could itself affect investor composition, since investors who place greater value on ESG performance may be more willing to hold a firm’s shares when its ESG performance is measured and disclosed more precisely. This shareholder-base response is closely related to the risk-sharing force discussed above: with ESG-risk-averse investors, improvements in reporting precision would affect their demand for the firm’s shares and thereby endogenize the effective weight of ESG-valuing investors in price. More directly, we could assume λ is increasing in the precision of ESG information. If greater precision attracts ESG-valuing investors and a larger λ in turn increases the value of precise ESG information, the two forces would be complementary. Introducing this mechanism would combine the direct effects of introducing ESG reporting in Section 5 with the comparative statics with respect to λ in Section 6. We hold λ fixed in the main analysis so that these effects can be identified separately rather than embedding an additional assumption about how investor composition responds to the reporting regime.

Taken together, these assumptions allow us to isolate the paper’s central mechanism: introducing an ESG report changes what investors learn, from both ESG and financial reports, which changes market responses to those reports and thereby changes managerial incentives. Allowing investors to learn about the firm’s ESG technology, having investors care about

outcomes independent of ownership, introducing ESG risk sharing, or endogenizing the investor base would add economically meaningful channels. Our results should therefore be interpreted as characterizing the information and incentive effects of outcome-based ESG reporting holding these additional channels fixed.

4 Equilibrium

In this section, we present and discuss the equilibrium, in which investors determine share demand (and in turn, stock price) based on observed reports and rational expectations about the manager’s action, and the manager chooses her action based on rational expectations about how the action will affect stock price, via the disclosed reports. We first show an equilibrium in the model with only financial reporting; next, we present an equilibrium of the full model, including ESG reporting. In both equilibria, stock price takes the form: $p = E[x|\Omega] + \lambda E[y|\Omega] - \rho \text{Var}[x|\Omega]$. The effects of financial and ESG reporting on stock price thus flow through updated expectations of financial and ESG performance, as well as reductions in risk borne by risk-averse investors. The manager internalizes the effect of her action on price, intermediated by the reports. As such, the price responses to the reports play important roles in the equilibria. We denote these by $\psi_f \equiv \frac{\partial p}{\partial f}$ and $\psi_r \equiv \frac{\partial p}{\partial r}$. We refer to the former as the ERC (earnings response coefficient), and the latter as the ESG-RC (ESG response coefficient).

4.1 Equilibrium in the model without ESG reporting

Lemma 1 below summarizes the equilibrium price, actions, and financial report in a regime in which only the financial report is issued. We use a superscript [†] to indicate the equilibrium without ESG reporting. This equilibrium serves as a benchmark to analyze how the introduction of ESG reporting can affect capital market and real outcomes.¹² An important

¹²This benchmark model is similar in spirit to models explored in [Lambert \(2001, Section 3.3.5\)](#) and [Feltham and Xie \(1994, Section V\)](#), though these focus on using market price as a contractual performance

aspect of the equilibrium is the ERC, $\psi_f^\dagger$.

Lemma 1 *In equilibrium in the model with only financial reporting, the ERC, the manager's action, the expected cash flows and ESG performance, and the ex-ante stock price are given by: $\psi_f^\dagger = 1 \cdot \left(1 - \frac{\sigma_f^2}{\Sigma_f}\right) + \lambda \frac{\theta \eta \sigma_\phi^2}{\Sigma_f}$, $e^\dagger = \frac{\psi_f^\dagger \theta}{c}$, $E[x^\dagger] = \theta(e^\dagger + \bar{\phi})$, $E[y^\dagger] = \eta(e^\dagger + \bar{\phi})$, and $p_0^\dagger = E[x^\dagger] + \lambda E[y^\dagger] - \rho \Sigma_x$, where $\Sigma_x \equiv \text{Var}[\tilde{x}] = \theta^2 \sigma_\phi^2 + \sigma_x^2$ and $\Sigma_f \equiv \text{Var}[\tilde{f}] = \Sigma_x + \sigma_f^2$.*

In the equilibrium described by Lemma 1, the financial report plays multiple roles. First, it provides information useful to all investors about expected cash flows, which depend on the action under the manager's control, via e , and factors outside of the manager's control, $\tilde{\phi}$ and $\tilde{\varepsilon}_x$. Second, the financial report provides information about the firm's ESG performance, which is stochastic from investors' perspective because investors do not observe $\tilde{\phi}$ or ε_y . Learning about the common random factor $\tilde{\phi}$ is useful to all investors because it affects cash flows, and is incrementally useful to type-2 investors because it affects ESG performance. Fundamentally, investors' response to the financial report is driven by the degree to which it contains information about relevant cash flow and ESG outcomes as opposed to reflecting the idiosyncratic noise in the financial report due to $\tilde{\varepsilon}_f$.

Investors' reaction to the financial report, ψ_f , is a function of investor learning. The equilibrium ERC, $\psi_f^\dagger$, is expressed as the sum of a component that captures learning about cash flows (multiplied by $1 \equiv$ the fraction of investors concerned about cash flows), and a component that captures learning about ESG performance (multiplied by $\lambda \equiv$ the fraction of investors concerned about ESG performance). The learning about cash flows term is $1 - \sigma_f^2/\Sigma_f$, which represents a full response of 1 attenuated by the fraction of the variance in the financial report that comes from noise. The learning about ESG term, $\frac{\theta \eta \sigma_\phi^2}{\Sigma_f}$, is increasing in the covariance between the financial report and ESG performance ($\theta \eta \sigma_\phi^2$) and decreasing in the overall variance of the financial report, Σ_f .

The equilibrium action, $e^\dagger$, is chosen by the manager to equalize the marginal benefit of increasing price with the cost of action. The benefit comes from higher action increasing expected financial performance by θ , which increases the financial report in expectation by

measure in a multi-action agency.

the same amount, and leads to an expected price increase of $\theta\psi_f^\dagger$. The marginal cost is captured by c .

Expected financial and ESG performance ($E[x^\dagger]$ and $E[y^\dagger]$, respectively), are functions of the equilibrium action and the expected common factor, $E[\tilde{\phi}] = \bar{\phi}$. Expected price, i.e., the stock price prior to the release of the financial report, is given by expected performance weighted by investor preferences, minus a risk premium of $\rho\Sigma_x$. There is no risk premium associated with uncertainty in ESG performance, $\tilde{y}$, because we have assumed investors are risk-neutral with respect to ESG performance (i.e., type-2 investors' utility depends on $E[\tilde{y}]$).

4.2 Equilibrium in the model with financial and ESG reporting

In this section we introduce the ESG report. We characterize the equilibrium values of interest, denoted by superscript $*$, in Lemma 2:

Lemma 2 *In the equilibrium of the model with financial and ESG reporting, the ERC and ESG-RC are given by*

$$\psi_f^* = \left(1 - \frac{\sigma_f^2}{\Sigma_f}\beta_1\right) + \lambda \frac{\theta\eta\sigma_\phi^2}{\Sigma_f}\beta_2, \text{ and} \quad (2)$$

$$\psi_r^* = \lambda \left(1 - \frac{\sigma_r^2}{\Sigma_r}\gamma_1\right) + \frac{\theta\eta\sigma_\phi^2}{\Sigma_r}\gamma_2; \quad (3)$$

the manager's action, expected cash flows, ESG performance, and ex-ante stock price are: $e^* = \frac{\psi_r^*\eta + \psi_f^*\theta}{c}$, $E[x^*] = \theta(e^* + \bar{\phi})$, $E[y^*] = \eta(e^* + \bar{\phi})$, and $p_0^* = E[x^*] + \lambda E[y^*] - \rho\Sigma_x$; where $\Sigma_x \equiv \text{Var}[\tilde{x}] = \theta^2\sigma_\phi^2 + \sigma_x^2$, $\Sigma_f \equiv \text{Var}[\tilde{f}] = \Sigma_x + \sigma_f^2$, $\Sigma_r \equiv \text{Var}[\tilde{r}] = \eta^2\sigma_\phi^2 + \sigma_y^2 + \sigma_r^2$, $\beta_1 = \Sigma_f / \left(\Sigma_f - \theta^2\sigma_\phi^2 \frac{\eta^2\sigma_\phi^2}{\Sigma_r}\right)$, $\beta_2 = \Sigma_f\sigma_r^2 / \left(\Sigma_r \left(\Sigma_f - \theta^2\sigma_\phi^2 \frac{\eta^2\sigma_\phi^2}{\Sigma_r}\right)\right)$, $\gamma_1 = \Sigma_r / \left(\Sigma_r - \eta^2\sigma_\phi^2 \frac{\theta^2\sigma_\phi^2}{\Sigma_f}\right)$, and $\gamma_2 = \Sigma_r\sigma_f^2 / \left(\Sigma_f \left(\Sigma_r - \eta^2\sigma_\phi^2 \frac{\theta^2\sigma_\phi^2}{\Sigma_f}\right)\right)$, with $\beta_1, \gamma_1 \geq 1$ and $\beta_2, \gamma_2 \in (0, 1)$.

As in Lemma 1, the equilibrium expected/pre-disclosure price is given by expected cash flows and ESG performance, weighted by investor interest (i.e., 1 and λ), minus the cash flow risk premium of $\rho\Sigma_x$. Expected financial and ESG performance take the same form as in Lemma 1: functions of the action and expected exogenous factors. The existence of the ESG report, however, changes the manager's choice of action, e^* , relative to $e^\dagger$ in Lemma 1,

because the action is now driven by the price impact of e through both financial and ESG reports. In the remainder of this section, we discuss the economic forces driving the market responses to the financial and ESG reports, when both are present, as these are the key terms differentiating the equilibria characterized in Lemmas 1 and 2.

The responses to the financial and ESG reports, the ERC (ψ_f^*) and ESG-RC (ψ_r^*), respectively, can be characterized as the sum of components representing: 1) a frictionless market response to the information in each report about its underlying primary performance variable (i.e., $\tilde{x}$ for the ERC and $\tilde{y}$ for the ESG-RC); 2) a reduction of item (1) due to noise in the report and information provided by the other report; and 3) the amount investors learn from one report about the other performance dimension (i.e., learning about ESG from the financial report and financial performance from the ESG report). In a frictionless world, with only the financial report and without any financial reporting noise, the ERC would be $\psi_f = 1$, as investors are willing to pay \$1 more for the stock when noiseless earnings indicate underlying cash flows are higher by \$1. The response is attenuated, however, by noise in the financial report, as indicated by the term $-\frac{\sigma_f^2}{\Sigma_f}\beta_1$. The reduction due to noise is stronger in the presence of the ESG report than in an environment without ESG reporting. Without the ESG report (see Lemma 1) this term captured the proportion of financial report variance due to noise. In the presence of the ESG report, the relevant metric is the fraction of *residual* variance due to noise. Here, investors learn about the cash flows from the ESG report, leaving less fundamental uncertainty. That is, there is less residual information to be learned and, as a result, the residual fraction of noise is larger than in a setting without an ESG report.¹³

The second additive term in the Lemma 2 expression for ψ_f^* reflects investors' learning about ESG performance from the financial report. This is indicated by the product of $\lambda\theta\eta\sigma_\phi^2\beta_2$ in the numerator, which reflects, respectively: the fraction of investors, λ , who care about ESG performance; the effect of the common stochastic factor, $\tilde{\phi}$, on the financial

¹³ $\beta_1 > 1$ captures the ratio of total to residual variance in the financial report.

report via its effect on cash flows, θ ; the effect of $\tilde{\phi}$ with variance σ_ϕ^2 , on ESG output, η ; and the relative noise in the ESG report, β_2 . The last term, β_2 , appears because higher noise in the ESG report implies that investors learn less about ESG performance from the ESG report, leaving more to be learned about ESG performance from the financial report.

The structure of the ESG-RC parallels that of the ERC. In a frictionless world, with only the ESG report and without any ESG reporting noise, the ESG-RC would be $\psi_r^* = \lambda$, as a λ fraction of investors are willing to pay \$1 more for the stock when the ESG report indicates underlying performance is higher by a single unit. As with the ERC, the response to the ESG report is attenuated by noise, as indicated by the term $-\frac{\sigma_r^2}{\Sigma_r} \gamma_1$, which reflects the ratio of noise to residual variance in the ESG report.¹⁴ The second term reflects investors' learning about financial performance from the ESG report. This is indicated by the product of $\theta\eta\sigma_\phi^2\gamma_2$ in the numerator, which reflects, respectively: the effect of the common stochastic factor, $\tilde{\phi}$, and managerial action, e , on cash flows, θ ; the effect of the common factor and managerial action on the ESG report via their effects on ESG performance, η ; the variance in the ESG report coming from its reflection of $\tilde{\phi}$, σ_ϕ^2 ; and the noise in the financial report, γ_2 . The last term, γ_2 , appears because higher noise in the financial report implies that investors learn less about financial performance from the financial report, leaving more to be learned about financial performance from the ESG report. Note that the second additive term in the ESG-RC does not contain λ , since it reflects the effect of all investors learning about financial performance, implying a multiplier of 1.

5 Effects of Introducing ESG Reporting

5.1 ESG-response coefficient

The direct effect of introducing ESG reporting is that the market now can respond to the information contained in the ESG report. Proposition 1 provides conditions for that response

¹⁴As with β_1 , $\gamma_1 > 1$ captures the ratio of total to residual variance in the ESG report.

to be positive.

Proposition 1 *The ESG-RC is positive, $\psi_r^* > 0$, if and only if*

$$\lambda > \frac{-\theta\eta\sigma_\phi^2\sigma_f^2}{\Sigma_y\Sigma_f - \theta^2\eta^2\sigma_\phi^4} \propto -\eta, \quad (4)$$

where $\Sigma_y \equiv \text{Var}[\tilde{y}] = \eta^2\sigma_\phi^2 + \sigma_y^2$ and $\Sigma_f \equiv \text{Var}[\tilde{f}] = \theta^2\sigma_\phi^2 + \sigma_x^2 + \sigma_f^2$.

As discussed above, investors use the ESG report to learn about the firm's financial and ESG performance. When the firm produces a positive externality, i.e., $\eta > 0$, a higher ESG report has positive implications for both ESG and financial performance, so the response to the ESG report is positive (the condition in Proposition 1 is always satisfied because λ cannot be negative).

When the firm produces a negative externality, i.e., $\eta < 0$, a higher ESG report implies better ESG performance but lower cash flows. In this case, traditional investors put a negative weight on the ESG report because it is a negative signal of cash flows. ESG investors, on the other hand, also try to learn about the ESG performance, which requires a positive weight on the ESG report. As a result, the net response to the ESG report is positive if and only if the fraction of investors concerned about ESG performance, λ , is sufficiently large. An additional factor determining the sign of the ESG-RC is related to how much an ESG investor can learn about ESG performance from the financial report. This is reflected in the term in the denominator in (4). For example, when σ_x^2 increases, the financial report contains more uninformative noise, and ESG investors learn more from the ESG report, making a positive ESG-RC more likely. Similarly, changes in η affect an investor's ability to learn about the ESG performance from both reports. A larger $|\eta|$ makes the information from the financial report more valuable, but it also directly increases the amount of information that the ESG report provides. As a result, the ESG-RC can turn negative for modestly negative values of η , where the value of the ESG report to investors comes primarily as a negative signal of cash flows, but returns to a positive value for $\eta \ll 0$, where the firm's actions have a very negative impact on ESG performance.

5.2 Earnings response coefficient (ERC)

Introducing the ESG report changes how investors respond to the financial report, as reflected in the ERC, ψ_f . Notably, the ERC can increase or decrease. Proposition 2 provides the condition for the ERC to increase when ESG reporting is introduced.

Proposition 2 *The ERC increases after the introduction of ESG reporting (i.e., $\psi_f^* - \psi_f^\dagger > 0$) if and only if*

$$\lambda\theta\eta < \frac{-\theta^2\eta^2\sigma_\phi^2\sigma_f^2}{\Sigma_y\Sigma_f - \theta^2\eta^2\sigma_\phi^4}, \quad (5)$$

where $\Sigma_y \equiv \text{Var}[\tilde{y}] = \eta^2\sigma_\phi^2 + \sigma_y^2$ and $\Sigma_f \equiv \text{Var}[\tilde{f}] = \theta^2\sigma_\phi^2 + \sigma_x^2 + \sigma_f^2$ and $\frac{-\theta^2\eta^2\sigma_\phi^2\sigma_f^2}{\Sigma_y\Sigma_f - \theta^2\eta^2\sigma_\phi^4} \leq 0$.

When the ESG report, which contains cash-flow-relevant information, is provided, investors learn less from the financial report about cash flows. This decreased learning can be seen by comparing the first terms in the post-ESG-reporting and pre-ESG-reporting ERCs, ψ_f^* and $\psi_f^\dagger$, in Lemmas 2 and 1, respectively: $\left(1 - \frac{\sigma_f^2}{\Sigma_f}\beta_1\right) - \left(1 - \frac{\sigma_f^2}{\Sigma_f}\right) = \frac{\sigma_f^2}{\Sigma_f}(1 - \beta_1) < 0$. In particular, while the discount in $\psi_f^\dagger$ only accounts for noise in the cash flow report, the discount in ψ_f^* also accounts for the cash flow related information that investors infer from the ESG report. This additional discount pushes the ERC down when ESG reporting is introduced.

Similarly, when the ESG report is provided, investors learn less from the financial report about ESG performance. This decreased learning can be seen in the comparison of the last terms, as $\lambda\frac{\theta\eta\sigma_\phi^2}{\Sigma_f}\beta_2 - \lambda\frac{\theta\eta\sigma_\phi^2}{\Sigma_f} \propto -\eta$. That is, when η is positive, the positive last term declines, indicating that the financial report is less important to investors in inferring ESG performance.

Taken together, whenever $\eta > 0$, the two reports are substitutes and, thus, the ERC decreases after the introduction of ESG reporting (as we can see in equation 5 given $\lambda > 0$). However, when $\eta < 0$, the term $\left(1 - \frac{\sigma_f^2}{\Sigma_f}\right)$, capturing learning about cash flows from the financial report, decreases, while the term $\lambda\frac{\theta\eta\sigma_\phi^2}{\Sigma_f}$, capturing learning about ESG from the financial report, increases. These conflicting effects imply that when the firm produces a negative externality and so its cash flows and ESG are negatively related ($\eta < 0$), the ERC

can increase or decrease, depending on parameter values. Figure 1 shows that for $\eta < 0$, the impact of ESG reporting on the ERC is non-monotonic in η .¹⁵

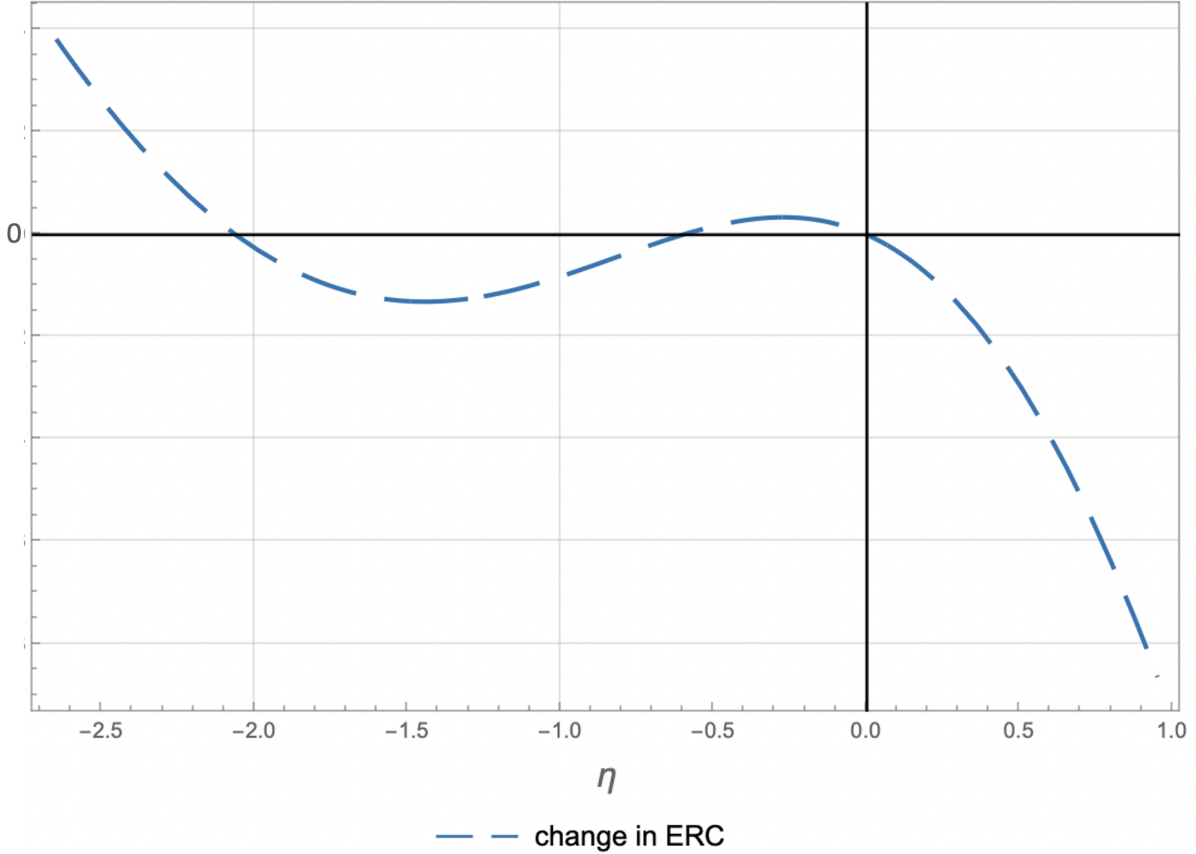


Figure 1: Change in the ERC from introducing ESG reporting. Here: $\lambda = 0.6, \theta = 2, \sigma_x = \sigma_y = 1, \sigma_f = 2, \sigma_r = 2.5, \sigma_\phi = 1.5$.

In particular, for η negative and sufficiently close to zero, the ERC increases. In this region, ESG investors used to place a negative weight on the financial report to learn about ESG performance. Because the ESG report provides this information more efficiently, they extract less ESG information from the financial report and therefore increase the ERC. As η decreases further, investors again infer valuable ESG information from the financial report. Because there is less residual financial information to be gleaned from the financial report, the ERC decreases for intermediate negative η . Finally, for very negative values of

¹⁵Note that the condition for an increase in the ERC in (5) can be derived by multiplying both sides of the condition for a positive ESG-RC in (4) by $-\theta\eta$. Because $\theta > 0$ but η can be negative, these conditions are either equivalent (for $\eta < 0$) or mutually exclusive (for $\eta > 0$).

η , investors obtain substantial ESG information from the financial report. This implies a strong negative component in the ERC absent ESG reporting. The introduction of ESG reporting reduces the negative component, increasing the ERC. Notably, the reason for the ERC to increase as a result of the introduction of ESG reporting is the change in the amount of ESG information that ESG investors infer from the financial report. In order for this force to dominate the updating about financial performance, there needs to be a sufficient amount of ESG investors, as Proposition 2 shows.

5.3 Ex-ante price

We focus on the ex-ante price, which is the stock price that prevails prior to the release of reports. One reason to focus on this price is that it reflects the effects of anticipating disclosure without incorporating the information released in specific disclosures. Empirically, it may be thought of as unconfounded by the information in *realized* reports. It may also be useful for empirical examinations of price changes in response to changes in the probability or extent of future ESG reporting (e.g., around legislative or standard-setting news events).

In our setting, the ex-ante price can be expressed as a function of expected financial and ESG performance net of a risk premium, $E[x] + \lambda E[y] - \rho \Sigma_x$. So, the change in the ex-ante price is given by $\Delta p = p_0^* - p_0^\dagger = E[x^* + \lambda y^*] - E[x^\dagger + \lambda y^\dagger]$.¹⁶ Changes in expected performance are in turn driven by the equilibrium action the firm takes. As discussed above, this action is determined by market incentives. So, changes in ex-ante price are consequences of changes in the ERC and ESG-RC. Substituting the expressions for the expected outputs as functions of the ERC and ESG-RC yields

$$\Delta p = \frac{\theta + \lambda \eta}{c} \left((\psi_f^* - \psi_f^\dagger) \theta + \psi_r^* \eta \right), \quad (6)$$

where the first term in parentheses is the change in incentives due to a change in the ERC

¹⁶Note that Σ_x is the ex-ante variance of $\tilde{x}$, which is not affected by the reporting regime as modeled.

and the second term captures the incentives arising from the price response to the new ESG report. Proposition 3 incorporates equilibrium expressions for the ERC and ESG-RC from Lemmas 1 and 2, providing conditions for the ex-ante price to increase with the introduction of the ESG report.

Proposition 3 *The ex-ante price increases after the introduction of ESG reporting (i.e., $p_0^* - p_0^\dagger > 0$), if and only if*

$$\eta(\theta + \lambda\eta)(\Sigma_f - \theta^2\sigma_\phi^2) (\theta\eta\sigma_\phi^2\sigma_f^2 + \lambda(\Sigma_y\Sigma_f - \theta^2\eta^2\sigma_\phi^4)) > 0, \quad (7)$$

where $\Sigma_y \equiv \text{Var}[\tilde{y}] = \eta^2\sigma_\phi^2 + \sigma_y^2$ and $\Sigma_f \equiv \text{Var}[\tilde{f}] = \theta^2\sigma_\phi^2 + \sigma_x^2 + \sigma_f^2$.

Fundamentally, our focus is a setting where a noisy but informative signal is introduced. In a setting with only cash flows, disclosing a second informative signal tends to reduce the weight investors place on the first signal. In this situation, the expected price of the firm would increase, as the manager's productive incentives increase. In our setting, this is the case for $\eta > 0$. However, as Proposition 2 shows, this need not be the case for $\eta < 0$, as the ERC can increase or decrease. The reason is a combination of two aspects of our setting: there is a common random term ($\tilde{\phi}$) that affects both signals; and some investors are also interested in the firm's ESG performance.

Figure 2 shows that for $\eta < 0$ there can be four regions where the firm's price either decreases or increases. When η is negative but not too negative, such that $\theta + \lambda\eta > 0$, the average investor prefers a higher managerial action because the positive cash flow effects outweigh the negative externality. However, the way investors use the financial report is not monotone (see Figure 1), nor is the way they use the ESG report (see Figure 2). Nonetheless, in this region, Propositions 1 and 2 imply that the ESG-RC and the change in the ERC have the same sign.

For η just below zero (between about -0.6 and 0 in Figure 2), the additional ESG report allows ESG investors to increase their weight on the financial report (i.e., how much they rely on f to inform share demand), because the financial report becomes a cleaner measure whose residual information about cash flows is less confounded by ESG-related noise. With

a small negative η , the ESG-RC is positive, which motivates the manager to choose a lower action. This mitigates negative externalities, but overshoots investors' average preferences, yielding a decrease in ex-ante price. That is, the manager's action choice does not reflect the investors' optimal tradeoff between ESG and cash flows, and the ex-ante price decreases.

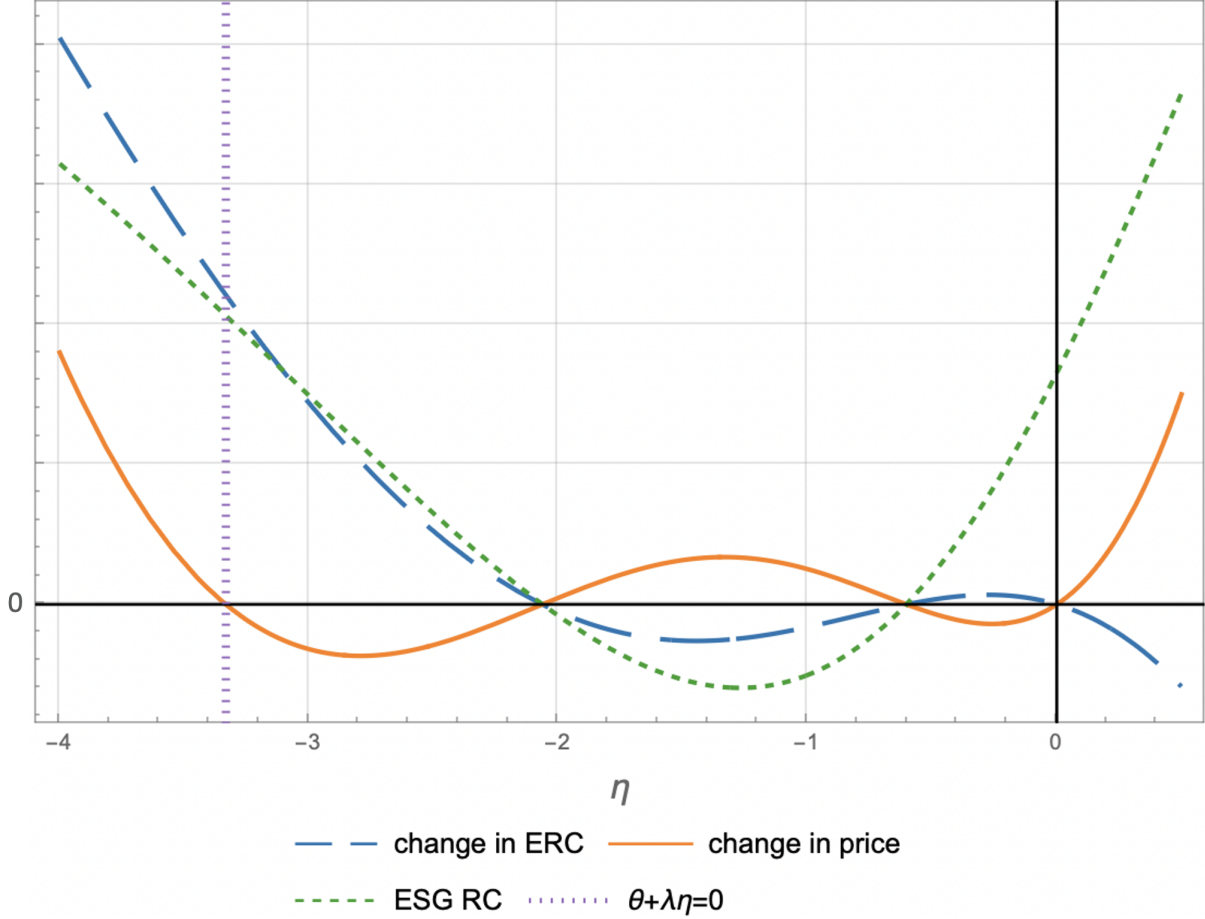


Figure 2: ESG-RC, change in ERC, and change in expected price from introducing ESG reporting. Here: $\lambda = 0.6, \theta = 2, \sigma_x = \sigma_y = 1, \sigma_f = 2, \sigma_r = 2.5, \sigma_\phi = 1.5, c = 1$.

As η becomes more negative (between approximately -0.6 and -2.1 in Figure 2), investors largely use the ESG report to infer cash-flow relevant information. Higher ESG performance indicates that the firm is sacrificing cash flows. Thus, the market response to the ESG report is negative. The manager responds by increasing the cash-flow-enhancing action. This lowers expected ESG performance and the ESG report, which investors react negatively to. In this region, an increase in the manager's action increases value for the av-

average investor, so the introduction of ESG reporting increases ex-ante price by encouraging higher action.

In the next region (where η is approximately between -2.1 and -3.3), ESG performance is even more sensitive to the firm's activity and, for $\lambda > 0$, contributes more to the total firm value. The positive ESG-preference component now dominates the negative cash-flow inference, turning the ESG-RC back to positive territory, and the manager responds with a lower action, yielding higher ESG performance. However, $\theta + \lambda\eta > 0$ still holds, so ESG reporting is causing the manager to reduce an action that the market still values on average. While ESG performance improves, the induced cash-flow loss is too large, causing ex-ante prices to decline with the introduction of ESG reporting in this range.

When η becomes sufficiently negative (below about -3.3 in Figure 2), the negative externality outweighs the cash flow effects of the manager's action for the average investor, so the average investor prefers an action reduction (i.e., $\theta + \lambda\eta < 0$). A positive ESG-RC provides incentives to the manager to reduce the action. Introducing the ESG report increases the ERC, but market incentives for lower action from the ESG-RC dominate the incentives for higher action from the ERC increase. Overall, the lower action in this region leads to higher ex-ante stock price.

Taken together, as the tradeoff between cash flows and ESG performance changes, the way that investors (both traditional and ESG investors) use the provided information changes. This corresponds to changing incentives for the manager. As a result, the tradeoff that the manager experiences does not always match the investors' preferred action and the ex-ante price can decrease even as investors get better information about the firm's financial and ESG performance.

6 Effects of Changes in Investors' Preferences

In this section, we study how a change in investor preferences, i.e., the proportion of investors who value ESG performance, λ , affects price responses, the manager's action, cash flows, ESG outcomes, and stock price in the setting with ESG reporting. Corollary 1 summarizes how equilibrium outcomes in the regime with both financial and ESG reporting change with investor preferences.

Corollary 1 *In the equilibrium of the model with financial and ESG reporting:*

1. $\frac{d\psi_r^*}{d\lambda}$ and $\frac{dE[y^*]}{d\lambda}$ are weakly positive;
2. $\frac{d\psi_f^*}{d\lambda}$, $\frac{de^*}{d\lambda}$, and $\frac{dE[x^*]}{d\lambda}$ have the same sign as η ;
3. $\frac{dp_0^*}{d\lambda} = \frac{dE[x^*]}{d\lambda} + \lambda \frac{dE[y^*]}{d\lambda} + E[y^*]$.

First, intuitively, as more investors value the firm's ESG performance, the ESG-RC increases. The ERC increases in λ if $\eta > 0$, and decreases in λ if $\eta < 0$, i.e., the effect depends on whether the firm's cash flows and ESG are positively or negatively related. When cash flows and ESG performance are positively related ($\eta > 0$), a higher financial report implies not only higher cash flows but also higher ESG. As more investors value ESG in addition to cash flows, the response to the financial report increases, similar to the response to the ESG report. In contrast, when cash flows and ESG performance are negatively related ($\eta < 0$), a higher financial report implies higher cash flows yet lower ESG. A greater proportion of ESG-valuing investors pushes the ERC down.

Second, the manager's equilibrium choice of action, e responds to investor preferences. If increasing the action improves ESG ($\eta > 0$), as more investors value ESG, the manager increases her equilibrium action. Vice versa, if increasing the action hurts ESG ($\eta < 0$), the manager reduces the action as more investors start valuing ESG performance. This equilibrium choice of action implies intuitive effects on expected cash flows and ESG as λ increases. Since the manager tailors the level of action based on its effect on ESG, the

expected ESG always increases as more investors value ESG. The effect on expected cash flows is perfectly correlated with the effect on e because higher e always increases cash flows. If the manager increases e with λ (when $\eta > 0$), expected cash flows increase; expected cash flows decrease in λ when $\eta < 0$.

Finally, the effect of increasing λ on the firm's expected price comprises three effects. The first is the effect on expected cash flows, $\frac{dE[x^*]}{d\lambda}$, which works as described above. Higher expected cash flows always increase expected price. The second is the effect on expected ESG, weighted by the proportion of investors that value it, $\lambda \frac{dE[y^*]}{d\lambda}$. Higher expected ESG increases expected price proportionally to the amount of investors valuing ESG. The third is the effect of having more investors value ESG, $E[y^*]$. As more investors value ESG, to the extent that expected ESG is positive (negative), the firm's price increases (decreases).

7 Financial Misreporting and Green-washing/hushing

Our main model specification assumes that the reports to investors about the firm's cash flows and ESG performance are noisy but unbiased. In reality, however, firms have incentives to misstate their financial and ESG performance. While financial misreporting has historically attracted significant academic and practitioner attention, corporate stakeholders have recently raised concerns about ESG reporting bias or greenwashing (see, e.g., [Toplensky, 2023](#); [Financial Times, 2024](#)). Concerns have extended to green-hushing, whereby firms downplay their ESG-related activities when facing anti-ESG threats (e.g., [Fisher et al., 2023](#)).

We extend our model to allow the manager to bias cash flow and ESG reports at a cost. Specifically, in period 0, after the manager chooses her action and learns shocks to cash flows and ESG performance (ϕ , ε_x , and ε_y), the manager can choose the values of the cash flow and ESG reports that are provided to investors, f and r .

Following [Dye and Sridhar \(2004\)](#), we incorporate randomness in the reporting environment, captured by ε_r and ε_f , into the manager's reporting cost function. This pre-

vents investors from fully unraveling the equilibrium reporting biases. Specifically, the manager's cost of choosing the financial report value, f , after observing ϕ , ε_x , and ε_f , is $\frac{c_f}{2} (f - \theta(e + \phi) - \varepsilon_x - \varepsilon_f)^2$, with $c_f > 0$ capturing costs of financial misreporting. The manager's cost of choosing the ESG report value, r , after observing ϕ , ε_y , and ε_r , is $\frac{c_r}{2} (r - \eta(e + \phi) - \varepsilon_y - \varepsilon_r)^2$, with $c_r > 0$ capturing the cost of misreporting ESG performance. Both financial and ESG misreporting costs might be driven by litigation or reputation concerns, as well as by direct costs of using accounting or ESG reporting discretion in the manager's favor.

The manager's modified utility function is

$$u_m = p - \frac{c}{2} e^2 - \frac{c_f}{2} (f - \theta(e + \phi) - \varepsilon_x - \varepsilon_f)^2 - \frac{c_r}{2} (r - \eta(e + \phi) - \varepsilon_y - \varepsilon_r)^2. \quad (8)$$

The lemma below describes the equilibrium of the modified model with financial misreporting and greenwashing/greenhushing (i.e., a quantitative ESG report manipulation), denoted by superscript $\dagger$. This is a window-dressing equilibrium in which the manager biases reports even though investors anticipate the expected biases and adjust for them when pricing the firm.

Lemma 3 *In equilibrium in the model with manipulation of financial and ESG reports, the manager's action, expected cash flows and ESG performance, the ex-ante stock price, and financial and ESG reports are given by $e^\dagger = \frac{\psi_r^\dagger \eta + \psi_f^\dagger \theta}{c}$, $E[x^\dagger] = \theta(e^\dagger + \bar{\phi})$, $E[y^\dagger] = \eta(e^\dagger + \bar{\phi})$, $p_0^\dagger = E[x^\dagger] + \lambda E[y^\dagger] - \rho \Sigma_x$, $f^\dagger = \frac{\psi_f^\dagger}{c_f} + x^\dagger + \varepsilon_f$, and $r^\dagger = \frac{\psi_r^\dagger}{c_r} + y^\dagger + \varepsilon_r$, where $\Sigma_x \equiv \text{Var}[\tilde{x}] = \theta^2 \sigma_\phi^2 + \sigma_x^2$ and $\psi_f^\dagger = \psi_f^*$ and $\psi_r^\dagger = \psi_r^*$ are price responses to the financial and ESG reports from Lemma 2.*

When the manager can choose the values of financial and ESG reports, the manager in expectation biases the reports in equilibrium proportionally to the price responses to the financial and ESG reports (terms $\frac{\psi_f^\dagger}{c_f}$ and $\frac{\psi_r^\dagger}{c_r}$). This yields overstated earnings and greenwashing in anticipation of positive market reactions. If the market penalizes the manager

for reported ESG performance (i.e., $\psi_r^\dagger < 0$), the manager will greenhush (i.e., understate the firm’s ESG) instead.

We comment briefly on whether market incentives motivate real performance and manipulation in the same or opposite directions. First, for cash flows, since the manager’s action always improves cash flows (recall that we assume $\theta > 0$), both the action and the extent of financial misreporting increase in the market’s reward per additional unit of reported cash flows, i.e., $\psi_f^\dagger$. So, higher ERCs should be associated with better real performance as well as more positive manipulation.

The intuition for ESG performance and manipulation depends on whether the action improves ($\eta > 0$) or hurts ($\eta < 0$) ESG performance. If the firm’s action is ESG-improving, a higher market reward per additional unit of reported ESG, $\psi_r^\dagger$, implies a higher action and more greenwashing chosen by the manager. If the action is ESG-destroying, when the market rewards reported ESG more ($\psi_r^\dagger > 0$), the manager chooses a lower action to improve actual ESG, $E[y^\dagger]$, and at the same time greenwashes more. This finding goes against the intuition that corporations that greenwash are those whose actual ESG performance is worse. We find that corporations’ exaggeration of their ESG performance is more likely when their expected ESG performance is higher, due to capital market incentives for both. In contrast, if the market penalizes the firm’s reported ESG performance (i.e., $\psi_r^\dagger < 0$), the manager will reduce an ESG-improving action ($\eta > 0$) or increase an ESG-destroying action ($\eta < 0$) while greenhushing at the same time.

8 Applications

8.1 Empirical implications for the introduction of ESG reports

In this section, we elaborate on empirical implications of our analysis. Above, we develop theoretical predictions on how investors’ responses to financial and ESG reports, firm pricing, and in turn managerial actions and the firm’s cash flow and ESG outcomes change around

the introduction of ESG reporting. We further describe how these changes depend on the firm’s profitability (θ), sign and magnitude of the firm’s externality (η), and the fraction of investors who assign value to the firm’s ESG outcomes (λ).

We discuss both archival and experimental settings. In archival settings, our predictions can be operationalized around the passage of ESG reporting mandates, firm-specific adoptions, or news/legislative events that affect the probability or scope of ESG reporting, similar to prior studies on the effects of the Sarbanes-Oxley Act or IFRS adoption (e.g., [Armstrong et al., 2010](#); [Jain and Rezaee, 2006](#)). Some of our predictions are non-monotonic. Figure 2 illustrates non-monotonic predictions as functions of η , the externalities that a firm’s activities cause. Studies can test our predictions in settings where η can be ordered or ranked, and with empirical specifications that allow for non-monotonicity in ERCs, prices, and ESG-RCs.

Several of our theoretical constructs have direct or standard proxies in archival data. The ESG-RC and ERC are market reactions to information releases, which can be estimated via regressions of returns on proxies for the information in the ESG or financial reports. Ex-ante prices are observable for listed firms, though researchers will have to make choices about measurement timing (e.g., how long in advance of report releases ex-ante prices should be captured). Firm cash flows and ESG performance could be captured by future performance, as reflected in cash flows, earnings, EBIT, ESG ratings, emissions, or identified ESG controversies.

Proxies for many key parameters of our model, however, are relatively novel. The proportion of ESG-valuing investors (λ) may be captured by variation in the types of firm owners, including PRI signatories or EU funds categorized under Articles 8 or 9 of the SFDR (Sustainable Finance Disclosure Regulation). However, it is non-trivial to distinguish investors who have nonpecuniary preferences for ESG or believe that high ESG results in higher long-term cash flows from those who view ESG information primarily as an input into cash-flow forecasts. Similarly, the magnitudes of firms’ externalities (η) plausibly vary across industries and business models in line with the externalities of their activities, but such measures may

be limited, confounded, or noisy. Cash flow effects (θ) are plausibly related to profitability, and for actions with non-trivial externalities, may vary with subsidies or taxes tied to ESG activities, such as renewable energy production or consumption.

Additionally, estimating the novel information content or quality in financial reports is non-trivial, with analyst forecasts or time series models used to proxy for the expected component of the report. Estimating the information content of ESG reports is arguably more difficult, though it is feasible to use time series models for periodically measured outcomes such as emissions, water use, or workforce diversity. Building on the discussion in Section 3.2, real-world ESG reporting, market reactions to it, and changes in firms' prices may commingle multiple economic stories, not all of which are covered by our model. For example, new ESG reporting mandates might also be confounded by concurrent changes in the quality of financial reporting, assurance provisions, investor attention, or a firm's investor composition, making it difficult to isolate the specific mechanisms. Our extension in Section 7 shows how financial misreporting, greenwashing, and greenhushing respond to capital market incentives, which drives relations between greenwashing, financial misreporting, ERCs, ESG-RCs, and pricing. Just like financial misreporting, measuring greenwashing or greenhushing can be difficult empirically (Bernini et al., 2024), though recent studies have made strides in this direction (e.g., Darendeli et al., 2022; Gipper et al., 2025; Kim and Lyon, 2015).

Several of these measurement issues may be addressed in well-specified field or lab experiments. An experimental setting could vary the reporting regime (financial reporting only versus financial and ESG reporting), the fraction of ESG-valuing investors (λ), and the sign and magnitude of the activity's ESG effect (η), while holding the cash-flow effect (θ) and the reporting noise (σ_f, σ_r) constant. These treatments would allow researchers to test the model's predictions that the ESG-RC and ERC may move in opposite directions, that the effects of ESG reporting can be non-monotonic in η , and that introducing ESG reporting can change managerial activity, expected cash flows, and ESG performance. Participants could alternatively be put in the manager's shoes (e.g., Martin and Moser, 2016), facing

investors characterized by different levels of λ or with different production functions (θ, η) . Measured outcomes could include investor willingness to pay for stock (e.g., [Elliott et al., 2014](#); [Bonnefon et al., 2025](#); [Heeb et al., 2023](#)), consequent reactions to financial and ESG reports, or the manager’s chosen level of activity, e .

8.2 Implications for other settings

The central features of our modeled setting are: 1) investor disagreement about whether ESG performance is valuable; and 2) the introduction of ESG reporting.¹⁷ There are many other settings where our model may be applicable, due to investor disagreement (feature 1) and novel reporting (feature 2). For instance, investors may disagree about the value implications of certain R&D investments. As well, mandatory disclosures about innovation, whether in securities or patent-related filings, have increased over time. Our model can help researchers understand how the introduction of new patent disclosures (e.g., around patent filing rather than granting) can affect corporate incentives and ERCs. Similarly, investors can take different views on the importance of management and analyst forecasts, particularly over long horizons. Our model shows that the implications of introducing long-horizon forecasts depend on whether long- and short-term performance are complements or substitutes. Accounting standard setters and securities regulators have also introduced or are considering introducing additional disclosures around corporate taxes (Accounting Standards Update [ASU] 2023-09), digital-asset holdings (ASU 2023-08), and executive compensation.¹⁸ Our model, with some relabeling, could provide guidance on how the introduction of reporting on these corporate activities could affect ERCs and firm value.

¹⁷There are two edge cases of our model that capture no-disagreement settings: $\lambda \in \{0, 1\}$. When $\lambda = 0$, no investors specifically value ESG performance (or R&D, tax strategies, etc.), and our model collapses to one in which there is only one important dimension of performance and a second noisy report is introduced. Investors still react to the new disclosure because it is informative about financial performance. Similarly, when $\lambda = 1$, all investors value ESG/other performance. Interactions between the two disclosures continue to be important, with effects driven by forces discussed above. Disagreement, while descriptive of the ESG investor setting, is not necessary for many of our predictions above.

¹⁸The Compensation Discussion and Analysis (CD&A) disclosures were mandated in 2006. See <https://www.sec.gov/news/press/2006/2006-123.htm> for details and [Bloomfield \(2021\)](#) for an analysis of the effect of these disclosures on competition.

9 Conclusion

In response to growing interest in ESG reporting, we develop a framework for considering the effects of introducing ESG reports in a capital market setting featuring existing financial reporting. We show how introducing the ESG report affects stock prices, market responses to financial reports, and corporate activities. We provide conditions related to measurable economic constructs that characterize when investors can be expected to react favorably, on average, to ESG reports, and when introducing ESG reporting will tend to increase or decrease ERCs and stock prices.

Overall, our paper contributes to the emerging literature on ESG reporting, providing a framework for developing and interpreting empirical results in a capital market setting. While we focus on a setting with expanding ESG reporting, our results are also applicable to recent shifts away from expansionary policy in sustainability reporting. Though our results highlight the importance of investor preferences, we view welfare implications as important but outside the scope of our endeavor. We also focus on corporate incentives provided by market pricing, rather than explicit compensation contracts. Considering welfare and contracting is likely to result in additional interesting implications of the expansion or contraction of ESG reporting and shifts in investors' interests in firms' ESG performance. Exploring these, however, requires care around the specification of regulatory and welfare objectives and clarity on how corporate governance structures balance different investors' preferences in the contracting process.

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A Proofs

A.1 Proof of Lemmas 1 and 2

We solve for the model with both reports via backward induction, then derive the equilibrium of Lemma 1 as a special case.

Given the CARA-normal setting, share demands are given by $q_1 = \frac{E[x|r,f]-p}{\rho \text{Var}[x|r,f]}$ and $q_2 = \frac{E[x+y|r,f]-p}{\rho \text{Var}[x|r,f]}$. Substituting demands into the market clearing condition $1 = \lambda q_2 + (1 - \lambda) q_1$ gives the price function as

$$\begin{aligned} 1 &= \lambda \frac{E[x+y|r,f]-p}{\rho \text{Var}[x|r,f]} + (1 - \lambda) \frac{E[x|r,f]-p}{\rho \text{Var}[x|r,f]} \\ \Leftrightarrow p &= E[x|r,f] + \lambda E[y|r,f] - \rho \text{Var}[x|r,f]. \end{aligned} \quad (9)$$

Conjecture that the manager's choice of action in equilibrium is a constant: $e^* = \alpha$.

The joint distribution of x, y, f , and r is:

$$\begin{pmatrix} \tilde{x} \\ \tilde{y} \\ \tilde{r} \\ \tilde{f} \end{pmatrix} \sim N \left(\begin{pmatrix} \theta(\alpha + \bar{\phi}) \\ \eta(\alpha + \bar{\phi}) \\ \eta(\alpha + \bar{\phi}) \\ \theta(\alpha + \bar{\phi}) \end{pmatrix}, \begin{pmatrix} \theta^2 \sigma_\phi^2 + \sigma_x^2 & \theta \eta \sigma_\phi^2 & \theta \eta \sigma_\phi^2 & \theta^2 \sigma_\phi^2 + \sigma_x^2 \\ . & \eta^2 \sigma_\phi^2 + \sigma_y^2 & \eta^2 \sigma_\phi^2 + \sigma_y^2 & \theta \eta \sigma_\phi^2 \\ . & . & \eta^2 \sigma_\phi^2 + \sigma_y^2 + \sigma_r^2 & \theta \eta \sigma_\phi^2 \\ . & . & . & \theta^2 \sigma_\phi^2 + \sigma_x^2 + \sigma_f^2 \end{pmatrix} \right)$$

Conditional means are given by

$$\begin{aligned} E \begin{bmatrix} \tilde{x} \\ \tilde{y} \end{bmatrix} \Big| r, f &= \begin{bmatrix} \theta(\alpha + \bar{\phi}) \\ \eta(\alpha + \bar{\phi}) \end{bmatrix} + \begin{bmatrix} \theta \eta \sigma_\phi^2 & \theta^2 \sigma_\phi^2 + \sigma_x^2 \\ \eta^2 \sigma_\phi^2 + \sigma_y^2 & \theta \eta \sigma_\phi^2 \end{bmatrix} \\ &\quad \begin{bmatrix} \eta^2 \sigma_\phi^2 + \sigma_y^2 + \sigma_r^2 & \theta \eta \sigma_\phi^2 \\ \theta \eta \sigma_\phi^2 & \theta^2 \sigma_\phi^2 + \sigma_x^2 + \sigma_f^2 \end{bmatrix}^{-1} \begin{bmatrix} r - \eta(\alpha + \bar{\phi}) \\ f - \theta(\alpha + \bar{\phi}) \end{bmatrix} \end{aligned}$$

Simplifying,

$$E[\tilde{x}|r, f] = \theta(\alpha + \bar{\phi}) + \frac{\theta\eta\sigma_\phi^2\sigma_f^2}{\Sigma_f\Sigma_r - \theta^2\eta^2\sigma_\phi^4}(r - \eta(\alpha + \bar{\phi})) + \frac{\Sigma_x\Sigma_r - \theta^2\eta^2\sigma_\phi^4}{\Sigma_f\Sigma_r - \theta^2\eta^2\sigma_\phi^4}(f - \theta(\alpha + \bar{\phi}))$$

$$E[\tilde{y}|r, f] = \eta(\alpha + \bar{\phi}) + \frac{\Sigma_y\Sigma_f - \theta^2\eta^2\sigma_\phi^4}{\Sigma_f\Sigma_r - \theta^2\eta^2\sigma_\phi^4}(r - (\eta(\alpha + \bar{\phi}))) + \frac{\theta\eta\sigma_\phi^2\sigma_r^2}{\Sigma_f\Sigma_r - \theta^2\eta^2\sigma_\phi^4}(f - (\theta(\alpha + \bar{\phi}))),$$

where $\Sigma_x \equiv \theta^2\sigma_\phi^2 + \sigma_x^2$, $\Sigma_f \equiv \Sigma_x + \sigma_f^2$, $\Sigma_y \equiv \eta^2\sigma_\phi^2 + \sigma_y^2$, $\Sigma_r \equiv \Sigma_y + \sigma_r^2$.

Knowing that $p = E[x|r, f] + \lambda E[y|r, f] - \rho \text{Var}[x|r, f]$, the response coefficients are

$$\psi_f^* \equiv \frac{\partial p}{\partial f} = \frac{\Sigma_x\Sigma_r - \theta^2\eta^2\sigma_\phi^4 + \lambda(\theta\eta\sigma_\phi^2\sigma_r^2)}{\Sigma_f\Sigma_r - \theta^2\eta^2\sigma_\phi^4}$$

$$\psi_r^* \equiv \frac{\partial p}{\partial r} = \frac{\theta\eta\sigma_\phi^2\sigma_f^2 + \lambda(\Sigma_y\Sigma_f - \theta^2\eta^2\sigma_\phi^4)}{\Sigma_f\Sigma_r - \theta^2\eta^2\sigma_\phi^4}$$

The manager's problem (reduced to only controlled parts) is

$$\max_e \quad \psi_r^*(\eta e) + \psi_f^*(\theta e) - \frac{c}{2}e^2$$

$$\Rightarrow \quad e^* = \frac{\psi_r^*\eta + \psi_f^*\theta}{c}.$$

Lemma 1 can be derived by setting $\sigma_r^2 \rightarrow \infty$.

A.2 Proof of Propositions 1, 2, and 3

Recall that the ESG-RC is $\psi_r^* = \lambda \left(1 - \frac{\sigma_r^2}{\Sigma_r}\gamma_1\right) + \frac{\theta\eta\sigma_\phi^2}{\Sigma_r}\gamma_2 = \frac{\theta\eta\sigma_\phi^2\sigma_f^2 + \lambda(\Sigma_y\Sigma_f - \theta^2\eta^2\sigma_\phi^4)}{\Sigma_f\Sigma_r - \theta^2\eta^2\sigma_\phi^4}$. The denominator of the ESG-RC is always positive. The ESG-RC is positive when its numerator is positive

$$\theta\eta\sigma_\phi^2\sigma_f^2 + \lambda(\Sigma_y\Sigma_f - \theta^2\eta^2\sigma_\phi^4) > 0$$

$$\Leftrightarrow \lambda > \frac{-\theta\eta\sigma_\phi^2\sigma_f^2}{\Sigma_y\Sigma_f - \theta^2\eta^2\sigma_\phi^4}$$

where the $\Leftrightarrow$ in the second line follows from $\Sigma_y\Sigma_f - \theta^2\eta^2\sigma_\phi^4 > 0$.

The ERC after the introduction of ESG reporting is $\psi_f^* = \left(1 - \frac{\sigma_f^2}{\Sigma_f}\beta_1\right) + \lambda \frac{\theta\eta\sigma_\phi^2}{\Sigma_f}\beta_2 = \frac{\Sigma_x\Sigma_r - \theta^2\eta^2\sigma_\phi^4 + \lambda(\theta\eta\sigma_\phi^2\sigma_r^2)}{\Sigma_f\Sigma_r - \theta^2\eta^2\sigma_\phi^4}$. The ERC before the introduction of ESG reporting is $\psi_f^\dagger = \left(1 - \frac{\sigma_f^2}{\Sigma_f}\right) + \lambda \frac{\theta\eta\sigma_\phi^2}{\Sigma_f} = \frac{\Sigma_x + \lambda\theta\eta\sigma_\phi^2}{\Sigma_f}$. The change in the ERC as a result of introducing ESG reporting is

$$\psi_f^* - \psi_f^\dagger = \frac{\Sigma_x\Sigma_r - \theta^2\eta^2\sigma_\phi^4 + \lambda(\theta\eta\sigma_\phi^2\sigma_r^2)}{\Sigma_f\Sigma_r - \theta^2\eta^2\sigma_\phi^4} - \frac{\Sigma_x + \lambda\theta\eta\sigma_\phi^2}{\Sigma_f}$$

Since $\Sigma_f\Sigma_r - \theta^2\eta^2\sigma_\phi^4 > 0$ and $\Sigma_f\Sigma_y - \theta^2\eta^2\sigma_\phi^4 > 0$, the change in the ERC is positive when

$$\begin{aligned} \Sigma_f(\Sigma_x\Sigma_r - \theta^2\eta^2\sigma_\phi^4 + \lambda(\theta\eta\sigma_\phi^2\sigma_r^2)) - (\Sigma_f\Sigma_r - \theta^2\eta^2\sigma_\phi^4)(\Sigma_x + \lambda\theta\eta\sigma_\phi^2) &> 0 \\ -\theta^2\eta^2\Sigma_f\sigma_\phi^4 + \lambda\Sigma_f(\theta\eta\sigma_\phi^2\sigma_r^2) - \lambda\theta\eta\Sigma_f\Sigma_r\sigma_\phi^2 + \theta^2\eta^2\Sigma_x\sigma_\phi^4 + \lambda\theta^3\eta^3\sigma_\phi^6 &> 0 \\ -\theta^2\eta^2\sigma_\phi^4\sigma_f^2 - \lambda\theta\eta\Sigma_f\sigma_\phi^2\Sigma_y + \lambda\theta^3\eta^3\sigma_\phi^6 &> 0 \\ -\theta^2\eta^2\sigma_\phi^2\sigma_f^2 - \lambda\theta\eta\Sigma_f\Sigma_y + \lambda\theta^3\eta^3\sigma_\phi^4 &> 0 \\ \lambda\theta\eta(\theta^2\eta^2\sigma_\phi^4 - \Sigma_f\Sigma_y) &> \theta^2\eta^2\sigma_\phi^2\sigma_f^2 \\ \lambda\theta\eta &< \frac{-\theta^2\eta^2\sigma_\phi^2\sigma_f^2}{\Sigma_f\Sigma_y - \theta^2\eta^2\sigma_\phi^4} \end{aligned}$$

where the last inequality follows from $\Sigma_f\Sigma_y - \theta^2\eta^2\sigma_\phi^4 > 0$.

The firm's expected price after the introduction of ESG reporting is $p_0^* = E[x^*] + \lambda E[y^*] - \rho\Sigma_x = (\theta + \lambda\eta)(e^* + \bar{\phi}) - \rho\Sigma_x = (\theta + \lambda\eta)\left(\frac{\psi_r^*\eta + \psi_f^*\theta}{c} + \bar{\phi}\right) - \rho\Sigma_x$. The firm's expected price before the introduction of ESG reporting is $p_0^\dagger = E[x^\dagger] + \lambda E[y^\dagger] - \rho\Sigma_x = (\theta + \lambda\eta)(e^\dagger + \bar{\phi}) - \rho\Sigma_x = (\theta + \lambda\eta)\left(\frac{\psi_f^\dagger\theta}{c} + \bar{\phi}\right) - \rho\Sigma_x$. The change in the expected price is $p_0^* - p_0^\dagger = \frac{\theta + \lambda\eta}{c} \left((\psi_f^* - \psi_f^\dagger)\theta + \psi_r^*\eta \right)$, and it is positive when

$$\begin{aligned} (\theta + \lambda\eta) \left(\frac{-\theta^2\eta^2\sigma_\phi^4\sigma_f^2 - \lambda\theta\eta\Sigma_f\sigma_\phi^2\Sigma_y + \lambda\theta^3\eta^3\sigma_\phi^6}{\Sigma_f} \theta + (\theta\eta\sigma_\phi^2\sigma_f^2 + \lambda(\Sigma_y\Sigma_f - \theta^2\eta^2\sigma_\phi^4))\eta \right) &> 0 \\ (\theta + \lambda\eta) \left((-\theta^2\eta^2\sigma_\phi^4\sigma_f^2 - \lambda\theta\eta\Sigma_f\sigma_\phi^2\Sigma_y + \lambda\theta^3\eta^3\sigma_\phi^6)\theta + (\theta\eta\sigma_\phi^2\sigma_f^2 + \lambda(\Sigma_y\Sigma_f - \theta^2\eta^2\sigma_\phi^4))\eta\Sigma_f \right) &> 0 \\ (\theta + \lambda\eta) \left(\theta\sigma_\phi^2\sigma_f^2(-\theta^2\eta^2\sigma_\phi^2 + \eta^2\Sigma_f) + \lambda(\Sigma_f - \theta^2\sigma_\phi^2)(\eta\Sigma_y\Sigma_f - \theta^2\eta^3\sigma_\phi^4) \right) &> 0 \\ \eta(\theta + \lambda\eta)(\Sigma_f - \theta^2\sigma_\phi^2) \left(\theta\eta\sigma_\phi^2\sigma_f^2 + \lambda(\Sigma_y\Sigma_f - \theta^2\eta^2\sigma_\phi^4) \right) &> 0. \end{aligned}$$