CFR Working Paper NO. 25-10

ESG Metrics in Executive Compensation: A Multitasking Approach

V. Agarwal • J.-P. Gomez •
K. Hosseini • M. Jha

centre for financial research
cologne

ESG Metrics in Executive Compensation: A Multitasking Approach*

Vikas Agarwal† Juan-Pedro Gómez‡ Kasra Hosseini§ Manish Jha¶

October 21, 2025

ABSTRACT

We model firm executives' compensation incentives when ESG metrics are added to their performance-vested contracts. Drawing on multitasking theory, we predict that incentives tied to standard accounting or financial metrics are reduced after introducing ESG metrics to induce executives to reallocate effort toward ESG goals. Empirically, the expected pay–performance sensitivity of standard metrics decreases by about 20% after ESG adoption, especially when ESG metrics are more numerous, less complementary, or less measurable. The tradeoff is associated with improved ESG ratings, consistent with efficient incentive design under multitasking that optimally balances effort across financial and ESG objectives.

JEL classification: J33, M12, M14, G34, G32
Keywords: ESG pay, multitasking, pay-performance sensitivity, dollar delta, incentives, executive compensation, metrics

*Vikas Agarwal thanks the CFR in Cologne for its continued support. Juan-Pedro Gómez acknowledges that the research reported in this paper was partially funded by MCIN /AEI /10.13039/501100011033/FEDER, UE Grant No. PID2021-125359NB-I00 and No. PID2024-161318NB-I00, and the program CIVICA through the grant EXECML 2004-26 sponsored by the European Commission. We are thankful to Swaminathan Kalpathy for sharing the code for delta calculations. We are grateful to Igor Kadach (discussant), Lin Qui (discussant), José Luis Sarto (discussant), Anna Toldrà-Simats (discussant), Mohammed Zakriya (discussant), Ron Masulis, Mauricio Montone, Peter Swan, Rafael Zambrana, and participants at the AES Annual Conference, Auckland University, Australian National University, Durham University, Eindhoven University of Technology, Erasmus Corporate Governance Conference, Finance Forum at UPNA (Pamplona), Future Finance Fest Lithuania, Georgia State University, Hong Kong University, IE University, Monash University, Peking University, Toulouse Business School, Universidad de Zaragoza, the University of Leicester, the University of New South Wales, and the University of Sydney.

†J. Mack Robinson College of Business. Georgia State University. Email: vagarwal@gsu.edu
‡IE Business School. IE University. Email: juanp.gomez@ie.edu
§Erasmus School of Economics, Erasmus University Rotterdam. Email: hosseini@ese.eur.nl
¶J. Mack Robinson College of Business. Georgia State University. Email: mjha@gsu.edu

1 Introduction

The integration of Environmental, Social, and Governance (ESG) metrics into executive compensation has become a focal point in corporate governance research, driven by the increasing emphasis on sustainability by regulators, investors, and society at large. This practice, referred to as "ESG Pay" has experienced rapid adoption around the world, with the percentage of executives with ESG performance metrics included in their contracts growing from about 15% in 2008 to close to 45% in 2023, with a sharp increase after 2018 (see Figure 1).

A growing literature shows that including ESG performance metrics in executive compensation is often associated with meaningful improvements in ESG outcomes, such as reduced carbon emissions and better ESG ratings, and a significant increase in firm value (Flammer, Hong, and Minor, 2019). More recent international evidence confirms this effect: firms adopting ESG-linked pay tend to achieve stronger key ESG indicators, though without clear gains in their overall financial returns (Cohen et al., 2023). At the same time, ESG metrics currently have a minimal impact on total executive compensation (Gantchev, Giannetti, and Hober, 2024). They typically account for only a modest fraction of bonus schemes (Rajan, Ramella, and Zingales, 2023; Efing et al., 2024), are highly discretionary and loosely specified, and thus ineffective as incentive devices (Edmans, 2021; Edmans, 2023). This flexibility also makes them vulnerable to manipulation by managers with rent-seeking incentives (Bebchuk and Tallarita, 2022).

We offer a fresh perspective that reconciles these seemingly contradictory views. Unlike standard financial metrics, the expected sensitivity of the stock price to ESG goals cannot be estimated at the time of setting executive pay because firms lack sufficient historical data to calibrate these metrics. ESG objectives are also notoriously difficult to quantify (with measurement challenges differing across environmental, social, and governance categories). In contrast, firms have long relied on well-established, measurable financial indicators, such as earnings before interest and taxes (EBIT) or total shareholder return (TSR), to motivate

executives to improve firm performance. The interplay of incentives for tasks of different nature and measurability is the object of multitasking theory (e.g., Holmstrom and Milgrom, 1991; Baker, 1992; Feltham and Xie, 1994; Prendergast, 1999; Dewatripont, Jewitt, and Tirole, 2000; Bénabou and Tirole, 2016). A key insight from this theory is that firms can provide incentives for a value-enhancing but difficult-to-measure task by optimally reducing its *opportunity cost*, that is, by decreasing the incentives for other tasks that are easier to measure or quantify and which compete for managers' limited time and costly effort. In that case, tasks are *substitutes*: the marginal cost of effort put into one task increases with the amount of effort exerted on the other task. The prediction is symmetrical when the tasks are *complementary*, thus prompting firms to optimally increase the incentives for the more measurable tasks.

In this paper, we explicitly model the inherent multitasking nature of managerial incentives when ESG metrics are introduced alongside standard financial or accounting metrics. Building on the seminal multitasking model of Holmstrom and Milgrom (1991), we derive a set of empirically testable predictions. Specifically, we predict that, if the ESG and standard tasks are substitutes (complements) in the provision of managerial effort, the expected pay-performance sensitivity or *dollar delta* of a standard accounting or financial metric (e.g., EBIT or TSR) will decrease (increase) upon the introduction of an ESG metric and, conversely, increase (decrease) upon its removal. In contrast, introducing or removing an additional standard metric should not alter the dollar delta of the standard metric, reflecting no trade-off in effort allocation by the executive. Furthermore, if the standard and ESG tasks are substitutes for the executive's effort, the decrease in dollar delta is expected to be more pronounced when the number of ESG-linked metrics in the compensation increases, the ESG and financial tasks are less complementary, or the ESG metrics are less measurable.

We test our hypotheses on a panel of over 22,000 *metric-executive-firm-year* observations, spanning 5,671 executives at 735 U.S. firms between 2008 and 2023. Each

observation corresponds to a standard accounting or financial metric tied to performance-vested share or option awards. Among these firms, 311 never included ESG metrics in executive contracts, while 424 firms had at least one executive with an ESG metric during our sample period. In particular, 38% of all observations relate to executives whose compensation contracts included at least one ESG metric, which dramatically increased from 23% in 2008 to 56% in 2023, with especially sharp acceleration in the last three years of the sample period. When CEOs are rewarded for meeting ESG-related goals, firms usually pass on similar responsibilities to other top executives, with more than 80 percent of non-CEO executives receiving goals in the same pillar, reflecting coordinated ESG adoption across the leadership team. The vast majority of ESG metrics are tied to absolute performance goals (80%), while a smaller share combines absolute and relative elements (19%), and less than one percent rely solely on relative performance. Using the ISS Incentive Lab database merged with market and accounting data and adopting a methodology introduced by Bettis et al. (2018), we estimate the *dollar delta* of each metric, that is, the expected change in dollar compensation (attributable solely to that specific metric) when the stock price increases by 1%.[1] We then examine the variation in dollar delta associated with standard financial metrics when an ESG metric or, alternatively, a new standard metric is introduced into the executive compensation contract.

At the extensive margin, consistent with the model's first prediction and supporting the hypothesis of effort substitution between ESG and standard tasks, we find that when firms add at least one ESG metric to the executive's compensation contract, the average dollar delta of standard financial or accounting metrics decreases by about $4,600, statistically significant at the 1% level. This result is also economically meaningful: it is equivalent to roughly 20% reduction from a baseline average dollar delta of $23,560. It holds even after accounting for high-dimensional *metric-executive-firm-award type-vesting schedule* and *year* fixed effects. That is, we estimate an economically and statistically significant decrease in the dollar delta of

[1]The dollar delta is a widely used measure of managerial incentives (e.g. Coles, Daniel, and Naveen, 2006; Gormley, Matsa, and Milbourn, 2013; Shue and Townsend, 2017).

a particular standard metric (Sales, TSR, EPS, Operating Income, EBITDA, EBIT, Earnings, Stock Price or Net Income) for the same executive in the same firm for the same type of award (stock options or equity) and vesting schedule (cliff, ratable, or unknown) after the executive's compensation contract includes at least one ESG metric. Finally, we find evidence consistent with a positive association between the tradeoff among standard and ESG incentives and the company's ESG rating. On average, the reduction of a one-standard deviation in the delta of a standard metric is associated with an ESG rating 0.93 points higher (the average rating is 60.3 out of 100). This result is statistically significant at the 1% level.

Our findings remain robust after accounting for year-industry fixed effects, and time-varying controls for firm, contract, and executive characteristics. This effect also holds when using an alternative pay-performance sensitivity measure, namely pay-performance elasticity or delta. Moreover, in tests allowing asymmetric effects for the introduction versus removal of ESG metrics, we confirm that the dollar delta declines when ESG metrics are added and correspondingly increases when they are fully removed. The magnitude and statistical significance of these effects are nearly symmetric. We also find that in terms of magnitude, environmental criteria dominate the incentive effect, followed by social metrics. There is no evidence that governance metrics by themselves alter the incentives' structure significantly.

Of course, the introduction or exclusion of an ESG metric in the executive's compensation is not an exogenous event. Using a staggered difference-in-differences (DiD) framework, which exploits the varying timing of ESG metric adoption or removal across executives, we confirm a symmetric causal effect. The inclusion of ESG metrics reduces the dollar delta of standard financial metrics, while their removal leads to an increase in dollar delta. This pattern holds even when considering dynamic treatment timing and potential heterogeneity using state-of-the-art DiD methodologies (e.g., Callaway and Sant'Anna, 2021). In contrast, and confirming the second prediction of our model, the addition or removal of standard financial metrics shows no significant change in the dollar delta of the standard metrics in place, hence supporting

the hypothesis of effort independence among standard tasks.

We next test the model's predictions at the intensive margin. First, we study the effect of the number of ESG metrics in executive contracts. The intuition is that, if the effort employed on ESG tasks is a substitute with respect to the effort exerted on standard tasks, adding more ESG metrics increases the executive's cognitive and effort burden, thereby raising the opportunity cost of effort directed toward more measurable standard tasks. Our empirical tests support our third prediction and show a non-linear effect of the number of ESG metrics on the dollar delta of standard financial metrics. Introducing a single ESG metric yields a modest and statistically weaker reduction in the dollar delta. When two or three ESG metrics are included, the average reduction in the dollar delta is about \$7,200 (significant at the 5% level). With four or more ESG metrics, the drop becomes more pronounced, approximately \$8,400 (statistically significant at the 1% level).

The model's fourth prediction establishes that the degree of substitution in effort cost between ESG and standard tasks should result in a larger drop in the dollar delta of the standard metric after the inclusion of the ESG metric. To capture the intensity of effort substitution empirically, we use the SASB materiality index. We classify each ESG metric in a given executive's contract as a substitute if it pertains to an ESG issue identified by SASB as financially less material to the executive's industry. Supporting this prediction, we find that a reduction of \$1,067.3 in the dollar delta, significant at the 5% level, for an increase of one non-material ESG metric in the contract. In contrast, for every new material ESG metric included in the contract, the decrease in dollar delta is statistically not different from zero.

The model's last prediction states that more measurable ESG metrics should be associated with a smaller decline in the dollar delta of the standard metrics. The theoretical rationale is as follows. If ESG targets were as quantifiable as standard metrics, executives could be held directly accountable with minimal or zero opportunity cost, thus without diluting their incentive to pursue traditional financial tasks. To operationalize measurability, we classify an ESG metric as measurable if at least one benchmark triggers vesting (such as minimum,

threshold, or maximum performance) and its corresponding payout is clearly reported in the ISS Incentive Lab. Empirically, the data supports the model's prediction. We show that the dollar delta of the average standard metric decreases by $1,769, significant at the 1% level, per the addition of a new nonmeasurable ESG metric. When the new ESG metric is measurable, the change in dollar delta is not statistically distinguishable from zero.

Our results remain robust to numerous sensitivity checks. They hold when controlling for firm- and executive-level characteristics; after applying entropy balanced matching based on determinants of ESG-pay adoption at the firm level; across alternative ESG classification taxonomies; when excluding grants with more than 12 ESG metrics (i.e., top 1% of the observations); and when omitting data prior to 2018, the year ISS Incentive Lab implemented a major reclassification of ESG metrics. We further show that the observed decrease in dollar delta for standard financial metrics is not compensated by an increase in incentives associated with time-vesting equity or option rewards, and that total executive compensation remains statistically unchanged when ESG metrics are added or removed. Overall, these comprehensive robustness tests support our interpretation that firms enact an efficient ESG performance-vested design, consistent with multitasking theory, where introducing harder-to-measure ESG objectives reduces emphasis on easily quantifiable tasks, without inflating overall pay.

1.1 Literature review and contribution

Holmström (1979) predicts that, according to efficient contracting theory, any observable metric correlated with the unobservable effort of executives to improve firm performance should be included in their compensation contracts. Based on this fundamental insight, many articles have followed the seminal paper of Larcker (1983) to create a rich corpus of work devoted to the typology and design of financial, market, and operating metrics included in executive compensation contracts (e.g., Ittner, Larcker, and Rajan, 1997; Dutta and Reichelstein, 2003; Bizjak, Lemmon, and Whitby, 2009; Bettis et al., 2010; De Angelis

and Grinstein, 2014; Li and Wang, 2016; Bettis et al., 2018; Ma, 2019). Despite the increasing complexity in the number and interaction of metrics included in executive compensation contracts (e.g., Albuquerque et al. (2025)), the empirical tradeoff in incentives among these metrics is under-researched.

Although the multitasking framework has been often invoked by balance scorecard models in the accounting literature (e.g., Budde, 2007; Dikolli, Hofmann, and Kulp, 2009; Kvaløy and Olsen, 2023) there is, to the best of our knowledge, no direct quantitative estimation of the incentives tradeoff for executives as predicted by the theory.[2] We contribute to fill this gap by empirically quantifying the reduction in the power of incentives (measured as dollar delta) for standard performance metrics in U.S. executive compensation after the introduction of ESG metrics. We find strong and robust support for the incentives tradeoff between ESG and standard metrics predicted by the theory, consistent with efficient contracting in the presence of multitasking.

The recent exponential growth of ESG metrics in executive compensation offers a unique setting to test the predictions of multitasking theory on executive compensation. Broadly speaking, there are three views on why companies may include ESG metrics in the compensation of their executives. According to the first view, ESG metrics align managerial incentives with the creation of long-term shareholder value. Thus, they should function much like other non-financial or non-accounting performance measures such as customer satisfaction or product quality examined in the studies previously mentioned. In that case, ESG goals should complement standard accounting, operating, or financial metrics in executive contracts. Consistent with this view, Cohen et al. (2023) use global executive compensation data to show that executive compensation tied to ESG performance is associated with improved ESG ratings and reduced carbon emissions, but does not lead to significantly higher total pay. Within the paradigm of efficient contracting, we propose and

[2] Slade (1996) presents evidence applied to the contracts between private, integrated oil companies and their service stations in the city of Vancouver. Hong et al. (2018) shows evidence of incentives tradeoff from a natural experiment among Chinese factory workers.

empirically examine an alternative hypothesis suggesting that ESG-related tasks diverge from other non-financial or non-accounting tasks due to their limited standardization and the absence of robust historical data, which impedes their objective measurability. In our model, ESG metrics compete for managerial effort spent on tasks traditionally undertaken by executives and associated with standard and easily measurable financial or accounting metrics. The empirical support of our model predictions suggests that firms understand these tradeoffs and reorganize performance-vested incentives accordingly.

Challenging the principle of efficient contracting, the second view presented by Bebchuk and Tallarita (2022) argues that ESG-based compensation is often poorly designed, featuring ambiguous, discretionary, or unmeasurable goals and payouts, conditions that can allow managers to extract rent and undermine both effectiveness and accountability in pay practices. Similarly, Edmans (2023b) critiques conventional incentive schemes, whether financial or ESG-based, and advocates replacing them entirely with long-term restricted share plans. Such restricted equity, held over multiyear vesting periods, would eliminate the need for performance-based bonuses altogether and align executive decisions with longer-run shareholder value while minimizing incentive distortions. Although we do not model or test the (clearly endogenous) inclusion of ESG metrics in executive compensation, our results present robust evidence inconsistent with the rent-extraction view and the redundancy of ESG-based compensation incentives. Our evidence, based on the micro-analysis of thousands of incentive compensation contracts, shows that boards significantly tame the incentives associated with traditional shareholder-value maximizing metrics when ESG metrics are introduced without increasing simultaneously the executive's total pay or the power of time-vesting options. We are also the first to show that the intensity of this reduction is associated with the number, materiality, and measurability of the ESG metric.

A third view suggests that firms are increasingly adopting ESG initiatives in response to pressure from stakeholders, including society and institutional investors, rather than only seeking direct financial gains (e.g. Hart and Zingales, 2017; Krueger, Sautner, and Starks,

2020; Bauer, Ruof, and Smeets, 2021; Pastor, Stambaugh, and Taylor, 2025). When such pressure is substantial, institutional investors and shareholder groups with intrinsic ESG preferences would prioritize sustainability over short-term financial returns (Riedl and Smeets, 2017; Hartzmark and Sussman, 2019; He, Kahraman, and Lowry, 2023; Lowry, Wang, and Wei, 2025). In this case, firms may adopt ESG-linked pay as a mechanism to align executive incentives with shareholder and investor demands.[3] Consistent with this hypothesis, Gantchev, Giannetti, and Hober (2024) show that the adoption of ESG pay is associated with higher levels of institutional investor engagement, voting and trading activities, as well as greater shareholder support for director elections and compensation proposals. Importantly, these authors use the *ex-post* sensitivity of executive compensation to firm performance to conclude that "ESG metrics complement and do not substitute metrics based on financial targets." Although we also find that ESG metrics are unrelated to stock performance in the short term, our tests document a robust and significant tradeoff in the power of *ex-ante* incentives between ESG and standard metrics, measured through the estimated dollar delta, consistent with both types of metrics being substitutes in the allocation of managerial effort. This contrasting evidence highlights the key distinction between the (ex-ante) design of incentives and their (ex-post) impact on firm performance, which may take longer to materialize or be affected by opposing contemporaneous factors (e.g., Hall and Liebman, 1998).

Testing empirically whether ESG pay is an efficient tool for fostering long-term managerial incentives or primarily serving to align executive effort with shareholders' social and environmental preferences is challenging. Pastor, Stambaugh, and Taylor (2021) and Pastor, Stambaugh, and Taylor (2022) analyze, respectively, the theoretical and empirical implications of investors' motives behind the demand for ESG stocks. Li, Watts, and Zhu (2024) show that the average U.S. retail investor cares about firms' ESG activities but

[3]See Chaigneau and Sahuguet (2025) for an alternative perspective, in which ESG metrics in executive compensation reflect the board's rather than the investors' preferences for social outcomes, potentially at the expense of shareholder value maximization.

primarily to the extent these activities matter for the company's financial performance. More closely related to our investigation, Jung (2025) employs a structural model to find evidence consistent with a tradeoff between a firm's environmental performance and financial performance after the introduction of green incentives in executive compensation. We contribute to this literature by shifting the focus from the *level* to a largely overlooked dimension of ESG pay design: the *interaction* between ESG metrics and traditional metrics to maximize shareholder value, such as accounting- and market-based performance indicators. Edmans (2023b) highlights potential conflicts that arise from explicitly incentivizing certain ESG objectives at the expense of other less explicit ESG objectives. In contrast, we quantify the opportunity costs of focusing on ESG metrics relative to standard financial performance measures.

The remainder of the paper is structured as follows. Section 2 presents a model to motivate our empirically testable predictions. Section 3 presents the data sources and the construction of the variables used in the empirical analysis. The results of the empirical tests are analyzed in Section 4. Section 5 reports the robustness tests before concluding with Section 6.

2 Theoretical motivation

2.1 The model setup

Our model is based on the multitasking framework of Holmstrom and Milgrom (1991). It features two actors: an executive (the agent) employed by a firm (the principal), within a single-period setting. At the start of the period, the executive's compensation is tied to a single metric that is positively but only partially correlated with her effort in performing a standard task aimed at increasing firm profits. This standard metric, denoted as s, could represent, for example, an accounting measure such as EPS or EBIT, or a financial measure such as total shareholder return (TSR). The firm may then choose to augment the compensation contract by adding a new metric n linked to a new task. The firm must decide the pay-performance

sensitivity for both metrics and the fixed salary. The executive decides whether to accept the contract and, if so, how to allocate effort between the two tasks. At the end of the period, the uncertainty resolves, the executive is paid based on the metric performance achieved, and shareholders receive the residual net profit.

The new task can also be standard, similar to the existing task (albeit associated with a different metric), or it can be related to ESG, aimed at reducing the firm's environmental impact (E), improving its social contribution (S) or improving its governance (G). In the ESG case, the new metric could be, for instance, an ESG score (or a specific pillar score), the number of workplace accidents, or the firm's carbon emissions. Let $e^T = (e_s, e_n) \geq 0$ denote the effort vector, where e_s and e_n represent the effort of the executive for the standard and new tasks, respectively. The effort is unobservable and imposes a personal cost on the executive, captured by a convex cost function:[4]

$$C(e) = \frac{e_s^2}{2} + \frac{e_n^2}{2} + \gamma\, e_s\, e_n \tag{1}$$

The parameter $-1 < \gamma < 1$ captures the degree of interaction between the two tasks: negative values indicate complementarity, meaning the cost of effort on one task decreases when more effort is devoted to the other, while positive values indicate substitution, meaning the cost of effort increases.

Each effort generates a signal observed through a performance metric. The distribution of the signal vector is given by

$$x(e) = e + \epsilon \tag{2}$$

where ϵ is a vector of normally distributed noise with mean zero and covariance matrix Σ. Thus, the expected signal vector is an unbiased predictor of the executive's effort in each task: $\bar{x}(e) = e$. Let σ_s^2 and σ_n^2 denote the noise (variance) associated with the standard and

[4]This functional form follows, for example, Bénabou and Tirole (2016).

the new signals, respectively. For analytical tractability, the noise terms are assumed to be uncorrelated (that is, $\sigma_{ns} = 0$). The firm's gross profit, denoted $B\big(x(e)\big)$, is an increasing and concave function of both signals, reflecting that both tasks contribute positively, although with diminishing returns, to the firm's profit.

2.2 The executive's problem

The executive is risk averse with the risk aversion parameter $r > 0$ and has an exponential utility defined over her compensation. The compensation (w) consists of a performance-based component linear in both metrics, and a fixed salary:

$$w(x) = \beta + \alpha^\top x \tag{3}$$

$\alpha^\top = (\alpha_s, \alpha_n) \geq 0$, where α_s and α_n measure the sensitivity of compensation to the observable metrics x_s and x_n, respectively; β is the fixed salary.

Under these assumptions, the executive chooses her optimal level of effort for each task to maximize the expected utility of her compensation net of the cost of effort. Given the utility function and the normal distribution of the noise term, this is equivalent to choosing e to maximize the certainty-equivalent (CE) payoff. Substituting Equation (2) into Equation (3) yields the following maximization problem:

$$\max_e \ \mathrm{CE}(e) = \alpha^\top e - \tfrac{1}{2}\, r\, \alpha^\top \Sigma \alpha + \beta - C(e) \tag{4}$$

Taking the gradient of CE with respect to each effort choice and setting it equal to zero yields the first-order conditions:

$$\frac{\partial \mathrm{CE}}{\partial e_i} = 0 \implies \alpha_i = \frac{\partial C}{\partial e_i}, \qquad i \in \{s, n\}$$

Differentiating this condition with respect to e and inverting it, we obtain the executive's

implicit incentive-compatibility constraint:

$$\frac{\partial e}{\partial \alpha} = C_{ij}^{-1}, \quad \text{with} \quad C_{ij} = \begin{pmatrix} 1 & \gamma \\ \gamma & 1 \end{pmatrix} \tag{5}$$

In other words, the sensitivity of the executive's optimal effort with respect to performance incentives α decreases with the convexity of the cost function. Given the cost of effort function in Equation (1), the optimal incentives satisfy

$$\begin{aligned} \alpha_s &= e_s + \gamma e_n, \\ \alpha_n &= e_n + \gamma e_s \end{aligned}$$

Solving this linear system yields the executive's best-response effort as a linear function of incentive coefficients, $e = (e_s, e_n)^\top = C_{ij}^{-1}\alpha$. Hence:

$$e_s = \frac{\alpha_s - \gamma\alpha_n}{1-\gamma^2}, \qquad e_n = \frac{\alpha_n - \gamma\alpha_s}{1-\gamma^2} \tag{6}$$

If tasks are substitutes (i.e., $\gamma > 0$), inducing a given effort level demands steeper incentives on the focal task or, alternatively, flatter incentives on the rival task, as putting more effort into the latter task makes effort marginally more costly for the former. On the other hand, if the tasks are complementary (i.e., $\gamma < 0$), a given effort level may be achieved by incentivizing either task, since putting more effort into one task decreases the marginal cost of effort of the other. If the tasks are independent (i.e., $\gamma = 0$), the effort spent on each task only depends on the corresponding metric sensitivity.

2.3 The firm's optimal contract problem

The firm is assumed to be risk neutral. At the beginning of the period, it must choose the contract (β, α) that maximizes the firm's expected profit $(\bar{B})$ net of the executive's expected

compensation, subject to the executive's certainty equivalent being above her reservation level $\hat{CE}$ (the participation constraint) and the incentive-compatibility constraint that implicitly defines the effort $e(\alpha)$ as a function of α in Equation (6):

$$\begin{aligned} \max_{\beta,\alpha} \quad & \bar{B}\big(x(e(\alpha))\big) - \beta - \alpha^\top e(\alpha) \\ \text{s.t.} \quad & \alpha^\top e(\alpha) - \tfrac{1}{2} r\, \alpha^\top \Sigma \alpha + \beta - C\big(e(\alpha)\big) \geq \hat{CE} \\ & e(\alpha) = C_{ij}^{-1} \alpha \end{aligned} \tag{7}$$

Holmstrom and Milgrom (1991) show that the optimal contract (β^*, α^*) satisfies the first-order conditions:

$$\frac{\partial \bar{B}}{\partial x} = \big(I + r\, C_{ij} \Sigma\big)\, \alpha^*$$

$$\beta^* = \hat{CE} - {\alpha^*}^\top e(\alpha^*) + \tfrac{1}{2} r\, {\alpha^*}^\top \Sigma \alpha^* + C\big(e(\alpha^*)\big)$$

For the standard metric, the first condition can be written as follows:

$$\frac{\partial \bar{B}}{\partial x_s} = \alpha_s^* + r\big(\alpha_s^* \sigma_s^2 + \gamma \alpha_n^* \sigma_n^2\big) \tag{8}$$

Let Δ denote *Dollar Delta*, that is, the variation in the executive's compensation when the company's gross profit changes. Hence, given Equation (3):

$$\Delta := \frac{\partial w(x)}{\partial \bar{B}} = \alpha_s^* \frac{\partial x_s}{\partial \bar{B}} + \alpha_n^* \frac{\partial x_n}{\partial \bar{B}} \tag{9}$$

We call $\Delta_s = \frac{\partial\left(\alpha_s^{*T} x_s\right)}{\partial \bar{B}} = \alpha_s^* \frac{\partial x_s}{\partial \bar{B}}$ the dollar delta associated with the standard metric. At the extensive margin, we want to study whether this dollar delta is expected to increase or decrease after the introduction of a new metric in the executive's compensation. At the intensive margin, we want to explore how the characteristics of the new metric will impact the magnitude of these changes.

By the inverse function theorem, we substitute the inverse of Equation (8) into Δ_s to obtain the executive's pay-performance sensitivity with respect to the standard metric:

$$\begin{aligned}\Delta_s &= \frac{\alpha_s^*}{\alpha_s^* + r(\alpha_s^* \sigma_s^2 + \gamma\, \alpha_n^* \sigma_n^2)} \\ &= \frac{1}{1 + r\left(\sigma_s^2 + \gamma\, \frac{\alpha_n^* \sigma_n^2}{\alpha_s^*}\right)} \\ &= \left[1 + r\sigma_s^2\left(1 + \gamma\, \frac{\alpha_n^* \sigma_n^2}{\alpha_s^* \sigma_s^2}\right)\right]^{-1}\end{aligned} \tag{10}$$

Equation (10) predicts that when the standard and new tasks are substitutes in the executive's effort cost function ($\gamma > 0$), the dollar delta of the standard metric should decrease after the new metric is introduced (i.e. when α_n^* changes from null to positive) and it should decrease after the new metric is removed (i.e. when α_n^* changes from positive to null). Alternatively, if the tasks are complementary ($\gamma < 0$), the dollar delta of the standard metric is expected to increase when the new metric is introduced and decrease after it is removed. When both tasks are independent ($\gamma = 0$), no effect is expected after the introduction or removal of the new metric.

The literature (e.g. Xue, 2025; Hart and Zingales, 2017) has assumed an implicit tension between profitability and social efficiency. Therefore, we hypothesize that, if the new task (hence metric) is related to ESG, it is likely to be a substitute for the executive's effort (i.e., $\gamma > 0$).

Equation (10) also shows that empirically the trade-off in dollar delta after the introduction of the new metric will be detected only if the signal associated with this metric is sufficiently noisy. In the limit, if $\sigma_n^2 \to 0$, the model predicts that introducing a new metric will have no impact on the dollar delta of the standard metric regardless of whether the tasks are complements or substitutes. In that case, the dollar delta of the standard metric will only depend (inversely) on the executive's risk aversion and the volatility of the standard metric:

$$\lim_{\sigma_n^2 \to 0} \Delta_s = \left(1 + r\sigma_s^2\right)^{-1}$$

In other words, if the new metric is sufficiently precise, the standard metric need not be modified since the executive can be motivated to work on the new task more efficiently by increasing the dollar delta of the new metric directly.[5] We say in that case that the metric is sufficiently *measurable*.

In summary, we hypothesize that, on average, ESG tasks are less measurable, that is, the company does not have enough data to infer with the necessary precision the executive's effort spent on ESG tasks (i.e., σ_n^2 is large enough). We also hypothesize that ESG tasks are substitutes for the executive's costly effort spent on the standard tasks. Under these hypotheses, the model predicts that it is more efficient to motivate the executive to put effort into the ESG task *indirectly* by decreasing the dollar delta of the standard metric. This is summarized in our first prediction.

Prediction 1 *After the introduction (removal) of an ESG metric in the executive's compensation contract, the dollar delta of the standard metric will decrease (increase) if the ESG and standard tasks are substitutes.*

Prediction 1 will be rejected if the ESG metric is measurable enough, that is, if the company has enough information to infer with sufficient precision the executive's effort spent on the new ESG task (i.e., $\sigma_n^2 \to 0$), or if the ESG metric is not measurable (i.e., $\sigma_n^2 > 0$) but is complementary to or independent of the standard metric (i.e., $\gamma \geq 0$).[6]

On the other hand, if the new metric is a standard accounting or market-based metric, the firm can rely on its own historical data and that of its peers (i.e., $\sigma_n^2 \to 0$) to incentivize the executive to work on the new task by increasing the pay-performance sensitivity (dollar delta) of the new metric without changing the dollar delta of the existing standard metric.

[5] The dollar delta of the new metric is given by the Equation

$$\Delta_n = \alpha_n^* \frac{\partial x_n}{\partial \bar{B}} = \left[1 + r\sigma_n^2\left(1 + \gamma \frac{\alpha_s^* \sigma_s^2}{\alpha_n^* \sigma_n^2}\right)\right]^{-1}$$

Note that Δ_n increases monotonically as σ_n^2 decreases.

[6] If both tasks are complements, the delta of the standard metric will increase (decrease) after the introduction (removal) of the ESG metric. If they are independent, the delta of the standard metric will not change whether a new ESG metric is introduced or removed.

Prediction 2 *After the introduction or removal of a new standard metric in the executive's compensation, the dollar delta of the existing standard metric will not change.*

The former prediction based on Equation (10) can be generalized to the introduction of $N > 1$ new ESG metrics, leading to the following expression:

$$\Delta_s = \left(1 + r\sigma_s^2 \left(1 + \gamma \sum_{m=1}^{N} \frac{\alpha_m^* \sigma_m^2}{\alpha_s^* \sigma_s^2}\right)\right)^{-1} \tag{11}$$

Therefore, looking at the impact of the number of new ESG metrics N on Δ_s, the model predicts the following:[7]

Prediction 3 *When the number of ESG metrics introduced in the executive's compensation increases, the dollar delta of the standard metric will decrease if the ESG and the standard tasks are substitutes.*

To study the model predictions at the intensive margin with respect to the degree of effort complementarity or substitution (proxied by the parameter γ) and measurability (proxied by the inverse of the noise term σ_n^2) of the new ESG metric relative to the standard metric, we take the derivative of Equation (10) with respect to γ and σ_n^2, respectively.

Taking the derivative of Δ_s with respect to γ:

$$\frac{\partial \Delta_s}{\partial \gamma} = -\Delta_s^{-2}\, r\, \sigma_n^2 \frac{\alpha_n^*}{\alpha_s^*} < 0 \tag{12}$$

Prediction 4 *After the introduction of an ESG metric, the dollar delta of the standard metric will decrease less if the two tasks are relatively less of a substitute in the provision of the executive's effort.*

Taking the derivative of Δ_s with respect to σ_n^2:

[7] The prediction will hold even if not all ESG metrics have the same γ as long as the *weighted average* of γs across tasks is large enough in absolute value.

$$\frac{\partial \Delta_s}{\partial \sigma_n^2} = -\Delta_s^{-2}\, r\, \gamma \frac{\alpha_n^*}{\alpha_s^*} \tag{13}$$

Note that the prediction with respect to the measurability of the new ESG metric, captured by the inverse of the error term σ_n^2, depends on whether the tasks are complements ($\gamma < 0$), substitutes ($\gamma > 0$), or independent ($\gamma = 0$):

Prediction 5 *After the introduction of an ESG metric, the dollar delta of the standard metric will decrease less if the ESG metric is more measurable.*

These predictions are the basis for our empirical analysis.

3 Data

We collect data on performance goals from the ISS Incentive Lab database, which compiles detailed, comparable information on incentive awards from firms' proxy statements (DEF 14A). This includes grants, performance metrics, performance goals, and payout structures for all short- and long-term awards granted to named executive officers (NEOs). We focus only on performance-vesting (p-v) grants, which trigger the vesting of stock and option awarded to executives based on one or several performance metrics. The criteria for the number of units vested are commonly based on one or more accounting, stock price, or ESG metrics, such as EPS, total shareholder return, or emissions reduction.[8] Our sample includes all the accounting or market-based metric-executive-firm-year observations from ISS Incentive Lab in the period from 2008 to 2023 with non-missing payout structure information and for which we were able to collect the historical market and accounting data necessary to compute our dependent variable, dollar delta. This results in a dataset of 22,437 observations from 15,303 grants awarded to 5,671 unique executives from 735 unique US companies. We obtain accounting

[8] Appendix includes an example of the performance-based structure of an executive in our sample with a detailed description of all the variables mentioned.

information from Compustat and stock price data from CRSP.[9]

3.1 Key variables

Dollar Delta: A continuous variable that measures the change in the expected performance metric value (in dollars) after an increase of 1% in the stock price. Mathematically, we define it as:[10]

$$\text{Dollar Delta} = \text{Stock Price} \times \text{Number of Shares} \times \text{Percent Vest} \times \text{Delta} \tag{14}$$

Our analysis is at the metric level. The first product on the right-hand side of Equation (14) quantifies the dollar value of the executive's compensation (from that specific metric) if the executive meets the target performance benchmark. The variable, *Percent Vest*, indicates the portion of the award tied to a particular metric in a given evaluation period.[11] *Delta* captures the sensitivity of the executive's compensation tied to a specific metric to changes in the company's stock price. We calculate Delta using the simulation method from Bettis et al. (2018), where the expected value of the metric is simulated under an initial stock price of \$1 and then increased by 1% to observe the change in the discounted expected value of the metric.

Complementary vs substitute tasks:

We assume that an ESG metric is more complementary with a standard metric if it is included in the SASB materiality map of the industry to which the firm belongs. The SASB framework assesses the relevance of ESG metrics across industries, identifying those most critical to a company's performance and risk exposure. For each ESG metric in a grant,

[9] To calculate our dependent variable, we require detailed grant information for delta simulation, including the performance metric triggering vesting (accounting or stock price), the back-end instrument (stock or option), the number of awarded units, the performance evaluation period, the option's exercise price and expiration date, the exact grant date, and the correlation between the accounting metric and stock price.

[10] If the award is in stock options, we replace stock price and number of shares with the Black-Scholes value of the option and number of options, ensuring consistency in valuation.

[11] Even if there is a single performance metric, it can be evaluated over several consecutive periods, with different weights applied to each period.

we determine whether it is material for the company's industry and classify the material ESG metrics as more complementary (lower γ in the model) to the standard metrics. We acknowledge that more material tasks may actually involve even greater trade-offs with short-term financial performance and core business operations. For example, according to the SASB Materiality Map, "Water & Wastewater Management" is material in industries such as Metals & Mining, Oil & Gas, and Utilities, where operations depend heavily on the usage and discharge of water. Arguably, improvements (e.g., the installation of advanced treatment systems) entail significant upfront costs and uncertain short-term payoffs and are likely to have a greater impact on short-term operations precisely in these sectors where water issues are the most material. In that case, the material ESG task would be more substitutive to the standard task (higher γ in the model). We let the data tell us which assumption is supported.

The last column in Table A.5 indicates whether several ESG metrics are considered material to the firm and, therefore, complementary to the standard metrics. Since materiality depends on the industry in which a company operates, the fourth column provides an example of an industry where such a metric is included in executive compensation.

Measurability: We define an ESG metric as measurable if at least one of the benchmarks that trigger vesting for that performance metric in the payout structure (i.e., minimum, threshold, or maximum performance) and the corresponding payout are reported in ISS Incentive Lab. Measurability indicates that ESG metrics within executive compensation are quantifiable and structured around clear performance criteria. Of course, this proxy is not exogenous, since firms may unintentionally under-report or strategically choose what elements of the pay structure to disclose. If it is unintentional, we assume that it is noise. If it is strategic, our results may be biased.

Table A.5 in the Appendix illustrates different examples of ESG metrics in grants for NEOs, where the third column indicates whether a metric is measurable. For instance, while "Cumulative Carbon Emissions Reduction" is measurable because the benchmarks at which

vesting is initiated for the executive are explicitly defined, "Progress toward our long-term sustainability goal" is a broader and rather ambiguous metric without any specific benchmark in the compensation structure.

Table 1 shows the annual trend in performance metrics in our sample during the period 2008 to 2023. The column *#Metrics* represents the number of accounting or market-based performance metrics in our sample. The column *%ESG Metrics* represents the percentage of observations in the column *#Metrics* that includes at least one ESG metric in the executive's compensation contract that year. The column *%Measurable ESG* and *%Complementary ESG* denote, respectively, the percentage of measurable and complementary ESG metrics in our sample. In particular, there is a sharp increase in the percentage of observations that include at least one ESG metric in executive compensation contracts over time, from about 23% in 2008 to more than 56% at the end of our sample period in 2023. Interestingly, there is significant time series variation in both the measurability and complementarity of ESG metrics, but neither shows a monotonically increasing or decreasing trend.

[Insert Table 1 about here]

3.2 Identification of ESG compensation contracts

To identify ESG-related compensation contracts, we initially considered using the categorization provided in the ISS Incentive Lab dataset, which classifies metrics as 'Accounting', 'Stock Price', 'Other', or 'ESG'. However, we found that prior to 2018, ESG metrics were left blank or categorized as 'Other'.[12] This limitation prompted us to instead rely on the available details for each disclosed metric.[13] The available details for each disclosed performance metric provide brief descriptions of the criteria tied to compensation contracts, such as 'Total Recordable Incident Rate', 'Development Contribution - Adjusted

[12]There are also examples of financial goals that are categorized as 'Other'.

[13]The column 'metricother' in the ISS Incentive Lab dataset provides additional details on disclosed metrics. For some examples of ESG metrics, see Table A.4.

EBITDA', and 'Environmental Health and Safety Performance'. These descriptions are available for both ESG and non-ESG contracts.

To classify these metrics as related to ESG, we use the keyword list provided by Gantchev, Giannetti, and Hober (2024), which consists of 1,034 terms associated with Environmental, Social, and Governance (ESG) factors. For each keyword on their list, we evaluated its effectiveness in identifying ESG metrics by analyzing its performance in the post-2018 period, when ISS Incentive Lab began explicitly categorizing ESG metrics. Specifically, we calculate the false positive ratio for each keyword, defined as the proportion of instances where the keyword incorrectly classifies a metric as ESG related (i.e., the metric was not marked ESG by ISS) relative to the total number of matches. Keywords with a false positive ratio greater than 50% are deemed unreliable and excluded from our classification process. This filtering results in the removal of 81 keywords, leaving a refined set of 953 terms used to identify ESG-related metrics. Section A.3 in the Appendix provides the complete list of the 953 keywords, along with examples of removed terms and their corresponding false positive matches. These examples illustrate cases where the removed keywords incorrectly classified non-ESG metrics as ESG-related.

Finally, a compensation contract is considered an ESG contract if the executive has at least one ESG metric in their contract.[14] Figure 1 shows the percentage of executives with ESG contracts in our sample based on the ISS Incentive Lab classification and our keyword-based classification. The percentage of ESG contracts was nearly zero from 2008 to 2017 using the ISS Incentive Lab classification, indicating that ESG metrics were not explicitly identified during this period. The percentage of contracts with an ESG component has increased since 2018. Our keyword-based classification identifies more ESG contracts than the ISS classification post-2018, since the ISS does not categorize certain descriptions as ESG, such as 'Environmental and Safety,' 'Green Growth Decarbonization,' and 'Implementation and Announcement of Climate Action Plan,' despite their likely relevance

[14] An example of an ESG contract with two metrics is provided in Section A.1 of the Appendix.

to ESG.

[Insert Figure 1 about here]

3.3 Descriptive statistics

As discussed in Section 3, our final sample includes 22,437 observations. Each observation is a unique performance metric at the executive-year level. Table 2 presents the descriptive statistics for the key variables in our analysis. The *ESG Metric* variable, a dummy indicator, has a mean value of 0.38, indicating that 38% of the observations in our sample have at least one ESG metric in the compensation contract. These are *treatment* observations. There is significant variability in the inclusion of ESG metrics in compensation contracts (standard deviation of 0.486). The *Dollar Delta*, is the pay-performance sensitivity and captures the managerial incentives for the standard metrics. It has a mean value of $23,559.5, with a median value of $5,934.1, suggesting a positively skewed distribution. This variable also shows considerable variation, as indicated by a standard deviation of $68,253.3.

[Insert Table 2 about here]

4 Empirical results

4.1 Baseline results

In this section, we test the first two predictions of the model. We estimate the following regression to test the first prediction: if the ESG and standard metrics represent substitute tasks, there should be a decrease in the dollar delta of a standard metric (accounting or market) when an ESG metric is included in the compensation contract. Specifically, we estimate:

$$Dollar\ Delta_{e,f,m,a,v,y} = \beta \cdot ESGMetric_{e,f,y} + \alpha_{e,f,m,a,v} + \alpha_y + \epsilon_{e,f,m,a,v,y} \tag{15}$$

Dollar Delta, or pay-performance sensitivity, is estimated for an executive e employed at firm f, where the compensation contract for fiscal year y is associated with metric type m, award group a, and vesting schedule v, following the definition in Equation (14). To ensure outliers do not unduly influence our findings, we winsorize *Dollar Delta* at the one percent level. The variable *ESGMetric* is an indicator equal to one if the executive's compensation contract includes an ESG metric, otherwise zero. We cluster standard errors at the executive level to account for heteroskedasticity and possible executive-level correlations among observations.

To mitigate potential omitted variable bias, we include high-dimensional fixed effects to control for confounding factors that may influence both pay-performance sensitivity and the inclusion of an ESG metric in an executive's compensation contract. Specifically, we include executive-firm-metric-award group-vesting schedule fixed effects to estimate the change in pay-performance sensitivity of a particular standard metric for the same executive in the same firm for the same type of award and vesting schedule when an ESG metric is either introduced or removed from the contract. We incorporate fixed effects for fiscal years to account for temporal variations in executive pay.

The coefficient of primary interest, β, measures the average difference in *Dollar Delta*, or pay-performance sensitivity, when an ESG-related metric is included in the compensation contract, after controlling for fiscal year, executive and other contract-level factors that can affect pay-performance sensitivity.

Table 3 reports the results. Specification (1) includes fixed effects by year, executive-firm, and metric to control for time-invariant characteristics across these dimensions. Column (2) imposes stricter executive-firm-metric fixed effects in addition to year fixed effects. This specification allows us to estimate the effect of ESG metrics on the dollar delta for the same executive at the same firm and for the same metric. Finally, column (3) includes even higher-dimensional fixed effects to absorb any variation across the award type (stock option or equity) and vesting schedule (cliff, ratable, or unknown). Regardless of the specification,

we observe roughly similar estimates ranging from (minus) $4,010.6 to (minus) $4,642.1, all significant at the 1% level, indicating that the incorporation of ESG metrics into executive compensation contracts significantly reduces managerial incentives for executives to achieve standard financial goals. These estimates are also economically large considering that the average dollar delta in our sample is $23,559.5.[15]

The findings of this baseline analysis support Prediction 1: ESG and standard tasks are substitutes for managerial effort. This evidence at the incentive level is consistent with the implicit tension between profitability and social efficiency previously assumed in the literature (e.g. Xue, 2025; Hart and Zingales, 2017).

Moreover, these results are not sensitive to our choice of pay-performance sensitivity measure. When we use the pay-performance elasticity or just the delta, our results continue to hold (see the Appendix Table A.6). For example, in the most comprehensive specification in column (3) with high-dimensional fixed effects, the delta decreases by 0.2% (8% of the the sample average delta of 2.5%) after the incorporation of ESG metrics into executive compensation contracts.

We also investigate the effect of different ESG pillars on the dollar delta. Table A.7 in the Appendix shows that when only environmental metrics are included in the contract, it has the largest effect on weakening the managerial incentives with a statistically significant reduction of $7,446.8 in dollar delta, significant at the 10% level. The effect of only including social metrics is lower at (minus) $4,087.3, significant at the 5% level. In contrast, requiring executives to achieve governance objectives does not significantly influence the pay-performance sensitivity associated with financial metrics.

Finally, we find a similar effect on the dollar delta when we restrict our sample either to financial metrics only or to accounting metrics only, as shown in the Appendix Table A.8.[16]

[15] As an alternative way to address the skewness in the distribution of our dependent variable, we repeat the regression in Equation (15) replacing the winsorized *Dollar Delta* with *Log(1+Dollar Delta)* without winsorization. The coefficient β becomes -0.164 significant at the 1% level, which indicates around 16.4% decrease in the *Dollar Delta* for the addition of an ESG metric. This magnitude is similar to the finding in Table 3 without logs (about 20% decline).

[16] Since ESG metric adoption may vary across industries over time, we also test the robustness of our findings

[Insert Table 3 about here]

Our baseline analysis in Equation (15) does not allow for an asymmetric effect of the addition versus removal of ESG metrics in an executive's compensation contract. To study the possibility of asymmetry contemplated in Prediction 1, we split the treatment effect into the addition and removal of ESG subsamples, and then repeat our analyses by considering the appropriate control groups for the two subsamples. For additions, the control group consists of executives that never had ESG metrics in their contracts while for removal subsample, the control group consists of executives who had at least one ESG metric in their contract throughout the sample period. Our results reported in Table 4 support a symmetric effect of the addition and removal of ESG metrics on managerial incentives. Thus, *Dollar Delta* increases on average by \$5,889 when an ESG metric is removed from the executive's compensation contract while it decreases by \$4,149 when it is added. The difference between the coefficients is not statistically significant, with a p-value of 61%. These results are consistent with the substitution of effort between the new ESG and the standard tasks from Prediction 1.

[Insert Table 4 about here]

To test the Prediction 2, we take a similar approach. We estimate a regression similar to Equation (15) but replace the primary independent variable *ESGMetric* with *StandardMetric*, which is a binary variable equal to one for executive-firm-year observations where executives' compensation contracts include at least one additional standard (accounting or market) metric for that year compared to the previous year, and zero otherwise.

Our results reported in column (1) of Table 5 show that, in sharp contrast to our baseline results in Table 3, the inclusion of additional standard metrics in executive compensation contracts has no significant effect on the dollar delta. This finding remains unchanged in column (2) when we control for the total number of metrics. In contrast, the introduction of

in Table 3 by including 2-digit SIC industry × year fixed effects and find qualitatively similar results (albeit slightly weaker in economic magnitude).

ESG metrics decreases the pay-performance sensitivity by $4,473 as shown in column (3) even after controlling for the total number of metrics in the compensation contract. Collectively, the results support that firms can rely on historical data and directly incentivize executives to work on the new task without altering the dollar delta of the standard tasks already included in the compensation contract.

[Insert Table 5 about here]

4.2 The number of ESG metrics

We continue our empirical investigation by testing the next three predictions of our model that follow from our first main prediction. Recall that Prediction 3 relates to how the number of ESG metrics affects the dollar delta. If the executive is required to pursue numerous ESG goals, it would require her to pay more attention and increase the opportunity cost of the marginal effort needed to meet standard financial goals. We would therefore expect a larger decline in the dollar delta as the number of ESG metrics increases.

Table 6 reports the results of three different specifications. Column (1) uses a count variable that counts the number of ESG metrics. The coefficient estimate on this variable indicates a reduction of $877.5 in the dollar delta for an increase of one ESG metric in the contract. Columns (2) and (3) allow for the nonlinear relation between the number of ESG metrics and the dollar delta. Specification (2) uses an indicator variable of whether the executive's compensation contract includes at least one ESG metric along with the count variable from specification (1). Only the indicator variable turns out to be significantly negative, suggesting that having at least one ESG metric has the dominant effect. Column (3) extends this analysis to a piecewise-linear specification where we include indicator variables for one, two to three, and four or more ESG metrics. Including more ESG metrics has a larger and non-linear effect on the dollar delta: about $8,400 for four or more ESG metrics compared to $7,200 for two to three ESG metrics.

[Insert Table 6 about here]

4.3 Measurability and Complementarity of the ESG metric

Having tested the model's Prediction 1 about the tradeoff in incentives between standard and ESG metrics at the extensive margin, we proceed now to test the model predictions about this tradeoff at the intensive margin.

We want to test how differences in complementarity -Prediction 4- of the ESG metrics with the standard metrics and their measurability -Prediction 5- affect the dollar delta of the standard metrics in place. We proxy complementarity through the SASB materiality map of the industry to which the firm belongs. The SASB materiality index helps companies determine which sustainability topics are most likely to impact their financial performance and should be disclosed in their reports. Therefore, if an ESG metric is material to the industry (hence, to the firm), the ESG and the standard/financial objectives assigned to the executive are assumed to be complementary. Otherwise, they are assumed to be substitutes. This implies that the opportunity cost of the time and effort that the executive needs to devote to standard objectives should be lower. Put differently, the decrease in the dollar delta should be smaller or less negative when the ESG and standard metrics are complements. A similar argument applies to the measurability of ESG metrics. If ESG metrics can be quantified and measured, it would also reduce the opportunity cost of time and effort to achieve standard goals. That is, the decrease in the dollar delta should be smaller or less negative when the ESG metrics are more measurable.

Columns (1) and (2) of Table 7 report the results of testing predictions 4 and 5, respectively. We include the same year and multidimensional fixed effects as in our baseline regressions. Using the SASB materiality map, specification (1) indicates a reduction of $1,067.3 in the dollar delta, significant at the 5% level, for an increase of one non-material ESG metric in the contract. In contrast, for every new material ESG metric included in the contract, the decrease in dollar delta is statistically not different from zero. This supports

the Prediction 4 of the model. Taking ESG metric materiality as a proxy for task complementarity (with respect to the standard metric), when the two metrics are complements, there is no significant trade-off in incentives between both tasks while this trade-off is economic and statistically significant when the two tasks are substitutes. When we test for the difference in coefficients, we cannot reject the null that they are statistically equivalent (p-value=0.17).

In specification (2), we repeat the analysis separately for measurable and nonmeasurable ESG metrics. Consistent with the Prediction 5, the dollar delta decreases by \$1,769, significant at the 1% level, after the addition of a new nonmeasurable ESG metric. When the new ESG metric is measurable, the change in dollar delta is not statistically distinguishable from zero. When we test for the difference in coefficients, the test clearly rejects that they are statistically equivalent (p-value=0.04).

[Insert Table 7 about here]

4.4 Effect on ESG and Financial Outcomes

After establishing support for our predictions, we examine whether the adjustment of incentives following the introduction of ESG metrics has a tangible effect on the ESG and financial performance of firms. To measure ESG performance, we use the LSEG (formerly Refinitiv) ESG scores, which are widely used in the ESG literature (e.g., Cohen et al., 2023; Derrien et al., 2025). For financial outcomes, we employ two commonly used measures of firm performance, namely, return on assets (ROA) and stock return. We estimate the following regression:

$$\begin{aligned} Y_{f,y} = \; & \beta \cdot ESGMetric_{e,f,y-1} + \gamma \cdot Dollar\ Delta_{e,f,m,a,v,y-1} + \\ & \delta \cdot ESGMetric_{e,f,y-1} \times Dollar\ Delta_{e,f,m,a,v,y-1} + \alpha_f + \alpha_y + \epsilon_{e,f,m,a,v,y} \end{aligned} \tag{16}$$

The unit of observation is the same as in the baseline regression (15). The dependent

variable Y represents, alternatively, LSEG's ESG score, ROA, and stock return. It is the same across every metric type m, award group a, and vesting schedule v in the compensation contract awarded to each executive e employed at firm f in fiscal year y. *Dollar Delta*, or pay-performance sensitivity, is estimated following the definition in Equation (14). To ensure that outliers do not unduly influence our findings, we winsorize *Dollar Delta* at the one percent level. The variable *ESGMetric* is an indicator equal to one if the executive's compensation contract includes an ESG metric, and zero otherwise. Both independent variables are lagged by one year. We include year (α_y) and firm (α_f) fixed effects. We cluster standard errors at the firm level to account for heteroskedasticity and possible firm-level correlations among observations. Our object of interest is the coefficient δ. The results are presented in Table 8.

We expect that if the tradeoff between incentives for ESG and standard tasks is effective, the company's ESG score improves when an ESG metric is introduced and, simultaneously, financial performance suffers from a decrease in the dollar delta of standard metrics in the executive's compensation contract. That is, a negative coefficient δ in Equation (16). The evidence reported in column (1) in Panel A supports this hypothesis. After introducing an ESG metric in executive compensation, the company's ESG score improves, on average, by 0.0136 points for every \$1,000 decrease in dollar delta, significant at the 1% level. This result is also economically significant: a one-standard deviation decrease in dollar delta would increase the average company's ESG score by 0.93 points ($= 68,230 \times 0.0136$). However, we do not observe any significant differences in financial outcomes (i.e., ROA and Stock Return). Although the lack of evidence on company accounting and market performance may seem to contradict the efficient contracting hypothesis, we must take into account that the financial value of improving the company's ESG rating may be long-term rather than short-term, an element not captured in our tests.

[Insert Table 8 about here]

5 Robustness tests

This section presents a series of robustness tests to confirm the validity of our main findings.

5.1 Robustness to including firm and executive controls

Although our fixed effects account for variations in pay associated with different compensation contracts for an executive, they do not control for time-varying firm and executive characteristics that may influence both the pay-performance sensitivity and the likelihood of including an ESG metric in an executive's contract. Table 9 includes additional time-varying firm and executive characteristics that have been identified as key determinants of the dollar delta (Gormley, Matsa, and Milbourn, 2013). The inclusion of these controls does not alter our results. We continue to observe significantly negative coefficient estimates for *ESGMetric* with magnitudes comparable to those reported in Table 3.

[Insert Table 9 about here]

5.2 Robustness to entropy-balanced matching

One potential concern with our empirical analysis is that there may be selection bias associated with the inclusion and removal of ESG metrics in compensation contracts. To address this concern, we use a host of observable firm and executive characteristics that have been shown to influence the choice of ESG pay in firms, as documented in Cohen et al. (2023), and construct an entropy-balanced matched sample of treatment and control firms. Specifically, the covariates included in the matching are tangibility, capital expenditure, return on assets, leverage, dividends, size, stock price volatility, stock price growth, institutional ownership, and executive tenure. Our results presented in Table 10 show that uniformly in all three specifications, the coefficient on *ESGMetric* remains negative and statistically significant at the 1% level, ranging from (minus) $5,106.5 to (minus) $6,890.5. These findings suggest that

the reduction in pay-performance sensitivity (dollar delta) persists even after considering the determinants of ESG pay at the firm level.

[Insert Table 10 about here]

5.3 Robustness to different ESG metric classification

To further assess the robustness of our classification methodology, we employ four alternative approaches to distinguish ESG-related metrics from non-ESG metrics. Specifically, we classify 'metric other' text as an ESG metric using the following methods: (1) ChatGPT 4o-mini, where we ask if the text pertains to an ESG-related compensation contract; (2) the comprehensive keyword set introduced in Gantchev, Giannetti, and Hober (2024), which includes all 1,034 words; (3) ISS Incentive Lab data, which classifies compensation contracts as ESG or non-ESG (available since 2018); and (4) an extended version of ISS Incentive Lab, where pre-2018 metrics are labeled as ESG if they appear as ESG in the post-2018 ISS classification. The results of these alternative classifications are presented in Table 11, all of which align with our baseline findings.

[Insert Table 11 about here]

5.4 Alternative incentives: Time-vesting incentives and total compensation

Executives may receive alternative incentives to those provided by the performance-vested equity or options analyzed so far. One possibility is time-vesting equity or options, not conditioned on any performance metric. In addition to equity- or option-based incentives, executives can also receive cash bonuses and fixed salaries. In this section, we test whether the documented decrease in performance-based incentives after the introduction of ESG metrics is offset to some extent by an increase in time-vesting or other type of incentives.

To test this hypothesis, we calculate the time-vested delta as the change in the dollar value of the CEO's overall compensation, including both stock holdings and option positions for a 1% change in the firm's stock price. We adopt the methodology of Core and Guay (2002) and Coles, Daniel, and Naveen (2006), which distinguishes among different time-vesting option components, such as new option grants, non-exercisable options, and exercisable options. Note that the time-vested delta is different from the performance-vested delta defined in Section 3.1, which is computed for an individual performance metric. Total compensation is defined as the logarithm of the sum of salary, bonus, stock, and option compensation received by the executive in a year.

The results are reported in Table 12. We do not find a significant relation between the introduction of ESG metrics and variation in either the delta of time-vested incentives or the total compensation.

[Insert Table 12 about here]

5.5 Robustness to restricted sampling

Finally, we perform two additional robustness tests, presented in Table 13. In the first test, we exclude executives with more than 12 ESG metrics in their compensation contracts, as this represents the 99th percentile of the treatment sample, ensuring that our results are not driven by outliers. In the second test, we restrict the sample to post-2017 data, as the ISS Incentive Lab data offer more comprehensive coverage of executive compensation contracts from 2018 onward. Our results remain consistent across both specifications.

[Insert Table 13 about here]

5.6 Using a staggered difference-in-differences approach

Since the addition and removal of ESG metrics can occur at different times for different executives across different firms, our setting is that of a staggered difference-in-differences.

Following the suggestion in Baker, Larcker, and Wang (2022), we use a staggered regression approach to avoid the "bad comparison" problem associated with comparing already-treated units with later-treated units. In addition, we zoom around the events of additions and removals of ESG metrics by constructing an event window of six years - three years before and three years after each event. We include year-event fixed effects along with the high-dimensional executive-firm-metric-awardgroup-vestingschedule fixed effects in our baseline analysis earlier. Our results reported in Table 14 corroborate our previous findings from Table 4. There is a significant decrease in the dollar delta of $4,066.2 associated with the inclusion of at least one ESG metric in the executive compensation contract. There is a significant symmetric increase in the dollar delta of $4,315.1 when ESG metrics are completely eliminated from an executive's compensation contract. These results are again consistent with the theory of multitasking.

[Insert Table 14 about here]

6 Conclusion

Despite the progress made in understanding ESG incentives in executive compensation, significant questions remain unaddressed. Scholars continue to debate whether ESG pay is primarily a tool for genuine sustainability efforts, a mechanism for addressing investors of the board's social or environmental concerns or, simply, a device to extract rents from investors. In addition, the long-term financial and social benefits of ESG pay remain largely unexplored.

This paper contributes to the growing body of literature on ESG pay by analyzing the interactions between incentives for standard versus ESG metrics in executive compensation. Informed by the predictions derived from a multitasking model where executives must allocate limited time and effort to competing standard and ESG tasks, we show that US firms in our sample find it optimal to decrease the incentives (dollar delta) for standard metrics to reduce

the opportunity cost of managers' time and effort spent in less measurable ESG metrics. The findings are consistent with efficient contracting in the presence of multitasking. They also support the distinctive nature of ESG incentives in comparison to other non-financial incentives in executive compensation. ESG and standard tasks work as substitutes in the cost of effort provision.

Our study revealed several novel patterns in ESG pay. The number of ESG metrics introduced reduces the optimal provision of incentives for standard tasks non-linearly, showing a convex relation between the decline in dollar delta and the number of ESG metrics. When the ESG metric is non-material (i.e., less complementary with traditional tasks) and less measurable, we observe that the dollar delta decreases even further, supporting the model's predictions.

Consistent with our prediction, we find that introducing ESG metrics in executive compensation improves the ESG scores of firms at the cost of reduced incentives for standard financial tasks, reflecting an effective tradeoff between the two. However, the absence of short-term effects on ROA or stock returns suggests that the financial benefits of enhanced ESG performance may materialize only over the longer term.

Taken together, our evidence supports the concept of efficient ESG performance-based design under multitasking where firms actively trade off incentives between tasks to optimize effort allocation.

References

Albuquerque, Ana, Mary Ellen Carter, Zhe (Michael) Guo, and Luann J. Lynch (2025). "Complexity of CEO compensation packages". *Journal of Accounting and Economics* 79.1, p. 101709.

Baker (1992). "Incentive contracts and performance measurement". *Journal of Political Economy* 100.3, pp. 598–614.

Baker, Andrew, David Larcker, and Charles Wang (2022). "How much should we trust staggered difference-in-differences estimates?" *Journal of Financial Economics* 144.2, pp. 370–395.

Bauer, Rob, Tobias Ruof, and Paul Smeets (2021). "Get Real! Individuals Prefer More Sustainable Investments". *Review of Financial Studies* 34.8, pp. 3976–4043.

Bebchuk, Lucian A. and Roberto Tallarita (2022). "The Perils and Questionable Promise of ESG-Based Compensation". *Journal of Corporation Law* 48, pp. 37–75.

Bénabou, Roland and Jean Tirole (2016). "Bonus Culture: Competitive Pay, Screening, and Multitasking". *Journal of Political Economy* 124.2, pp. 305–370.

Bettis, Carr, John Bizjak, Jeffrey Coles, and Swaminathan Kalpathy (2010). "Stock and Option Grants with Performance-based Vesting Provisions". *Review of Financial Studies* 23.10, pp. 3849–3888.

— (2018). "Performance-vesting provisions in executive compensation". *Journal of Accounting and Economics* 66.1, pp. 194–221.

Bizjak, John, Michael Lemmon, and Ryan Whitby (2009). "Option Backdating and Board Interlocks". *Review of Financial Studies* 22.11, pp. 4821–4847.

Budde, Jörg (2007). "Performance Measure Congruity and the Balanced Scorecard". *Journal of Accounting Research* 45.3, pp. 515–539.

Callaway, Brantly and Pedro HC Sant'Anna (2021). "Difference-in-differences with multiple time periods". *Journal of Econometrics* 225.2, pp. 200–230.

Chaigneau, Pierre and Nicolas Sahuguet (2025). "Executive compensation with environmental and social performance". *Review of Finance* 29.3, pp. 779–818.

Cohen, Shira, Igor Kadach, Gaizka Ormazabal, and Stefan Reichelstein (2023). "Executive Compensation Tied to ESG Performance: International Evidence". *Journal of Accounting Research* 61.3, pp. 805–853.

Coles, Jeffrey L., Naveen D. Daniel, and Lalitha Naveen (2006). "Managerial incentives and risk-taking". *Journal of Financial Economics* 79.2, pp. 431–468.

Core, J. and W. Guay (2002). "Estimating the Value of Employee Stock Option Portfolios and Their Sensitivities to Price and Volatility". *Journal of Accounting Research* 40.3, pp. 613–630.

De Angelis, David and Yaniv Grinstein (2014). "Performance Terms in CEO Compensation Contracts". *Review of Finance* 19.2, pp. 619–651.

Derrien, François, Philipp Kruger, Augustin Landier, and Tianhao Yao (2025). "ESG News, Future Cash Flows, and Firm Value". *Journal of Finance* forthcoming.

Dewatripont, M, I Jewitt, and J Tirole (2000). "Multitask agency problems: Focus and task clustering". *European Economic Review* 44.4-6, pp. 869–877.

Dikolli, Shane S., Christian Hofmann, and Susan L. Kulp (2009). "Interrelated Performance Measures, Interactive Effort, and Incentive Weights". *Journal of Management Accounting Research* 21.5, pp. 125–149.

Dutta, Sunil and Stefan Reichelstein (2003). "Leading Indicator Variables, Performance Measurement, and Long-Term Versus Short-Term Contracts". *Journal of Accounting Research* 41.5, pp. 837–866.

Edmans, Alex (2021). "Why Companies Shouldn't Tie CEO Pay to ESG Metrics". *Wall Street Journal* June 27.

— (2023a). "Applying Economics—Not Gut Feel—to ESG". *Financial Analysts Journal* 79.4, pp. 16–29.

— (2023b). "The End of ESG". *Financial Management* 52, pp. 3–17.

Efing, Matthias, Stefanie Ehmann, Patrick Kampkötter, and Raphael Moritz (2024). "All Hat and No Cattle? ESG Incentives in Executive Compensation". *HEC Paris Research Paper No.* FIN-2024-1506.

Feltham, G. A. and J. Xie (1994). "Performance Measure Congruity and Diversity in Multi-Task Principal/Agent Relations". *The Accounting Review* 69.3, pp. 429–453.

Flammer, Caroline, Bryan Hong, and Dylan Minor (2019). "Corporate governance and the rise of integrating corporate social responsibility criteria in executive compensation: Effectiveness and implications for firm outcomes". *Strategic Management Journal* 40.7, pp. 1097–1122.

Gantchev, Nickolay, Mariassunta Giannetti, and Marcus Hober (2024). "Beyond ESG: Executive Pay Metrics and Shareholder Support". *FEB-RN Research Paper No. 26/2024*.

Gormley, Todd A., David A. Matsa, and Todd Milbourn (2013). "CEO compensation and corporate risk: Evidence from a natural experiment". *Journal of Accounting and Economics* 56.2, pp. 79–101.

Hall, Brian J. and Jeffrey B. Liebman (1998). "Are CEOs Really Paid Like Bureaucrats?*". *The Quarterly Journal of Economics* 113.3, pp. 653–691.

Hart, Oliver and Luigi Zingales (2017). "Companies Should Maximize Shareholder Welfare Not Market Value". *Journal of Law, Finance, and Accounting* 2.2, pp. 247–275.

Hartzmark, Samuel M. and Abigail B. Sussman (2019). "Do Investors Value Sustainability? A Natural Experiment Examining Ranking and Fund Flows". *Journal of Finance* 74.6, pp. 2789–2837.

He, Yazhou Ellen, Bige Kahraman, and Michelle Lowry (2023). "ES Risks and Shareholder Voice". *Review of Financial Studies* 36.12, pp. 4824–4863.

Holmstrom, Bengt and Paul Milgrom (1991). "Multitask Principal–Agent Analyses: Incentive Contracts, Asset Ownership, and Job Design". *The Journal of Law, Economics, and Organization* 7, pp. 24–52.

Holmström, Bengt (1979). "Moral Hazard and Observability". *The Bell Journal of Economics* 10.1, pp. 74–91.

Hong, Fuhai, Tanjim Hossain, John A. List, and Migiwa Tanaka (2018). "Testing The Theory Of Multitasking: Evidence From A Natural Field Experiment In Chinese Factories". *International Economic Review* 59.2, pp. 511–536.

Ittner, Christopher, David Larcker, and Madhav Rajan (1997). "The choice of performance measures in annual bonus contracts". *The Accounting Review* 72, pp. 231–255.

Jung, Kyle (2025). "Green Moral Hazard: Estimating the Financial and Non-financial Impacts of CEO Incentives". *SSRN Working Paper*.

Krueger, Philipp, Zacharias Sautner, and Laura T Starks (2020). "The Importance of Climate Risks for Institutional Investors". *Review of Financial Studies* 33.3, pp. 1067–1111.

Kvaløy, Ola and Trond E Olsen (2023). "Balanced scorecards: A relational contract approach". *Journal of Accounting Research* 61.2, pp. 619–652.

Larcker, David F. (1983). "The association between performance plan adoption and corporate capital investment". *Journal of Accounting and Economics* 5, pp. 3–30.

Li, Qianqian, Edward M Watts, and Christina Zhu (2024). "Retail investors and ESG news". *Journal of Accounting and Economics* 78.2-3, p. 101719.

Li, Zhi and Lingling Wang (2016). "Executive Compensation Incentives Contingent on Long-Term Accounting Performance". *Review of Financial Studies* 29.6, pp. 1586–1633.

Lowry, Michelle, Pingle Wang, and Kelsey D Wei (2025). "Are All ESG Funds Created Equal? Only Some Funds Are Committed". *Review of Financial Studies* forthcoming.

Ma, Fangyuan (2019). "Subjective CEO Pay and Long-term Incentives". *SSRN Working Paper* No.3314100.

Pastor, Lubos, Robert Stambaugh, and Lucian Taylor (2021). "Sustainable investing in equilibrium". *Journal of Financial Economics* 142.2, pp. 550–571.

— (2022). "Dissecting green returns". *Journal of Financial Economics* 146.2, pp. 403–424.

Pastor, Lubos, Robert Stambaugh, and Lucian Taylor (2025). "Green Tilts". *Journal of Financial Economics*. Forthcoming.

Prendergast, Canice (1999). "The Provision of Incentives in Firms". *Journal of Economic Literature* 37.1, pp. 7–63.

Rajan, Raghuram, Pietro Ramella, and Luigi Zingales (2023). "What Purpose Do Corporations Purport? Evidence from Letters to Shareholders". *NBER Working Paper* No.31054.

Riedl, Arno and Paul Smeets (2017). "Why Do Investors Hold Socially Responsible Mutual Funds?" *Journal of Finance* 72.6, pp. 2505–2550.

Shue, Kelly and Richard Townsend (2017). "How Do Quasi-Random Option Grants Affect CEO Risk-Taking?" *Journal of Finance* 72.6, pp. 2551–2588.

Slade, Margaret E. (1996). "Multitask Agency and Contract Choice: An Empirical Exploration". *International Economic Review* 37.2, pp. 465–486.

Xue, Hao (2025). "ESG Disclosure, Market Forces, and Investment Efficiency". *The Accounting Review*, pp. 1–29.

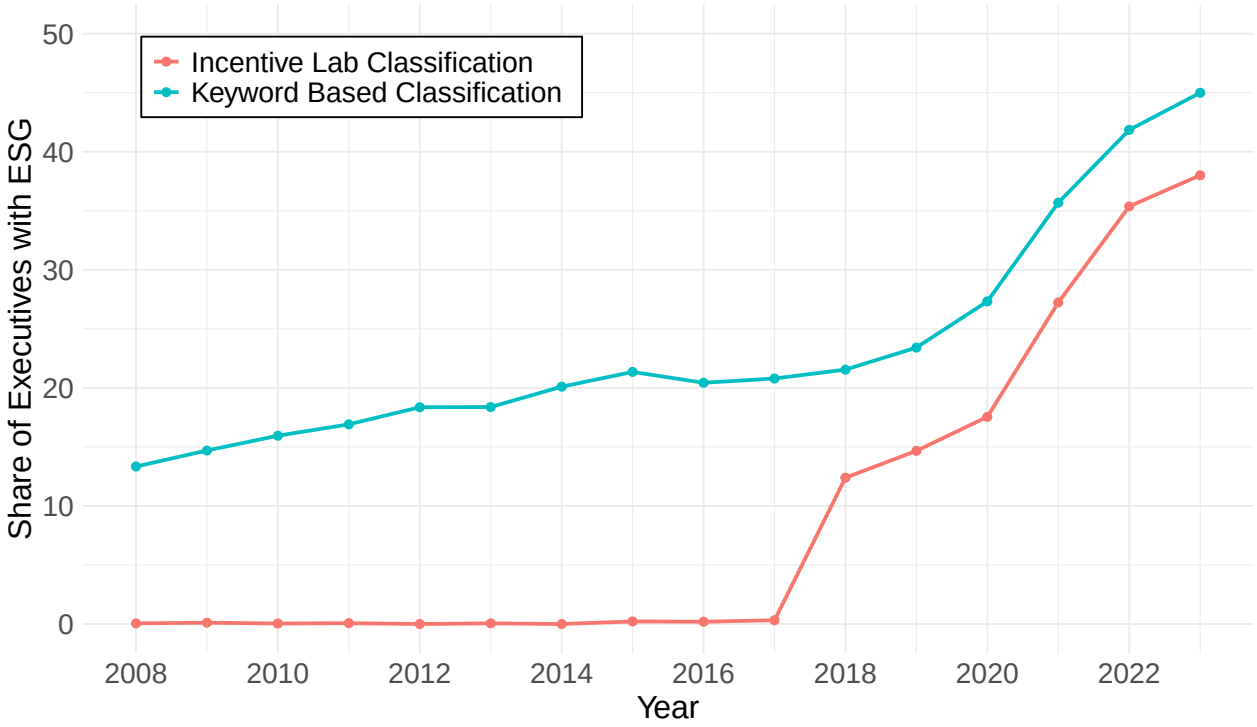


Figure 1: Share of executives that have ESG metric in their compensation contracts

Table 1: Annual distribution of performance-based metrics for NEOs

Fiscal Year	# Metrics	% ESG Metrics	% Measurable ESG	% Material ESG
2008	532	22.9	25.3	18.9
2009	383	29.0	28.6	32.9
2010	467	36.6	51.9	39.1
2011	555	20.2	48.5	48.2
2012	518	26.8	42.7	26.3
2013	468	27.1	64.4	15.6
2014	541	29.9	67.4	9.47
2015	456	20.4	79.5	19.5
2016	514	23.7	66.3	18.8
2017	604	23.8	63.2	18.6
2018	2,294	24.9	58.5	38.0
2019	2,687	29.6	56.9	34.2
2020	2,892	32.1	51.0	30.6
2021	3,013	45.4	53.8	28.7
2022	3,485	54.6	54.6	30.8
2023	3,028	56.3	52.0	31.0
Avg. 2008-2023	**22,437**	**38.2**	**54.0**	**30.7**

This table reports the annual distribution of performance-based metrics for named executive officers (NEOs) in our sample. *# Metrics* counts the number of observations. *% ESG Metrics* shows the percentage of observations that includes at least one ESG metric that year. *% Measurable* is a continuous variable at the grant level representing the percentage of ESG performance metrics with explicit performance benchmarks. *% Material* is a continuous variable at the grant level representing the percentage of ESG performance metrics in a grant that are classified as material based on the SASB Materiality Map.

Table 2: Summary statistics

	Observation	Mean	SD	p25	Median	p75
Dollar Delta	22,437	23,559.5	68,253.3	1,230.3	5,934.1	17,861.5
ESG Metric	22,437	0.382	0.486	0	0	1
One ESGMetric	22,437	0.175	0.38	0	0	0
Two-Three ESGMetric	22,437	0.123	0.329	0	0	0
Four or More ESGMetric	22,437	0.084	0.277	0	0	0
Cashflows/assets	18,266	0.136	0.086	0.084	0.124	0.18
EBITDA/assets	18,633	0.137	0.083	0.084	0.124	0.175
Ln(assets)	22,339	9.497	1.33	8.555	9.429	10.393
Ln(sales)	17,892	8.903	1.272	8	8.841	9.711
Market-to-book ratio	18,687	2.708	75.348	1.616	2.947	5.337
PP&E/assets	21,721	0.277	0.265	0.068	0.177	0.426
R&D/sales	17,892	0.039	0.104	0	0.004	0.038
Sales growth	17,441	0.06	0.208	-0.009	0.053	0.126
Surplus cash/assets	18,433	0.086	0.09	0.033	0.07	0.127
Ln(total pay)	20,372	14.973	0.872	14.338	14.891	15.566
Salary + bonus	22,344	838,444	749,077	500,000	650,000	951,157
Options/total pay	20,374	0.098	0.146	0	0	0.188
Tenure	22,437	4.9	4.9	1	3	7

This table reports the summary statistics of the variables used in our empirical analyses. We estimate *Dollar Delta* following Equation 14. *ESG Metric* is a binary variable equal to one for executives whose compensation contracts include at least one ESG-related metric that year, and zero otherwise. *One ESGMetric* identifies observations with a single ESG metric. We construct analogous variables for *Two–Three ESGMetrics* and *Four or More ESGMetrics*. The contract variables are from ISS Incentive Lab.

Table 3: Change in the dollar delta associated with ESG metric inclusion

	(1)	(2)	(3)
	Dollar Delta		
ESGMetric	-4,454.1***	-4,010.6***	-4,642.1***
	(-2.92)	(-2.96)	(-3.37)
Year FE	Y	Y	Y
Executive-Firm FE	Y		
Metric FE	Y		
Executive-Firm-Metric FE		Y	
Executive-Firm-Metric -Award-Vesting FE			Y
Observations	20,929	20,315	20,061
R-squared	0.680	0.725	0.757

This table reports coefficient β from our baseline results in Equation 15:

$$Dollar\ Delta_{e,f,m,a,v,y} = \beta \cdot ESGMetric_{e,f,y} + \alpha_{e,f,m,a,v} + \alpha_y + \epsilon_{e,f,m,a,v,y}.$$

For each observation *executive (e)–firm (f)–metric (m)–award type (a)–vesting schedule (v)–year (y)*, we calculate $Dollar\ Delta_{e,f,m,a,v,y}$ in accordance with Equation 14. $ESGMetric_{e,f,y}$ is a binary variable set to one for *executive–firm–year* observations where the executive's compensation contract includes at least one ESG-related metric for that year, otherwise zero. $\alpha_{e,f,m,a,v}$ and α_y represent alternative multidimensional and year fixed effects, respectively. The t-statistics, in parentheses, are based on standard errors clustered at the executive level. ***, **, * denote statistical significance at the 0.01, 0.05, and 0.10 levels, respectively.

Table 4: Change in the dollar delta associated with the addition or removal of ESG metrics

	(1)	(2)
	Dollar Delta	
Treatment	-4,148.8**	5,889.4**
	(-2.35)	(2.01)
Treatment Definition	ESG Presence	ESG Absence
Year FE	Y	Y
Executive-Firm-Metric -Award-Vesting FE	Y	Y
Observations	12,800	5,703
R-squared	0.805	0.573

This table reports coefficient β from the following baseline regression in Equation 15:

$$\textit{Dollar Delta}_{e,f,m,a,v,y} = \beta \cdot \textit{Treatment}_{e,f,y} + \alpha_{e,f,m,a,v} + \alpha_y + \epsilon_{e,f,m,a,v,y}.$$

For each observation *executive (e)–firm (f)–metric (m)–award type (a)–vesting schedule (v)–year (y)*, we calculate $\textit{Dollar Delta}_{e,f,m,a,v,y}$ in accordance with Equation 14. In column (1), $\textit{Treatment}_{e,f,y}$ is a binary variable equal to one for *executive–firm–year* observations where the compensation contract includes at least one ESG-related metric in that year, and zero otherwise. In column (2), $\textit{Treatment}_{e,f,y}$ is equal to one for *executive–firm–year* observations where the contract does not include any ESG-related metric, and zero otherwise. In column (1), the control group consists of executive–firm pairs who never had any ESG metrics included in their contracts from 2008 to 2023. In column (2), the control group consists of executive–firm pairs who had at least one ESG metric during the same period. The treatment group includes executive–firm pairs that experienced a one-time change in *Treatment* status during the same period. $\alpha_{e,f,m,a,v}$ and α_y represent *executive–firm–metric–award type–vesting schedule* and *year* fixed effects, respectively. The t-statistics, in parentheses, are based on standard errors clustered at the executive level. ***, **, * denote statistical significance at the 0.01, 0.05, and 0.10 levels, respectively.

Table 5: Change in the dollar delta associated with the addition of standard metrics

	(1)	(2)	(3)
	Dollar Delta		
StandardMetric	-546.5	-159.2	
	(-0.58)	(-0.16)	
ESGMetric			-4,472.6***
			(-2.99)
TotalMetric		-230.7	-58.63
		(-1.59)	(-0.39)
Year FE	Y	Y	Y
Executive-Firm-Metric -Award-Vesting FE	Y	Y	Y
Observations	20,003	20,003	20,061
R-squared	0.757	0.757	0.757

This table reports coefficient β from our baseline results in Equation 15, but for standard or non-ESG contracts:

$$\textit{Dollar Delta}_{e,f,m,a,v,y} = \beta \cdot \textit{StandardMetric}_{e,f,y} + \alpha_{e,f,m,a,v} + \alpha_y + \epsilon_{e,f,m,a,v,y}.$$

For each observation *executive (e)–firm (f)–metric (m)–award type (a)–vesting schedule (v)–year (y)*, we calculate $\textit{Dollar Delta}_{e,f,m,a,v,y}$ in accordance with Equation 14. $\textit{StandardMetric}_{e,f,y}$ is a binary variable equal to one for *executive–firm–year* observations where the executive's compensation contract includes at least one additional standard metric for that year, and zero otherwise. In column (2), we control for *TotalMetric*, which captures the total count of both ESG and standard metrics assigned to an executive by a firm in a given fiscal year. In column (3), we show our results from Table 3 for *ESGMetric*, a dummy variable equal to one if an executive's compensation contract includes at least one ESG-related metric for that year, after controlling for *TotalMetric*, and zero otherwise. $\alpha_{e,f,m,a,v}$ and α_y represent alternative high-dimensional and year fixed effects, respectively. The t-statistics, in parentheses, are based on standard errors clustered at the executive level. ***, **, * denote statistical significance at the 0.01, 0.05, and 0.10 levels, respectively.

Table 6: Number of ESG metrics in the compensation contract

	(1)	(2)	(3)
		Dollar Delta	
Number of ESGMetric	-877.5***	-480.0	
	(-2.78)	(-1.52)	
ESGMetric		-3,803.9**	
		(-2.53)	
One ESGMetric			-2,934.5
			(-1.58)
Two-Three ESGMetric			-7,240.6**
			(-2.46)
Four or more ESGMetric			-8,389.2***
			(-3.77)
Year FE	Y	Y	Y
Executive-Firm-Metric -Award-Vesting FE	Y	Y	Y
Observations	20,061	20,061	20,061
R-squared	0.757	0.757	0.757

In specification (1) we regress *Dollar Delta* on *Number of ESGMetric*, a variable that counts the number of ESG metrics included in the executive's compensation contract in a given year. We calculate *Dollar Delta* in accordance with Equation 14. In specification (2) we add the variable *ESG Metric*, a binary variable set to one for executives whose compensation contracts include at least one ESG-related metric that year. In specification (3) we allow for the number of metrics to change in a non-linear fashion. *One ESGMetric* identifies observations with a single ESG metric. Analogous definitions apply to *Two–Three ESGMetrics* and *Four or More ESGMetrics*. We include high-dimensional *executive–firm–metric–award type–vesting schedule* and *year* fixed effects in all regressions. In all specifications, the t-statistics, in parentheses, are based on standard errors clustered at the executive level. ***, **, * denote statistical significance at the 0.01, 0.05, and 0.10 levels, respectively.

Table 7: Measurable and Complementary ESG metrics

	(1)	(2)
	Dollar Delta	
# Non-Material ESGMetric	-1,067.3**	
	(-2.67)	
# Material ESGMetric	-374.6	
	(-1.00)	
# Non-Measurable ESGMetric		-1,768.8***
		(-2.90)
# Measurable ESG		-331.1
		(-1.11)
Year FE	Y	Y
Executive-Firm-Metric Award-Vesting FE	Y	Y
Observations	20,061	20,061
R-squared	0.757	0.757
Coeff. difference	0.1694	0.0364

This table reports regressions of *Dollar Delta* on the measurability and materiality of ESG metrics. An ESG metric is defined as *measurable* if at least one vesting benchmark and payout is reported in ISS Incentive Lab, and *material* if it appears in the SASB Materiality Map of the firm's industry. In specification (1), *# (Non-)Material ESGMetric* counts the number of ESG metrics that are (not) material; in specification (2), the variables are defined analogously. *Coeff. difference* in the last row reports the p-value from an F-test of equality between the two coefficients in each specification. We include multidimensional *executive–firm–metric–award type–vesting schedule* and *year* fixed effects in all regressions. In all specifications, the t-statistics, in parentheses, are based on standard errors clustered at the executive level. ***, **, * denote statistical significance at the 0.01, 0.05, and 0.10 levels, respectively.

Table 8: ESG and Financial Outcomes

Panel A: Impact of incentive adjustment on ESG and financial performance.

	(1) ESG Score	(2) ROA (in %)	(3) Stock Return (in %)
ESGMetric	-0.177	-0.347	-28.08
	(-0.25)	(-0.86)	(-0.75)
Dollar Delta ($1,000)	0.00759**	0.00172	-0.0163
	(2.47)	(0.72)	(-0.46)
ESGMetric × Dollar Delta	-0.0136***	-0.00208	0.178
	(-2.66)	(-0.81)	(0.82)
Year FE	Y	Y	Y
Firm FE	Y	Y	Y
Observations	19,390	18,605	20,267
R-squared	0.889	0.733	0.175

Panel B: Descriptive statistics of ESG and financial performance variables.

Variable	Mean	SD	p25	Median	p75
ESG Score	60.308	16.896	48.754	62.892	72.725
ROA (in %)	14.746	9.253	8.837	13.135	18.633
Stock Return (in %)	0.390	11.309	-0.120	0.069	0.282

Panel A reports results from the regression:

$$\begin{aligned} Y_{f,y} &= \beta \cdot \textit{ESGMetric}_{e,f,y-1} + \gamma \cdot \textit{Dollar Delta}_{e,f,m,a,v,y-1} \\ &+ \delta \cdot \left(\textit{ESGMetric}_{e,f,y-1} \times \textit{Dollar Delta}_{e,f,m,a,v,y-1}\right) + \alpha_f + \alpha_y + \epsilon_{e,f,m,a,v,y}. \end{aligned}$$

where Y represents, respectively, ESG performance, return on equity, return on assets, and stock return in specifications (1)–(4). *ESGMetric* is a binary variable equal to one for executives whose compensation contracts include at least one ESG-related metric in a given year, and zero otherwise. *Dollar Delta* measures the change in the expected value of a performance metric (in $1,000) following a 1% increase in the stock price. ESG Score ranges from 0 to 100 and is provided by LSEG (formerly Refinitiv). Return on assets and stock returns are in percentages. *Panel B* presents summary statistics for the four dependent variables used in Panel A. In all specifications, the t-statistics, in parentheses, are based on standard errors clustered at the firm level. ***, **, * denote statistical significance at the 0.01, 0.05, and 0.10 levels, respectively.

Table 9: Robustness to adding firm- and executive-level controls

	(1)	(2)	(3)
		Dollar Delta	
ESGMetric	-4,642.1***	-4,284.5**	-4,110.5**
	(-3.37)	(-2.34)	(-2.24)
Cashflows/assets		-15,157.9	-12,505.7
		(-1.07)	(-0.80)
EBITDA/assets		20,044.6	15,412.3
		(1.37)	(0.98)
Ln(assets)		-7,924.5	-9,046.8
		(-1.22)	(-1.34)
Ln(sales)		4,827.9	5,859.3
		(0.86)	(1.12)
Market-to-book ratio		-1.976	-1.269
		(-0.46)	(-0.29)
PP&E/assets		37,527.5**	51,529.8**
		(1.99)	(2.54)
R&D/sales		49,923.3	29,747.1
		(1.33)	(0.84)
Sales growth		-2,391.9	-2,886.0
		(-0.60)	(-0.75)
Surplus cash/assets		-13,060.8	-11,709.6
		(-1.22)	(-1.06)
Ln(total pay)			22,239.8***
			(7.17)
Salary + bonus			-0.00221
			(-1.07)
Options/total pay			-20,231.6*
			(-1.81)
Tenure			471.1
			(0.17)
Year FE	Y	Y	Y
Executive-Firm-Metric -Award-Vesting FE	Y	Y	Y
Observations	20,061	14,964	14,009
R-squared	0.757	0.735	0.749

Model (1) of this table reports the results from the baseline specification in Equation 15. We estimate *Dollar Delta* following Equation 14. *ESGMetric* is a binary variable equal to one for executives whose compensation contracts include at least one ESG-related metric in a given year, and zero otherwise. In Model (2), we include the firm- and executive-level control variables described in Gormley, Matsa, and Milbourn (2013). In Model (3), we add the contract variables reported in ISS Incentive Lab. We include high-dimensional *executive–firm–metric–award type–vesting schedule* and *year* fixed effects in all models. In all models, the *t*-statistics, in parentheses, are based on standard errors clustered at the executive level. ***, **, * denote statistical significance at the 0.01, 0.05, and 0.10 levels, respectively.

Table 10: Robustness to entropy balanced matching

	(1)	(2)	(3)
		Dollar Delta	
ESGMetric	-5,106.5***	-6,401.8***	-6,890.5***
	(-4.178)	(-5.282)	(-5.708)
Year FE	Y	Y	Y
Executive–Firm FE	Y		
Metric FE	Y		
Executive–Firm–Metric FE		Y	
Executive–Firm–Metric–Award–Vesting FE			Y
Observations	19,506	19,506	19,506
R-squared	0.653	0.703	0.753

This table reports the results using an entropy-balanced matched sample of firms that either add or remove ESG metrics from executive compensation contracts during our sample period (treatment firms) and firms that either never had ESG metrics in contracts or always had ESG metrics during the sample period (control firms). Observable executive and firm characteristics are used for matching covariates that include tangibility, capital expenditure, return on assets, leverage, dividends, size, stock price volatility, stock price growth, percentage institutional ownership, and executive tenure. The fixed effects included in Models (1)–(3) correspond to those in Table 3. *t*-statistics, shown in parentheses, are computed from heteroskedasticity robust standard errors clustered at the executive level. ***, **, and * indicate significance at the 0.01, 0.05, and 0.10 levels, respectively.

Table 11: Robustness to other definitions of ESG metric

	(1)	(2)	(3)	(4)
			Dollar Delta	
ESGMetric	-3,379.7**	-3,512.5**	-3,099.4**	-2,822.7**
	(-2.40)	(-2.54)	(-2.06)	(-2.05)
ESGMetric Definition	LLM	All Keywords	ISS Classification	Extend ISS Class.
Year FE	Y	Y	Y	Y
Executive-Firm-Metric -Award-Vesting FE	Y	Y	Y	Y
Observations	20,061	20,061	15,588	20,061
R-squared	0.757	0.757	0.780	0.757

This table reports the results from our baseline specification in Equation 15 after considering alternative definitions of ESG metric. We estimate *Dollar Delta* following Equation 14. *ESGMetric* is a binary variable equal to one for executives whose compensation contracts include at least one ESG-related metric for that year, and zero otherwise. In Model (1), we use ChatGPT 4o-mini to classify the *metricother* variable from IncentiveLab as either ESG or non-ESG. In Model (2), we rely on the full set of 1,034 words provided in Gantchev, Giannetti, and Hober (2024) to identify ESG contracts. In Model (3), we use the ISS classification to determine ESG contracts; however, because this data is only available since 2018, the sample size is smaller. In Model (4), we extend the ISS classification to earlier years by labeling a contract as ESG if it exactly matches a *metricother* value classified as ESG by ISS after 2018. We include high-dimensional *executive–firm–metric–award type–vesting schedule* and *year* fixed effects in all regressions. In all specifications, the t-statistics, in parentheses, are based on standard errors clustered at the executive level. ***, **, * denote statistical significance at the 0.01, 0.05, and 0.10 levels, respectively.

Table 12: Alternative incentives: Time-vested delta and total compensation

	(1) TV Delta	(2) ln(Total Compensation)
ESGMetric	5.202	-0.0108
	(0.34)	(-0.81)
Year FE	Y	Y
Executive-Firm FE	Y	Y
Observations	6,580	13,092
R-squared	0.927	0.897

This table reports the results from our baseline specification in Equation 15 after replacing the dependent variable, *Dollar Delta*, by time-vested delta (*TV Delta*) in Model (1) and logarithm of total compensation (*ln(Total Compensation)*) in Model (2). *TV Delta* is calculated in accordance with Core and Guay (2002) and Coles, Daniel, and Naveen (2006) . *Total Compensation* is the sum of all compensation elements (salary, bonus, and stock and options) provided to an executive. *ESGMetric* is a binary variable equal to one for *executive–firm–year* observations where executives' compensation contracts include at least one ESG-related metric in a given year, and zero otherwise. We include executive–firm and year fixed effects. The *t*-statistics, in parentheses, are based on standard errors clustered at the executive level. ***, **, * denote statistical significance at the 0.01, 0.05, and 0.10 levels, respectively.

Table 13: Robustness to extreme number of ESG metrics and restricting sample to recent years

	(1)	(2)
	Dollar Delta	
ESGMetric	-4,637.8***	-3,907.8***
	(-3.37)	(-3.02)
Sample restricted to	≤13 ESGMetric	after 2017
Year FE	Y	Y
Executive-Firm-Metric-Award-Vesting FE	Y	Y
Observations	19,976	15,588
R-squared	0.757	0.780

This table reports the results from our baseline specification in Equation 15 after excluding outliers in the number of ESG metrics in compensation contracts and restricting our sample to recent years. *Dollar Delta* is estimated following Equation 14. *ESGMetric* is a binary variable equal to one for executives whose compensation contracts include at least one ESG-related metric for that year, and zero otherwise. In Model (1), we exclude observations where executives have more than 12 ESG metrics in their compensation contracts, as 12 represents the 99th percentile in our treatment sample. In Model (2), we restrict the sample to years after 2018, as ISS Incentive Lab provides more comprehensive data coverage and improved ESG classification for compensation contracts during this period. High-dimensional *executive–firm–metric–award type–vesting schedule* and *year* fixed effects are included in all regressions. In all specifications, the *t*-statistics, in parentheses, are based on standard errors clustered at the executive level. ***, **, * denote statistical significance at the 0.01, 0.05, and 0.10 levels, respectively.

Table 14: Staggered difference-in-differences estimates for the addition and removal of ESG metrics in executive compensation contracts

	(1)	(2)
	Dollar Delta	
Treatment x Post	-4,066.2**	4,315.1*
	(-2.00)	(1.80)
Treatment Group	ESG Added	ESG Removed
Year-Event FE	Y	Y
Executive-Firm-Metric -Award-Vesting-Event FE	Y	Y
Observations	3,312,106	524,425
R-squared	0.872	0.565

This table presents the estimated coefficients from our baseline specification in Equation 15 using a staggered difference-in-differences framework. The dependent variable is *Dollar Delta*, calculated as described in Equation 14. *Treatment* is a binary indicator equal to one for executive–firm observations in which an ESG metric was added to or removed from the compensation contract, and zero otherwise. *Post* is a binary indicator equal to one for all years following (and including) the year in which the ESG metric change occurred. We construct an event window spanning six years—three years before and three years after the addition or removal of an ESG metric in an executive's compensation contract. In Column (1), we focus on events where an ESG metric was added to an executive's compensation contract exactly once within the six-year window. The control group comprises executives who never had any ESG metrics included in their compensation contracts during the same period. In Column (2), we examine events where an ESG metric was removed from an executive's compensation contract exactly once during the six-year window. The control group consists of executives who retained ESG metrics in their compensation contracts for the entire six-year period. High-dimensional *executive–firm–metric–award type–vesting schedule–event* and *year–event* fixed effects are included in all regressions. In all specifications, the t-statistics, in parentheses, are based on standard errors clustered at the executive level. ***, **, * denote statistical significance at the 0.01, 0.05, and 0.10 levels, respectively.

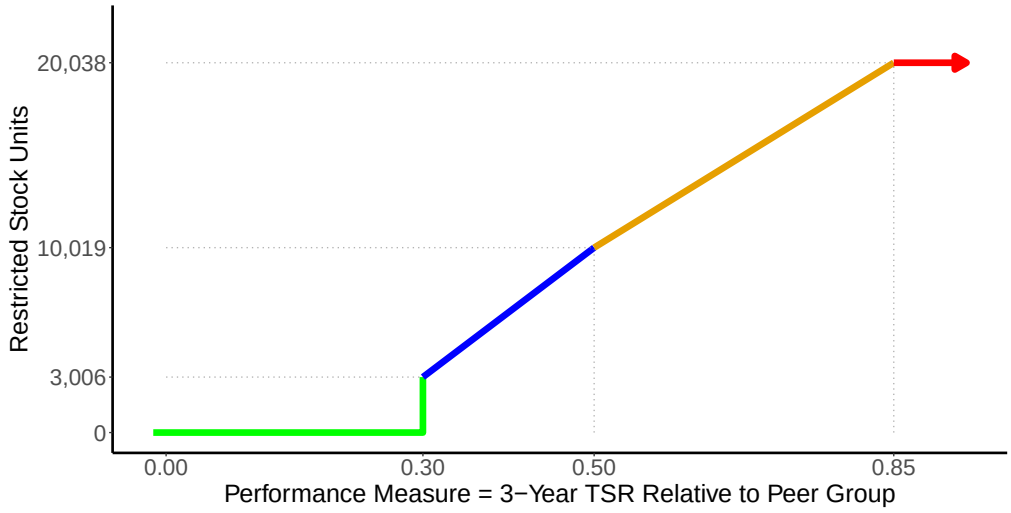
Appendix

A.1 Example of performance metrics and award structure in Xcel Energy Inc.

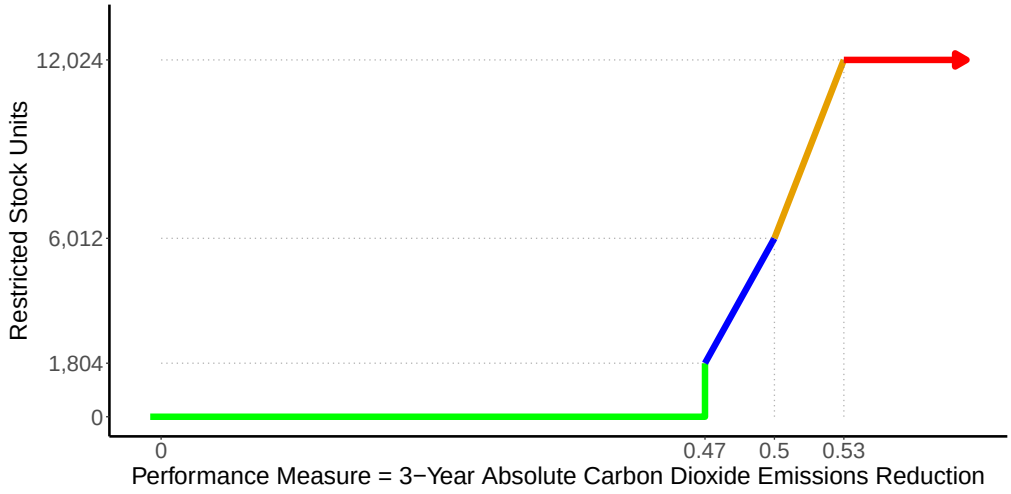
Here, we provide a detailed example of how we calculate different variables in our dataset. We consider a two-metric performance grant awarded to Mr. Kent T. Larson, former Executive Vice President and Group President of Operations at Xcel Energy Inc., for fiscal year 2020. The grant includes two performance metrics: one based on the firm's total shareholder return (TSR) relative to its peer group (accounting based) and the other on absolute reduction in carbon dioxide emissions (ESG based), both of which determine the vesting of restricted stock. The award payout structure specifies, for each metric, the performance metric that triggers vesting, the type of back-end instrument granted upon vesting, the number of units awarded, and the performance period used to evaluate the payout.

Figure A.1 (a) is provided to facilitate the interpretation of the award payout structure for this specific example. The minimum relative TSR required to trigger vesting is 30%, which means that the firm must outperform its peer group by at least 30%. At this point, the *minimum award* consists of 3,006 restricted shares. Once this threshold is met, the award amount increases linearly for a relative TSR between 30% and 50% to reach 10,019 shares, the *target award*. After that, the award increases linearly when the relative TSR is between 50% and 85% to reach the *maximum award* 20,038 restricted shares. After that, for any increase in TSR above 85%, the award remains at the maximum payoff.

Figure A.1 (b) shows the payoff structure when the performance metric is the reduction in carbon emissions. The minimum target and maximum trigger points in this case are 47%, 50% and 53%, respectively. The corresponding minimum, target, and maximum awards are, respectively, 1,084, 6,012, and 12,024 restricted shares.



(a) Accounting-based award payout structure



(b) ESG-based award payout structure

Figure A.1: Award payout structures
Payoffs from the 2 performance metrics in a grant awarded to Mr. Kent T. Larson, former Executive Vice President and Group President of Operations at Xcel Energy Inc., for the fiscal year 2020.

To calculate *Dollar Delta* for the TSR metric, we first estimate delta that measures the change in the expected value of the metric when the stock price increases by 1%, assuming an initial stock price of $1. We apply the approach of Bettis et al. (2018) [17]. The simulation approach focuses on performance-vesting awards, where vesting in this case depends on 3-year TSR relative to peers. A Monte Carlo simulation models the evolution of this metric over the

[17]We thank the authors for generously sharing their simulation code with us.

performance period, assuming that TSR follows an arithmetic Brownian motion and stock prices follow a geometric Brownian motion. We estimate volatility and correlation between these factors using historical firm-level data. For each simulated path, the number of shares that vest is determined by the payout schedule, and the present value of the award is computed within a risk-neutral framework.[18]

In this case, delta is calculated to be 0.02. The *Percent Vest* is equal to one, which means that 100% of the target award depends on this measurement period. Given that the closing stock price at the grant date (January 2, 2020) was \$62.38 and the target number of shares was 10,019 Therefore, according to Equation 14, the *Dollar Delta* is calculated as follows:

$$DollarDelta = \$62.38 \times 10{,}019 \times 1 \times 0.02 \approx \$12{,}500$$

In other words, if the stock price increases by one percent, the executive is expected to earn 12,500 dollars based on this metric performance.

For the ESG metric in this grant, we cannot estimate the dollar delta for the ESG-based payout structure since there are no historical series of carbon dioxide emissions to estimate the moments necessary for the Monte Carlo simulation. However, because the trigger points and corresponding payouts are specified, this ESG metric is considered measurable, giving it a measurability value of 1. Moreover, according to the SASB Materiality Map, "GHG emissions" are material for companies in the "Electric Utilities & Power Generators" sector. As a result, this ESG metric is also considered material, with a materiality value of 1.

A.2 Example of introducing an ESG metric to a non-ESG grant and its effect on delta

In 2019, Mr. Paul S. Herendeen, Executive Vice President and Chief Financial Officer of Bausch Health Companies Inc., had only non-ESG metrics, such as Total Shareholder Return

[18] For a more detailed explanation, refer to Appendix 1 of Bettis et al. (2018).

(TSR), EBIT, and Gross Revenues, included in his compensation grant. In 2020, a social metric from the Employee Engagement, Diversity & Inclusion category was introduced to his grant. In Figure A.2, the change in the pay structure related to the TSR metric is illustrated. It can be seen that while the benchmarks that trigger vesting remain unchanged, the amount paid at the same performance level is modified; as a result, the delta decreased from 0.031 to 0.025.

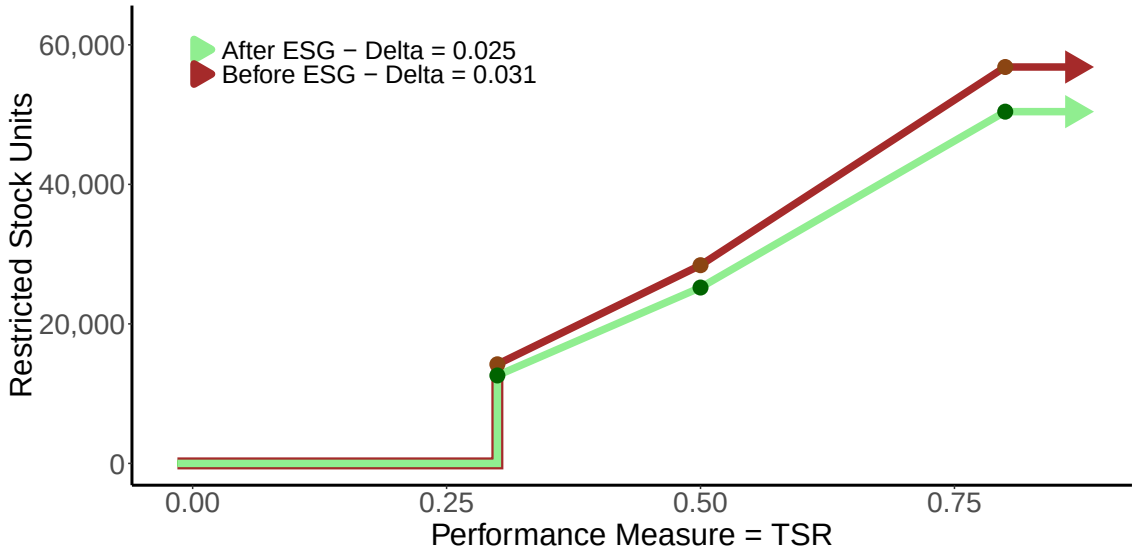


Figure A.2: Comparison of the delta in a performance metric before and after the introduction of an ESG metric in the 2019 compensation package of Mr. Paul S. Herendeen, Executive Vice President and Chief Financial Officer of Bausch.

A.3 ESG words

The following is the list of 953 words from Gantchev, Giannetti, and Hober (2024) we used to classify compensation contracts as related to ESG:

AAIR, abatement, abating, Aboriginal, ACCC, accessible, accident, accidents, adopt, adverse, affordability, affordable, AFR, African, aid, AIFR, air, AIRR, alarms, all-electric, all-employee, all-injury, AML, animal, anti-money, antibias, antibribery, anticorruption, antidumping, antimicrobial, antiracist, antislavery, antitrust, arsenic, ASAOC, assault,

assistance, assisting, atmosphere, attitude, attitudes, audit, auditing, auditors, authority's, avoidable, avoidance, awareness, AWRCR, B-BBEE, BaCE, BAIR, BAME, BEE, behaving, behavior, behavior-based, behavioral, beneficial, BIFR, bio, biodiversity, biofuel, biomass, biosecurity, BIPOC, black, breach, breaches, BREEAM, bribery, BSEE, bullying, bushfire, CAHPS, carbon, carcinogens, caseload, catastrophic, catchment, CCUS, CCV, CDC, CDIs, CDP, CE marking, Celsius, censure, certificates, certification, certifications, certified, CFC, CG, CGA, chargeable, charitable, charities, charity, CHESM, child, CIFR, CIGS, circular, circularity, citizenship, clean, cleaner, cleantech, climate, climate-positive, climate-related, climates, climatic, CMVI, CNMC, CO, CO2, CO2 emission, CO2 reduction, CO2-equivalent, CO2-reduced, CO2e, CO2eq, coal-based, coal-exit, collaborate, collaborative, collaboratively, collaborators, colleague, colleagues, collision, collisions, color, colored, commit, committed, committing, communities, community, community-backed, commuting, complex-recycling, compliance, compliances, compliantly, complying, compostable, concerns, conflict, conflicts, conservancy, conservation, consumed, consumption, contaminated, contamination, cooperation, COP21, CORESafety, corporate social responsibility, corrupt, corruption, coworker, CPMM, CRD, Cree, CRI, criticality, CSA, CSAP, CSR, CTF, cultivate, culture, CVIR, CWI, DI, damage, damages, danger, dangerous, DART, Days Away Restricted Time, deadly, deaths, decarbonization, decarbonized, DEI, demographic, demographics, derailments, dielectric, diesel, DIFR, dioxide, DIR, disability, disaster, discrimination, disposals, disturbance, diverse, diversity, DJSI, DJSIW, DOJ, donations, DOT, drops, e-buses, e-trucks, e-waste, EACC, eco, eco-design, eco-efficient, eco-labeled, ecological, ecologically, ECOLOGO, EcoVadis, educate, educating, education, educational, EEAFR, EHS, EHS-related, EHSS, EI, EIA, EIR, elearning, electricity, electrification, ELMUS, ELWG, EMAS, emergencies, emergency, emission, emissions, emitted, empathetic, employability, employee, employee-based, employee-evaluation, employee-initiated, employee-led, employees, employer, employers, employment, energies, energy, engage, engaged, engagement, engages, engaging, engender,

enjoyable, ENSR, environment, environment-linked, environmental, environmental-related, environmentally, environmentally-friendly, environments, EOS, EPC, equality, equitable, ergonomic, ERIF, ESCG, ESCMP, ESE, ESG, ESG reporting, ESG targets, ESG-criteria, ESG-dedicated, ESG-integrated, ESG-oriented, ESG-related, ESPC, Ethibel, ethic, ethically, ethics, EthiFinance, ethnic, ethnically, ethnicity, EV charging, EXI, fair, fairly, fatal, fatalities, fatality, fatigue, fatigue-violation, FCA, FCPA, female, female-owned, females, feminization, feminizing, fiduciary, FIR, fire, fire-related, fires, Fitwel, flooding, FOFA, food, footprint, footprinting, forest, forestry, FOS, foster, fostering, fosters, freedom, frequency, freshwater, FSI, FTSE4Good, FVR, GAIA, Gallup, Gallup's, gaps, gas outages, GCA, gCO2, gCO2e, GDPR, GED, gender, Gender-Equality Index, GHG, GHG-related, GHGE, GMDSS, GMP, GMP-compliant, GMP-ready, GMR, governance, GPG, green, greener, greenhouse, greening, GRESB, GRI, GSCOP, GWh, GxP, HACT, happier, happiness, harassment, harm, harmful, harms, hazard, hazardous, hazards, HCAHPS, HDSA, HDSAs, health, Health-e Workforce Solutions, healthcare-associated, healthier, healthy, heat, help, helped, helping, HES, HESS, high-hazard, high-severity, HIPAA, HIRR, HIV, HMDA, hospice, hospitality, hospitalization, house, housing, HPI, HPIFR, HPIs, HPN, HQE, HRA, HRI, HSE, HSEC, HSEIP, HSEMS, HSEQ, HSER, HSES, HSMSO, HSS, HSSD, HSSE, HSSEC, HSSEQ, HTA, human, human-resource, human-resources, humanitarian, humanity, hygiene, ICAM, IDEAL, IIR, illegal, illness, illnesses, impact, impacting, impacts, incidence, incidences, incident, incident-based, incidents, inclusion, inclusion-related, inclusiveness, inclusivity, Indigenous, infractions, inhalable, injuries, injury, Innu, inpatient, inspires, integrity, intensity, interpersonal, Inuit, involvement, IOSA, ISNetworld, ISO-compliance, ISP, ISS ESG, ISS ESG rating, ISS-oekom, JCI, job-safety, jobs, JSEA, justice, kCO2, kgCO2, kgCO2e, kids, kWh, KYC, L6, landfill, landscape, Latinx, laundering, lawfully, LDAR, leader, leaders, leadership, leakage, leaks, LEED, legislation, LFTR, LGBTQ, life-changing, life-enhancing, LifeSkills, literacy, litigations, livelihood, lives, LMICs, LOCIs, LOPC, lost, Lost-Time, low-carbon, low-emission, LTAFR,

LTAR, LTAs, LTDIF, LTFIR, LTIF, LTIFR, LTIIR, LTIR, LTIs, LTIS, LTISR, LWCR, LWDIR, LWDR, MAIFI, malaria, males, managers, materiality, maternal, Mecheshoo, Medicaid, medically, men, mental, mentality, mentor, mentoring, mentorship, methane, microplastics, middle-income, migrant, minorities, minority, mitigating, mitigation, MMTCO2e, monitor, morale, morbidity, mortality, MOSWEC, motivated, motivating, MSHA, MTIFR, multicultural, multiracial, MVI, NABERS, nationality, native, near-miss, NECEC, neighborhoods, net-zero, neutralize, newborn, NFDL, noise, noise-related, non-compliance, non-compliances, non-compliant, non-discrimination, non-emitting, non-fatal, non-fresh, non-hazardous, non-injury, non-renewable, non-reportable, non-white, norms, NQS, nurture, nurturing, occupational, ODMs, odor, Ofcom, offset, offsets, offsetting, Ofwat, OHC, OHES, OHI, OHSAS, OHSE, OII, oil-to-gas, ombudsman, ORIR, OSHA, OSHA-recordable, outpatient, OWL, P1, palm, parental, passion, patient, patient-centric, patient-focused, peatland, people, people-based, peoples, personnel development, PHC, PHEV, philanthropic, philanthropy, photovoltaic, physician, planet, plant-based, planting, plastic, plastics, PLMUS, PLWG, PM10, PMVA, PMVAR, policies, policy, policymaker, pollution, pollutions, population, populations, positivity, potable, poverty, POW, prejudice, preventable, preventative, prevention, preventive, prosecution, prosper, protected, protecting, PSER, PSEs, PSIR, PSIs, PSPS, psychologically, PUE, PV, PVAR, PVIR, QHSE, QHSES, QualityScore, race, racial, racialized, RCFR, RCR, recordable, recordables, recruit, recruiting, recyclability, recyclable, recycle, recycled, recycling, reduce, reduction, reductions, refuel, regeneratively, regime, regulation, regulations, regulator, regulatory, rehab, rehabilitate, rehabilitated, rehabilitation, rehospitalization, reliance, remotely, removals, renewable, replacements, represented, resilience, resilience-based, resilient, reskilling, resource, resources, resources-related, respecting, respects, responsibilities, responsibility, responsible, responsibly, retention, retirees, retraining, reusable, reusables, reuse, reused, RGMP, Ribbon, RICI, RIDDOR, RIDDORs, RIF, RIFR, rights, RightShip, RIR, Robeco, RobecoSAM, rPET, RSE, RVIR,

SACIFR, SAF, safe, safeguarding, safer, safety, safety-first, safety-related, SAIDI, salary, saltwater, SAM, sanitation, Sapin, Sarbanes-Oxley, SASB, satisfactory, satisfied, SBTi, SBTi-approval, SCFR, science-based, scope, scopes, secrecy, SEEC, SEIFR, self-care, self-development, serious, severity, sexual, SF6, shared-value, SHECR, SHECS, SHS, sick, sickness, SICR, SIF, SIFR, sinks, SIP, slates, slavery, SLO, smallholder, SMCR, SO2, social, social health, social-economical, socially, societal, societies, society, society's, socioeconomic, soil, solidarity, SOX, SOX deficiencies, SOX-compliant, species, spill, spilled, spills, SPMVI, SSOFR, StakeholderWatch, STARR, statutorily, stewardship, stress, succession, suicide, supervisors, supplied, support, supported, supportive, supports, surveillance, SustainAbilities, sustainability, sustainability-based, sustainability-labelled, sustainability-linked, sustainability-related, sustainable, sustainable-development, sustainably, Sustainagility, Sustainalytics, SWD, tailings, tails, talent, talents, TAR, taxonomy, TCEQ, TCF, TCFD, TCIR, tCO2, tCO2e, team, teambuilding, teammate, teams, teamwork, teamworking, TFAF, TFIR, thriving, TICR, TIFR, TIR, traceability, traceable, TRAFR, training, trainings, transparency, TRCF, TRCFR, TRCR, treatable, treating, trees, TRER, TRFIR, TRI, TRIF, TRIFR, TRIR, TRR, trustworthiness, trustworthy, TSM, TTIFR, UN, underrepresented, underserved, unionized, unions, unsafe, upcycling, upskilling, urgency, value-based, values, values-based, vegetation, veteran, veterans, Vigeo Eiris, violation, violations, VIR, VOCs, VoE, voluntary turnover, volunteered, volunteering, volunteerism, vulnerable, WACI, warming, waste, wastes, wastewater, water, water-intensive, waters, watershed, ways-of-working, welfare, wellbeing, wellness, whistleblowing, WHS, wildfire, wildflower, wildlife, WLO, WLTP, woman, women, women-owned, women's sponsorship, women,Äôs, woodland, work, work-related, workday, workdays, worked, worker, workforce, worklife, workload, workplace, workplaces, worksite, worst, young, youth, zero-carbon, zero-fatalities.

A.4 Examples of excluded words

Below we show examples of few words we exclude from Gantchev, Giannetti, and Hober (2024) word list. We exclude these words, since the fraction of correctly identifying ISS classified ESG *metricother* was less than 0.5.

Table A.1: Examples of excluded words: Complaint

metricother	ESG Comp. Metric
Customer Complaint	0
On-time complaint quality reporting	0
Complaint Tracking Module Volume per 1,000 members per month	0
Complaint Management	0
Complaint Timeliness Execution	0

Table A.2: Examples of excluded words: Cyber

metricother	ESG Comp. Metric
Cyber Mindset results for Finance and Corporate Development departments	0
Cyber Mindset results	0
Cyber Mindset results for US Markets	0
Technology and Cyber Risk Management	0

Table A.3: Examples of excluded words: Trust

metricother	ESG Comp. Metric
Execution of The Trust's Capital Plan	0
Trust and Brokerage as Measured Against Their Combined Goals	0
Composition of Trust's Portfolio	0
Merck Trust & Value Customer Survey	0
MS Leader in Customer Trust and Value Survey	0
Wells Fargo Institutional Retirement Trust Integration Scorecard ...	0
MS Leader in Customer Trust and Value Survey	0
Enhance customer trust by achieving targeted product safety ...	0
Performance of Commerce Trust	0

A.5 Examples of ESG metrics in executive compensation

Table A.4: Examples of ESG metrics in executive compensation

Environmental	Social	Governance
Food Waste	Employee Retention	Ethics Compliance
Wildfire Plan	Diversity	Cybersecurity
Zero Waste	Safety Training	Succession Plan
Water Recycling	Women in Leadership	Capital Use
Plastic Reduction	Incident Rate	Regulatory Goals
Renewable Energy	Client Retention	Internal Controls
Carbon Market	Fair Hiring	Public Policy
Water Savings	Community Work	Board Diversity
Emission Cuts	Workplace Safety	Anti-Corruption
Green Buildings	Employee Satisfaction	ESG Reporting
Methane Reduction	Equal Pay	Risk Management
Carbon Intensity Cut	Health & Safety	Corporate Transparency
Net Zero Goals	Labor Rights	Shareholder Rights

This table presents selected environmental, social, and governance (ESG) metrics commonly used in executive compensation.

A.6 Examples of measurability and materiality of ESG metrics

Table A.5: Examples of measurability and materiality of ESG metrics

Metric	ESG Category	Measurable	Industry	Material
Cumulative Carbon Emissions Reduction	Environmental	1	Electric Utilities & Power Generators	1
Sustainability - Air Travel	Environmental	1	Software & IT Services	0
Climate Change	Environmental	0	Road Transportation	1
Progress toward our long-term sustainability goals	Environmental	0	Restaurants	0
Low-carbon Investments as a Percent	Environmental	1	Oil & Gas – Refining & Marketing	1
Carbon Footprint Goal	Environmental	1	Medical Equipment & Supplies	1
Fatalities	Social	1	Meat, Poultry & Dairy	1
Safety Performance (Measured in ORIR)	Social	1	Water Utilities & Services	1
Safety	Social	0	Metals & Mining	1
On-Site Team Engagement, Retention	Social	0	Real Estate	0
Diversity Index Scores	Social	1	Asset Management & Custody Activities	1
Succession Planning	Governance	0	Real Estate	0
Achieve the Reliability System Average	Governance	1	Electric Utilities & Power Generators	1
Ethics	Governance	0	Biotechnology & Pharmaceuticals	1
Supporting Our Corporate Ethics Program	Governance	0	Software & IT Services	0
Legal Client Support	Governance	0	Electric Utilities & Power Generators	0

This table presents examples of ESG metrics in our dataset. The *Measurable* column indicates whether a given metric has explicit performance benchmarks (1) or not (0). Since the materiality of an ESG metric depends on the industry, the *Industry* column includes one SASB industry category where this metric appeared in at least one executive's grant. The *Material* column specifies whether the ESG metric is considered material in that industry (1) or not (0).

Table A.6: Change in the pay–performance elasticity (delta) on inclusion of ESG metrics

	(1)	(2)	(3)
		Delta	
ESGMetric	-0.00114	-0.00186**	-0.00202**
	(-1.24)	(-2.05)	(-2.17)
Year FE	Y	Y	Y
Executive-Firm FE	Y		
Metric FE	Y		
Executive-Firm-Metric FE		Y	
Executive-Firm-Metric -Award-Vesting FE			Y
Observations	20,831	20,234	20,061
R-squared	0.432	0.464	0.472

This table reports coefficient β from the baseline results in Equation 15:

$$Delta_{e,f,m,a,v,y} = \beta \cdot ESGMetric_{e,f,y} + \alpha_{e,f,m,a,v} + \alpha_y + \epsilon_{e,f,m,a,v,y}.$$

For each observation *executive (e) – firm (f) – metric (m) – award type (a) – vesting schedule (v) – year (y)*, we calculate $Delta_{e,f,m,a,v,y}$ following Bettis et al. (2018). $ESGMetric_{e,f,y}$ equals one for *executive–firm–year* observations where an executive's compensation contract includes at least one ESG-related metric in a given year. $\alpha_{e,f,m,a,v}$ and α_y represent alternative high-dimensional and year fixed effects, respectively. The *t*-statistics, in parentheses, are based on standard errors clustered at the executive level. ***, **, * denote statistical significance at the 0.01, 0.05, and 0.10 levels, respectively.

Table A.7: Effect of E, S, or G metric separately

	(1)	(2)	(3)
	Dollar Delta		
Only E Metric	-7,446.8*		
	(-1.89)		
Only S Metric		-4,087.3**	
		(-2.43)	
Only G Metric			-727.2
			(-0.54)
Year FE	Y	Y	Y
Executive-Firm-Metric -Award-Vesting FE	Y	Y	Y
Observations	12,373	15,028	12,443
R-squared	0.807	0.804	0.807

We calculate *Dollar Delta* following Equation 14. In specification (1), *Dollar Delta* is regressed on *Only E Metric*, a binary variable equal to one for executives whose compensation contracts include only environment-related metrics for that year, but exclude social or governance-related metrics, and zero otherwise. Similarly, *Only S Metric* in specification (2) and *Only G Metric* in specification (3) are binary variables based on the inclusion of exclusively social-related and governance-related metrics, respectively, in the compensation contract. We remove observations where an executive has more than one type of ESG metric included in their contracts. All regressions include high-dimensional *executive-firm-metric-award type-vesting schedule* and *year* fixed effects. In all specifications, the t-statistics, in parentheses, are based on standard errors clustered at the executive level. ***, **, * denote statistical significance at the 0.01, 0.05, and 0.10 levels, respectively.

Table A.8: Effect on accounting and financial metric separately

	(1)	(2)
	Dollar Delta	
ESGMetric	-5,704.2*	-4,019.2***
	(-1.96)	(-2.91)
Metric Type	Accounting	Financial
Year FE	Y	Y
Executive-Firm-Metric -Award-Vesting FE	Y	Y
Observations	6,828	13,233
R-squared	0.627	0.795

We calculate *Dollar Delta* following Equation 14. In specification (1), we restrict our sample to only accounting metrics including EBIT, EBITDA, EPS, Earnings, Net Income, Operating Income, and Sales. In specification (2), we restrict our sample to only financial metrics including Stock price and Total shareholder returns. All regressions include high-dimensional *executive-firm-metric-award type-vesting schedule* and *year* fixed effects. In all specifications, the t-statistics, in parentheses, are based on standard errors clustered at the executive level. ***, **, * denote statistical significance at the 0.01, 0.05, and 0.10 levels, respectively.

CFR working paper series

centre for financial research cologne

CFR working papers are available for download from www.cfr-cologne.de.

2025

No.	Author(s)	Title
25-10	V. Agarwal, J.-P. Gomez, K. Hosseini, M. Jha	ESG Metrics in Executive Compensation: A Multitasking Approach
25-09	V. Agarwal, P. Ghosh, N. Prabhala, H. Zhao	Animal Spirits on Steroids: Evidence from Retail Options Trading in India
25-08	V. Agarwal, S. Cao, S. Huang, M. Kim	Incentive Realignment: Mutual Funds' Influence on Executive Compensation Contracts
25-07	V. Agarwal, Y. E. Arisoy, T. Trinh	Eponymous Hedge Funds
25-06	D. Hess, F. Simon, S. Weibels	Interpretable Machine Learning for Earnings Forecasts: Leveraging High-Dimensional Financial Statement Data
25-05	B. F. Ballensiefen	Collateral Choice
25-04	C. Andres, F. Brochet, P. Limbach, N. Schumacher	Sell-Side Analysts with Accounting Experience
25-03	W. Bazley, G. Cici, J. Liao	Conflicts of Interest among Affiliated Financial Advisors in 401(k) Plans: Implications for Plan Participants
25-02	A. T. Maître, N. Pugachyov, F. Weigert	Twitter-Based Attention and the Cross-Section of Cryptocurrency Returns
25-01	N. Käfer, M. Mörke, F. Weigert, T. Wiest	A Bayesian Stochastic Discount Factor for the Cross-Section of Individual Equity Options

2024

No.	Author(s)	Title
24-06	V. Beyer, T. Bauckloh	Non-Standard Errors in Carbon Premia
24-05	C. Achilles, P. Limbach, M. Wolff, A. Yoon	Inside the Blackbox of Firm Environmental Efforts: Evidence from Emissions Reduction Initiatives
24-04	Ivan T. Ivanov, T. Zimmermann	The "Privatization" of Municipal Debt
24-03	T. Dyer, G. Köchling, P. Limbach	Traditional Investment Research and Social Networks: Evidence from Facebook Connections
24-02	A. Y. Chen, A. Lopez-Lira, T. Zimmermann	Does Peer-Reviewed Research Help Predict Stock Returns?

24-01	G. Cici, P. Schuster, F. Weishaupt	Once a Trader, Always a Trader: The Role of Traders in Fund Management

2023

No.	Author(s)	Title
23-08	A. Braun, J. Braun, F. Weigert	Extreme Weather Risk and the Cost of Equity
23-07	A. G. Huang, R. Wermers, J. Xue	“Buy the Rumor, Sell the News”: Liquidity Provision by Bond Funds Following Corporate News Events
23-06	J. Dörries, O. Korn, G. J. Power	How Should the Long-term Investor Harvest Variance Risk Premiums?
23-05	V. Agarwal, W. Jiang, Y. Luo, H. Zou	The Real Effect of Sociopolitical Racial Animus: Mutual Fund Manager Performance During the AAPI Hate
23-04	V. Agarwal, B. Barber, S. Cheng, A. Hameed, H. Shanker, A. Yasuda	Do Investors Overvalue Startups? Evidence from the Junior Stakes of Mutual Funds
23-03	A. Höck, T. Bauckloh, M. Dumrose, C. Klein	ESG Criteria and the Credit Risk of Corporate Bond Portfolios
23-02	T. Bauckloh, J. Dobrick, A. Höck, S. Utz, M. Wagner	In partnership for the goals? The level of agreement between SDG ratings
23-01	F. Simon, S. Weibels, T. Zimmermann	Deep Parametric Portfolio Policies

This document only covers the most recent CFR working papers. A full list can be found at www.cfr-cologne.de.

centre for financial research
cfr/university of cologne
Albertus-Magnus-Platz
D-50923 cologne
Fon +49(0)221-470-6995
Fax +49(0)221-470-3992
kempf@cfr-cologne.de
www.cfr-cologne.de