Information Frictions and the Real Effects of Sustainable Investing*

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Abstract

Investors can influence firms only through what outsiders can measure. We model a setting where sustainable demand rewards perceived social action but firms choose how precisely to disclose it. In confidential U.S. Census wage records, with rich fixed effects, socially responsible ownership is unrelated to firm-year employee gender pay gaps. The relation turns negative when boards include female directors, and these firms talk more about gender equality in earnings calls. A structural extension implies that a U.S. analogue of the 2017 U.K. mandate would close 7% of the pay gap, rising to 11% with continued growth of sustainable ownership.

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1 Introduction

Can investors change what firms do when the relevant actions are hard to observe? This question is central to corporate governance: suppliers of capital can discipline managers only to the extent that markets and monitors can measure what managers choose. The same question has become central in the debate over socially responsible investing. A growing set of investors wants firms to pursue specific social objectives, and firms publicly commit to a wide range of social policies. Yet many of the underlying actions—pay practices, promotion decisions, workplace conditions, internal compliance—are not directly observable to outsiders. When actions are opaque, investor pressure may affect prices, ownership, and public communication without necessarily changing what happens inside the firm.

This paper studies information asymmetry as a friction that limits the real effects of investor preferences on firm actions. The basic logic is simple. If investors care about an outcome and can verify it, they can reward firms that deliver it, either through price premia when their demand tilts toward those firms or through voting and engagement when their ownership confers governance influence. Both rewards create incentives for managers to supply the outcome. But if the outcome is not verifiable, both channels are weak: investors can reward only what they can observe, and firms can respond by supplying observable proxies or just talking rather than costly real changes. In that environment, investor influence can look strong in outcomes that are easy to monitor (such as board composition) while remaining weak in outcomes that are economically important but hidden from outsiders (such as employee pay equity).

We formalize this mechanism in a stylized model that combines a taste-based wedge in prices with endogenous information production. Investor demand creates an incremental valuation benefit for perceived social performance, as in a taste-based asset-pricing wedge (Pástor, Stambaugh, and Taylor, 2021).[1] The firm then chooses a real action and also chooses the precision of disclosure that

[1]This reduced-form wedge captures both the flow channel (sustainable demand tilts prices) and the voice channel

allows outsiders to infer that action. Following the logic of endogenous disclosure (e.g., Admati and Pfleiderer, 2000), disclosure is costly, and it is more costly when credible measurement is difficult.[2] Our key extension is that board quality lowers the cost of producing precise and credible disclosure about an otherwise hard-to-observe social action. The model delivers a sharp "null under opacity": when information is too noisy or too costly, equilibrium features pooling at a regulatory compliance baseline and no strategic real action above it, even if investors have strong social preferences. The model also delivers an "active" region in which investor demand has real effects, and those effects are stronger when board quality is higher.

We take the model to a setting where the outcome is important, costly to change, and typically not observable to investors: the employee-level gender pay gap among U.S. public companies from 2001 to 2021. We measure pay gaps using restricted-access administrative wage records from the U.S. Census Bureau's Longitudinal Employer-Household Dynamics (LEHD) program, following the residual-based approach in Goldin et al. (2017). The confidentiality of LEHD is, for our question, an advantage: the data are not visible to investors and provide a clean laboratory for testing whether investor preferences have real effects when the outcome is opaque to outsiders. We merge LEHD to Compustat, CRSP, BoardEx, and institutional ownership data, and construct two complementary measures of socially responsible investment (SRI): a revealed-preference measure from institutions that buy on female-director appointments in 13F (Friedman, 2020; Knippen, Shen, and Zhu, 2019), and a fund-name measure of mutual funds whose names signal a social mandate (following Van der Beck, 2025). Throughout we use causal language sparingly and interpret the estimates as reduced-form correlations, since ownership and governance are endogenous.

(sustainable owners exercise governance pressure through voting and engagement). We develop the microfoundation in Section 2.4.

[2]For gender pay-gap disclosure, the cost comes from (i) legal exposure to discrimination claims under the Equal Pay Act and Title VII once a detailed within-firm gap is published, (ii) the price of third-party audit and attestation that gives the number standing with outside investors, (iii) competitive risk from revealing the gender composition of pay grades and the firm's internal pay structure, and (iv) the reputational cost of committing to one of several contested measurement methodologies (mean vs. median, raw vs. adjusted, hourly vs. annual) that must be defended in every subsequent year, even when the reported gap moves for reasons other than pay policy. The actual computation of the number is essentially free once payroll data are digital; what is costly is making it believed. See Section 2 for further discussion.

Three reduced-form findings follow. First, socially responsible investment is negatively related to the employee gender pay gap in simple specifications but becomes economically small and statistically insignificant once we absorb time-varying industry and regional trends with granular fixed effects, consistent with the model's null under opacity. Second, the same socially responsible investment is positively related to board-level gender diversity, and market valuations move with board diversity but not with the employee pay gap, suggesting that investor influence is strong where information is readily available and weak where the relevant outcome is hidden. Third, the SRI–pay-gap slope turns negative in firms with at least one female director and is strongest with two female directors, and firms with more female directors discuss gender equality more in earnings calls, consistent with the model's complementarity between sustainable demand and credible disclosure. We interpret these patterns as suggestive reduced-form evidence rather than definitive causal effects.

To put magnitudes on these patterns, we extend the model to a dynamic version and fit it to the regressions above. A U.S. analogue of the 2017 U.K. gender-pay-gap disclosure mandate closes about 7% of the cross-sectional pay gap. A continuation of the post-2014 expansion of sustainable ownership closes another 3%. When a disclosure mandate is adopted during such an expansion, the joint policy closes about 11%, roughly 59% more than the sum of the two policies in isolation, because the mandate's bite on each firm scales with the ownership it operates on. We read these as informative estimates from a stylized model, not causal forecasts.

The broader message is not limited to "ESG." The paper speaks to a general question in finance: when can outside investors affect real firm policies, and when do information frictions blunt that influence? Sustainable investing is an economically important context in which this question is visible, but the mechanism is older and more general. It is the same friction emphasized in the disclosure and corporate governance traditions: without credible information, market discipline and external monitoring are weak, and equilibrium incentives can shift toward observable proxies rather than the underlying action.

Related Literature. This paper contributes to the literature on corporate governance and investor influence by emphasizing information production as a prerequisite for investor-driven change. The governance problem starts from the classic question of how suppliers of finance assure themselves of getting a return (Shleifer and Vishny, 1997; see also La Porta et al., 2002). A central insight of the disclosure literature is that information is endogenous and costly, and that forcing or facilitating disclosure can change incentives (e.g., Admati and Pfleiderer, 2000). Our model applies this logic to investor preferences over nonfinancial actions and highlights a simple prediction: investor demand can affect prices and ownership even when actions are opaque, but real effects on the action require credible information. This perspective is also consistent with evidence that board structure and governance are linked to firms' information environments and transparency (Adams, Hermalin, and Weisbach, 2010; Armstrong, Core, and Guay, 2014).

We also contribute to the sustainable-investing and impact-investing literature by providing a tractable mechanism that connects investor demand to real outcomes only when outcomes are measurable and communicable. Pástor, Stambaugh, and Taylor (2021) formalizes a taste-based pricing wedge in equilibrium, and related models link screening or investor tastes to prices and firm behavior (Heinkel, Kraus, and Zechner, 2001; Hong and Kacperczyk, 2009). On the demand side, investors respond strongly to salient sustainability signals and rankings, generating flow-induced reallocation toward "sustainable" assets (Hartzmark and Sussman, 2019; Riedl and Smeets, 2017). A growing literature studies when these preferences translate into corporate behavior through exit and engagement: Edmans, Levit, and Schneemeier (2024) models socially responsible divestment as a disciplinary force, while active ownership and shareholder engagement can affect firm policies and outcomes (Dimson, Karakaş, and Li, 2015; Flammer, 2015); Dyck et al., 2019 provides international evidence linking institutional ownership to corporate social performance. We add an information-production margin to these channels and show why investor influence can be strong for highly observable governance proxies (such as board composition) yet weak for opaque internal outcomes (such as employee pay equity). This mechanism also speaks to evidence that ESG signals

are noisy and often disagree across data providers (Berg, Koelbel, and Rigobon, 2022; Boffo and Patalano, 2020; Chen, Cohen, and Gurun, 2021; Gibson Brandon et al., 2022).

Finally, we contribute to the literature on gender inequality inside firms by bringing capital-market forces and information frictions into the analysis of employee pay gaps. We build employee-level gender pay gaps using administrative wage records and established residual-based methods (Goldin et al., 2017; see also Blau and Kahn, 2017), and we relate within-firm pay gaps to ownership and governance. Our approach complements matched employer-employee work showing that firms are central to wage-setting and pay gaps (Card, Cardoso, and Kline, 2016). We connect these outcomes to board composition and leadership, consistent with evidence that female leadership can shape gender-related labor outcomes (Dezső and Ross, 2012; Tate and Yang, 2015) and with the broader literature on board gender diversity and governance (Adams and Ferreira, 2009; Ahern and Dittmar, 2012; Matsa and Miller, 2013). We also speak to policy debates about gender-pay disclosure requirements by showing that the effectiveness of investor demand depends on whether the underlying outcome is observable and credibly communicated (Bennedsen et al., 2022; Lagaras et al., 2022).

The remainder of the paper is organized as follows. Section 2 presents the model and derives testable implications. Section 3 describes the data and measurement of the employee gender pay gap and socially responsible ownership. Sections 4–5 present the main empirical results and additional evidence on communication. Section 6 develops and structurally estimates the dynamic extension and reports policy counterfactuals. Section 7 concludes.

2 A Stylized Model

This section presents a deliberately simple model of how sustainable investing can, and often cannot, affect a firm's *internal* social outcomes when outsiders face severe information frictions. The model combines two ingredients. First, a segment of investors derives utility from holding

firms they believe to treat stakeholders well, which creates a valuation wedge in the spirit of Pástor, Stambaugh, and Taylor (2021). Second, the firm can invest in the *precision* (credibility) of disclosure about a hard-to-observe social action, in the spirit of Admati and Pfleiderer (2000). Our key extension is that board quality governs the cost of producing credible information.

The central mechanism is simple: sustainable investors can only reward what they can *price*, and they can only price what they can *infer*. When the firm's social action is opaque, the pricing wedge attaches to beliefs that do not move with reality. In that case, sustainable tastes do not induce real action. When disclosure becomes sufficiently informative—especially when board quality is high—the wedge becomes a real shadow price on the firm's social action, and sustainable ownership has bite.

Throughout, the model is not meant to be realistic. It is meant to isolate an economic logic: *prices discipline firms only through measurable objects*. Detailed derivations appear in Appendix B.

2.1 Setup

There is a representative firm with baseline fundamental value V_0. The firm can take a costly social action $a \geq 0$. In the application, think of a as a bundle of internal policies and investments that reduce an employee-level gender pay gap: pay audits, pay adjustments, promotion and hiring reforms, manager accountability, and related HR systems.

The firm has a board characterized by an observable quality parameter $q > 0$. Higher q means the board can (i) acquire and process internal information about a at lower cost, and (ii) credibly communicate that information to outsiders at lower cost. In the data, we proxy this board-quality dimension using female board representation. The model is agnostic about whether this proxy works through attention, expertise, monitoring, credibility, or all of the above; it only requires that it reduces the marginal cost of producing credible information about the action.

There is a mass of investors. A share $\lambda \in [0, 1]$ of them are "sustainable" in the sense that their demand shifts upward in the perceived social action of the firm. We summarize the strength of this

demand by a reduced-form pricing wedge $\omega(\lambda) \geq 0$ with $\omega'(\lambda) > 0$. We treat λ as predetermined within the period; later we discuss what changes when sustainable ownership is itself endogenous.

Timing. (i) The firm begins with predetermined (λ, q); (ii) the board chooses disclosure precision $\tau \geq 0$; (iii) the manager chooses action $a \geq 0$; (iv) a public signal about a is realized; (v) investors price the firm.

2.2 Costs, information, and pricing

Board. The board chooses disclosure precision τ subject to a regulatory baseline $\underline{\tau} \geq 0$, $\tau \geq \underline{\tau}$, at convex cost

$$H(\tau; q) = \frac{\kappa}{2q}\tau^2, \qquad \kappa > 0,\ q > 0. \tag{1}$$

The cost κ should not be read as the cost of computing the underlying pay-gap number, which is essentially free once payroll data are digital. It is the cost of producing a number that outside investors are willing to act on. That bundle is large and largely non-technological: legal exposure once a detailed wage statistic is published in a litigious environment, the political cost of committing to a particular measurement methodology when several are contested, the dollar cost of third-party audit and attestation that gives the number standing, the strategic risk of revealing internal wage structure to competitors, and the reputational cost of locking the firm onto a future disclosure trajectory that has to be defended in every subsequent year. Better boards lower this bundle because they bring institutional credibility with outsiders, the legal and governance expertise to navigate the exposure, and the capacity to commit credibly to a measurement standard. The bottleneck is rarely measurement itself; it is the apparatus that makes the measurement believed.

The lower bound $\underline{\tau}$ reflects the institutional reality that listed firms cannot credibly disclose nothing: regulatory mandates (e.g., SEC Regulation S-K human-capital disclosure, NASDAQ board-diversity rule, federal EEO-1 filings) force a positive baseline of gender-related corporate communication. We interpret $\underline{\tau}$ as the mechanical content generated by these rules together with

the routine references to female executives and board members that are unavoidable in any earnings call. The unconstrained limit $\underline{\tau} = 0$ recovers the textbook signalling model and is studied as a comparative-statics benchmark in Section 2.4.

Information. The market does not observe a. Instead it observes a noisy signal

$$y = a + \varepsilon, \qquad \varepsilon \sim \mathcal{N}\left(0, \frac{1}{\tau}\right). \tag{2}$$

We adopt a normal prior for outsiders' beliefs about a, $a \sim \mathcal{N}(0, \sigma^2)$. This prior variance σ^2 is a reduced-form measure of how uncertain outsiders are about the firm's internal social policy absent disclosure. Under normal-normal updating, the posterior mean is

$$m(y, \tau) \equiv \mathbb{E}[a \mid y, \tau] = K(\tau)\, y, \qquad K(\tau) = \frac{\tau\sigma^2}{1 + \tau\sigma^2} \in [0, 1). \tag{3}$$

Pricing wedge. Following Pástor, Stambaugh, and Taylor (2021), we assume the time-0 price includes an additive wedge proportional to the market's *perceived* social action:

$$P = V_0 - C(a) - H(\tau; q) + \omega(\lambda)\, m(y, \tau). \tag{4}$$

The wedge is deliberately reduced form. It captures that when sustainable investors are marginal, expected social action commands a higher price (equivalently, a lower required return). The key point is that the wedge attaches to beliefs $m(y, \tau)$, not to the true action a.

Firm objective. Taking expectations conditional on (a, τ) and using $\mathbb{E}[m(y, \tau) \mid a, \tau] = K(\tau)a$, the firm-board chooses (a, τ) to maximize expected price:

$$\max_{a \geq 0,\, \tau \geq \underline{\tau}} \; V_0 - \frac{\theta}{2}a^2 - \frac{\kappa}{2q}\tau^2 + \omega(\lambda)\, K(\tau)\, a. \tag{5}$$

Action has convex cost

$$C(a) = \frac{\theta}{2}a^2, \qquad \theta > 0. \tag{6}$$

This objective can be interpreted as a reduced form for a firm that cares about its stock price because of managerial compensation, takeover discipline, or because it raises external finance and thus values a lower cost of capital. The analysis below does not depend on which interpretation one prefers.

2.3 Equilibrium

Fix $\tau \geq 0$. Maximizing (5) with respect to a yields

$$a^*(\lambda, \tau) = \frac{\omega(\lambda)}{\theta} K(\tau). \tag{7}$$

If disclosure is at its minimum ($\tau = \underline{\tau}$), then $K(\underline{\tau})$ is small but positive and therefore $a^*(\lambda, \underline{\tau})$ is small but positive. Sustainable tastes generate only a thin baseline of real action when the only information about a is the mechanical content produced by regulation.

Substituting (7) into (5), the board chooses τ by trading off the cost of precision against the benefit of making action more "priceable." Define

$$A(\lambda, q) \equiv \frac{\omega(\lambda)^2 \sigma^4 q}{\theta \kappa}. \tag{8}$$

Let $\tau^\circ(\lambda, q) \equiv \sigma^{-2}\big(A(\lambda, q)^{1/3} - 1\big)$ denote the interior optimum that the firm would choose in the absence of the regulatory floor. Then equilibrium disclosure precision is

$$\tau^*(\lambda, q) = \max\Big\{\underline{\tau},\ \tau^\circ(\lambda, q)\Big\} = \begin{cases} \underline{\tau}, & \text{if } A(\lambda, q) \leq \big(1 + \sigma^2 \underline{\tau}\big)^3, \\ \dfrac{1}{\sigma^2}\left(A(\lambda, q)^{1/3} - 1\right), & \text{otherwise.} \end{cases} \tag{9}$$

The model therefore partitions the cross-section into two regions. In the *floor region*, the regulatory baseline binds: every firm discloses at the mandated minimum and chooses a small but

positive action $a^*(\lambda, q) = \omega(\lambda)K(\underline{\tau})/\theta$. In the *active region*, the firm finds it worthwhile to disclose strictly above the floor, and equilibrium action has the closed form

$$a^*(\lambda, q) = \frac{\omega(\lambda)}{\theta}\Big(1 - A(\lambda, q)^{-1/3}\Big). \tag{10}$$

The unconstrained limit $\underline{\tau} = 0$ collapses the floor region to the classical inactive region of the canonical signalling model: only firms with $A(\lambda, q) > 1$ disclose, and all others choose $\tau^* = 0$ and $a^* = 0$.

2.4 Economic mechanism and discussion

Microfoundations of the pricing wedge: flow and voice. The pricing wedge $\omega(\lambda)\, m$ in (4) is deliberately reduced form, but two distinct microfoundations from the literature justify the same functional form. Both deliver an identical first-order condition for the firm's choice of a, so the analysis below applies to either or to a hybrid of the two. We do not need to take a stand on which channel dominates in practice; what matters is that the firm faces a marginal incentive to be perceived as taking social action, and that incentive scales with sustainable-investor intensity λ.

The first microfoundation is the *flow* or *exit* channel of Pástor, Stambaugh, and Taylor (2021), building on the screening logic of Heinkel, Kraus, and Zechner (2001) and the boycott logic of Hong and Kacperczyk (2009). Investors with mass λ have non-pecuniary preferences for firms perceived to take social action. Their demand-side tilt toward such firms creates an additive valuation wedge proportional to the market's posterior mean m,

$$\Delta P^{\text{flow}} \;=\; \omega_0^{\text{flow}}\, \lambda\, m,$$

where $\omega_0^{\text{flow}} > 0$ measures the strength of the taste-based price tilt per unit of sustainable ownership. Because the manager maximizes the stock price—through any of the mechanisms in (5)—the marginal benefit of action under the flow channel is $\omega_0^{\text{flow}}\, \lambda\, K(\tau)$, which equates to the marginal cost θa at the optimum.

The second microfoundation is the *voice* or *engagement* channel. Sustainable shareholders with voting weight λ exercise governance pressure on the firm: they withhold support from incumbent directors when perceived social performance is low and engage in private dialogue otherwise (Dimson, Karakaş, and Li, 2015). Linearizing the manager's retention probability around its equilibrium value $\bar{\pi}$,

$$\Pr(\text{manager retained} \mid m, \lambda) \;=\; \bar{\pi} + \nu\,\lambda\,m + o(m),$$

the manager's expected utility from a wage w paid only on retention is $w\bar{\pi} + w\,\nu\,\lambda\,m$. The marginal benefit of action under the voice channel is therefore $w\,\nu\,\lambda\,K(\tau)$, algebraically identical to the flow channel with $\omega_0^{\text{voice}} \equiv w\,\nu$. The disclosure cost $H(\tau; q)$ in this interpretation is the manager's effort cost of producing verifiable internal information, with q indexing the credibility of the board's monitoring power and the implicit threat of replacement.

When both channels operate simultaneously—as they do in practice for most large firms—the marginal benefits add. The reduced-form intensity ω_0 embedded in $\omega(\lambda)$ is therefore the sum,

$$\omega_0 \;=\; \omega_0^{\text{flow}} \;+\; \omega_0^{\text{voice}},$$

and the model identifies the bundle without taking a stand on the relative contribution of each channel. Crucially, the information friction at the center of the paper—opacity of the action a—affects both channels *symmetrically*. A flow channel that rewards m cannot discipline firms when m is uninformative about a; a voice channel that conditions retention on m is similarly blunted. The model's prediction that investor pressure has weak real effects when actions are opaque holds whether the dominant channel is flow, voice, or a mixture. This view also clarifies the long-running debate over the relative effectiveness of divestment versus engagement in driving corporate social outcomes (Edmans, Levit, and Schneemeier, 2024): in the present framework, both channels leave the same residual incentive on the firm conditional on the available information, and both are blunted by the same information friction.

What gets priced is beliefs, not reality. Equation (4) is the whole story. Sustainable investors pay for what they *think* the firm does, not for what the firm *actually* does. The gap between beliefs and reality is an information problem, and in the model that problem is governed by τ.

This perspective is useful because it separates two questions that are often conflated in discussions of ESG: (i) do investors care, and by how much (captured by $\omega(\lambda)$)? and (ii) can investors tell which firms actually take costly actions (captured by $K(\tau)$)? The model says that without (ii), (i) does not deliver real effects.

Disclosure and action are complements, which creates tipping. The reason we obtain a sharp threshold is that disclosure is valuable only if the firm takes action, and action is valuable only if disclosure makes it priceable. Starting from a low action, the benefit of raising τ above the regulatory floor is small because there is little to learn; conversely, when τ is at the floor, $K(\underline{\tau})$ is small and the marginal return to a is small. This complementarity yields the floor region $A(\lambda, q) \leq (1 + \sigma^2\underline{\tau})^3$ and the active region $A(\lambda, q) > (1 + \sigma^2\underline{\tau})^3$. The unconstrained limit $\underline{\tau} = 0$ recovers the classical $A(\lambda, q) \leq 1$ versus $A(\lambda, q) > 1$ dichotomy.

The parameter $A(\lambda, q)$ has a transparent interpretation: it is a signal-to-cost ratio. Higher sustainable demand (higher $\omega(\lambda)$), greater outsider uncertainty (higher σ^2), and better boards (higher q) all increase the value of information and therefore make it more likely that the firm crosses the threshold.

Pooling and separating equilibria. The two-region structure has a direct interpretation in the language of adverse selection and signalling. In the floor region, every firm discloses exactly $\underline{\tau}$ and takes the common small action $\omega(\lambda)K(\underline{\tau})/\theta$. Because all firms produce the same information content – the mandated minimum – investors cannot distinguish a firm with strong but unobserved commitment to social action from one with weak commitment. This is a *pooling equilibrium* in the sense of Akerlof (1970): the regulatory floor generates a uniform compliance signal but no strategic

separation, and all firms in the region are priced as if they were the population average.

In the active region, by contrast, firms with stronger sustainable demand or better-quality boards find it optimal to disclose *above* the floor. The choice of disclosure precision $\tau^*(\lambda, q) > \underline{\tau}$ is itself a costly signal in the sense of Spence (1973): firms in environments with higher $A(\lambda, q)$ endogenously choose higher τ and are more accurately priced for their true action. Since τ^* varies smoothly with $A(\lambda, q)$ and since investors update their posterior $m = K(\tau)y$ continuously in τ, the active region delivers a *partially separating equilibrium*: firms with different fundamentals reveal themselves to different degrees, with full revelation in the limit $\tau \to \infty$.

The cutoff $A(\lambda, q) = (1 + \sigma^2\underline{\tau})^3$ is therefore the *separation threshold*. Below it, costly signalling above the regulatory baseline is not worthwhile and the market pools at compliance. Above it, firms find it optimal to pay the disclosure cost in order to be priced separately. Because $A(\lambda, q)$ is increasing in both sustainable ownership and board quality, low-λ or low-q firms are pulled into the pooling region and high-λ, high-q firms into the separating region. The regulatory floor shifts the cutoff outward relative to the classical signalling model but preserves the same qualitative comparative statics. The empirical contrast at the centre of the paper – that investor pressure has bite for firms with female directors but not for those without – is precisely the cross-sectional analogue of this pooling-versus-separating dichotomy. The standard tools of continuous Bayesian signalling deliver these adverse-selection predictions in a tractable form that admits closed-form policies and a unique within-period equilibrium, while a discrete two-type model would require additional refinements to pin down which equilibrium is selected when both pooling and separating outcomes are supported.[3]

[3] A discrete two-type adverse-selection version of the model would require commitments on three fronts that the continuous formulation finesses. *First, equilibrium selection*: pooling and semi-separating equilibria typically coexist for ranges of parameters, so structural estimation must impose a selection rule (e.g. efficient separating, lexicographic dominance, or an estimated selection probability). *Second, off-equilibrium beliefs*: signalling equilibria depend on what investors think upon observing a deviation, which requires a refinement such as the Cho-Kreps Intuitive Criterion that is not pinned down by the data. *Third, dynamic tractability*: persistent types in a recursive setting introduce reputation effects and multiple steady-state equilibria that obstruct the closed-form policies and Bellman-recursion structure used here. These complications do not preclude structural estimation but require additional modelling commitments. The continuous-signalling formulation in this paper delivers the same pooling-versus-separating economic content under a unique within-period equilibrium with a smooth simulated-moment surface, which is what

Why board quality matters here. In many models, the board matters because it monitors the CEO. Here the board matters because it reduces the cost of producing credible information about a socially relevant internal action. In practice, this can arise because (i) some boards are better at getting the organization to measure internal outcomes (pay audits and dashboards), and/or (ii) outsiders are more willing to believe disclosure coming from boards with certain characteristics, including gender diversity.

Observable proxies and "window dressing." The model above treats a as the only socially relevant action, and it is hard to observe. In the gender-equality application, that is exactly what makes the problem interesting: the employee-level pay gap is typically not directly observable to outside investors in real time. But investors do see (and many explicitly use) board composition.

A simple way to capture this is to add a second action $b \geq 0$ that is *perfectly observable*, with cost $C_b(b) = \frac{\theta_b}{2} b^2$, and with a pricing wedge $\omega_b(\lambda)\, b$. Think of b as a visible governance choice (e.g., appointing female directors, adopting a public policy, or joining a pledge). Then the firm chooses

$$b^*(\lambda) = \frac{\omega_b(\lambda)}{\theta_b}$$

regardless of τ and regardless of what happens to a. In other words, sustainable tastes can move *visible* objects even when they do not move *hidden* ones. We use the term "observable proxy" without implying deception: when outsiders monitor b but cannot verify a, equilibrium incentives tilt toward the measurable dimension. This extension motivates our empirical contrast between board gender diversity and employee pay gaps (Tables 3 and 4).

Endogenous sustainable ownership and self-fulfilling transparency. We have taken λ as predetermined. In reality, sustainable ownership often follows disclosure: as firms communicate more, they enter ESG screens, attract ESG funds, and face different marginal investors. If we

makes the SMM-style estimation in the dynamic extension tractable.

allow λ to increase in perceived action or disclosure (e.g., $\lambda = \Lambda(m, \tau)$ with Λ increasing), then the complementarity between action and disclosure can generate tipping dynamics. In such an extension, an increase in sustainable ownership raises disclosure, which raises perceived action, which raises sustainable ownership further. This can produce multiple regimes (low disclosure/low action vs. high disclosure/high action), and small shifts in attention can move firms across regimes.

Section 6 develops a fully dynamic, recursive extension in which sustainable ownership is slow-moving and adjusts gradually to perceived social performance, generating a forward-looking incentive to disclose and act. The dynamic extension is structurally estimated by simulated method of moments and used for counterfactual experiments on forced disclosure and board-quality reform; closed-form auxiliary results for the two-period special case (anticipation premium, path dependence, and dynamic policy multipliers) are recorded in Appendix C.

Forced disclosure. A natural counterfactual experiment is to raise the regulatory baseline $\underline{\tau}$ above its current level – a tightening of disclosure rules. Because the floor enters the firm's problem through $K(\underline{\tau})$ in (7), raising $\underline{\tau}$ increases the return to action a for every firm in the floor region and shrinks the cutoff $(1 + \sigma^2\underline{\tau})^3$ above which firms voluntarily disclose more. In settings where transparency rules tighten, the model therefore predicts that sustainable ownership becomes more potent precisely when disclosure becomes more credible, with the largest effects concentrated among firms that were previously pooled at the compliance minimum.

2.5 Testable predictions

The model delivers three testable implications that map directly to our empirical design. Full derivations are in Appendix B.

Proposition 1 (Null under opacity). *If employee-pay equity is not credibly inferable beyond the regulatory minimum, sustainable-investing tastes in prices do not induce strategic disclosure or real action above the compliance baseline: equilibrium features pooling at $\underline{\tau}$ and a uniformly small*

action $\omega(\lambda)K(\underline{\tau})/\theta$. In the unconstrained limit $\underline{\tau} = 0$, the prediction collapses to zero disclosure and zero action.

Proof. By (9), equilibrium precision is $\tau^*(\lambda, q) = \underline{\tau}$ whenever $A(\lambda, q) \leq \left(1 + \sigma^2 \underline{\tau}\right)^3$. Substituting into (7) gives $a^*(\lambda, q) = \omega(\lambda)K(\underline{\tau})/\theta$, a small constant that does not vary across firms in the floor region. The unconstrained case sets $\underline{\tau} = 0$, in which case $K(0) = 0$ and both $\tau^* = 0$ and $a^* = 0$.

Intuition. The pricing wedge rewards only what investors can *credibly infer* about the firm's social action. When the only credible information is the mechanical regulatory baseline, investors' beliefs respond uniformly across firms and do not move with the true action of any given firm. The firm therefore cannot raise its price by taking costly strategic action above what compliance already generates. Empirically, this region is the one in which the cross-sectional relation between SRI and the pay gap should be statistically weak.

Proposition 2 (Board quality amplifies sustainable ownership). *In the active region, both disclosure and action increase in sustainable-investor intensity and board quality, and the effect of sustainable ownership on action is larger when board quality is higher.*

Proof. For $A(\lambda, q) > 1$, equilibrium action is

$$a^*(\lambda, q) = \frac{\omega(\lambda)}{\theta}\left(1 - A(\lambda, q)^{-1/3}\right) \quad \text{from (10)}.$$

Let $A \equiv A(\lambda, q)$. Differentiating yields

$$\frac{\partial a^*}{\partial \omega} = \frac{1}{\theta}\left(1 - \frac{1}{3}A^{-1/3}\right) > 0, \qquad \frac{\partial a^*}{\partial q} = \frac{\omega(\lambda)}{3\theta q}A^{-1/3} > 0, \tag{11}$$

and the complementarity is captured by

$$\frac{\partial}{\partial q}\left(\frac{\partial a^*}{\partial \omega}\right) = \frac{1}{9\theta q}A^{-1/3} > 0. \tag{12}$$

Since $\omega'(\lambda) > 0$, the same comparative statics hold with respect to λ.

Intuition. Sustainable ownership increases the valuation benefit from making the firm's action

"priceable." A higher-quality board reduces the marginal cost of producing precise and credible information. This raises τ, strengthens the mapping from action to investors' posterior mean, and increases the return to taking real action. Because disclosure and action are complements in (5), sustainable ownership has a larger effect when board quality is higher.

Proposition 3 (Board quality predicts more disclosure/communication). *Higher board quality leads to more information production and makes it more likely that the firm operates in the active region.*

Proof. Equilibrium precision is given by (9). When $A(\lambda, q) > 1$,

$$\tau^*(\lambda, q) = \frac{1}{\sigma^2}\big(A(\lambda, q)^{1/3} - 1\big), \qquad \frac{\partial \tau^*}{\partial q} = \frac{1}{3\sigma^2 q} A(\lambda, q)^{1/3} > 0.$$

Because $A(\lambda, q)$ is increasing in q, higher q also expands the set of (λ, q) such that $A(\lambda, q) > 1$.

Intuition. When the board can generate credible disclosure at lower cost, it chooses higher precision. This makes investors' beliefs more sensitive to the firm's true action, which increases the payoff to taking real action and moves the equilibrium into the "active" region more often.

Empirical mapping. We map the model's objects to the data as follows. **Action**, a, is the residual-based employee gender pay gap constructed inside each firm-year from LEHD micro wage records, following Goldin et al. (2017) (Section 3.2); we also report mean/median difference measures. **Sustainable demand**, λ (and the associated wedge $\omega(\lambda)$), is firm-year socially responsible ownership, constructed either from institutions' revealed preference around female-director appointments or from mutual-fund names (Section 3.3). **Board quality**, q, is proxied by female board representation (BoardEx). **Disclosure precision**, τ, is not directly observed; we use earnings-call gender-equality language as a public proxy for information production (Section 5.2).[4] Propositions 1–3 are tested in Sections 4–5 (Tables 2, 5, 7, and 8). The observable-proxy extension motivates the additional contrast that sustainable ownership predicts

[4]We identify gender-related sentences as well as broader DEI-related sentences by using a large language model.

visible governance outcomes (female directors) more strongly than the opaque employee pay gap (Tables 3 and 4). We interpret the evidence as reduced-form associations consistent with the model's mechanisms rather than a one-for-one structural mapping from theory to empirics.

Proposition 1 implies a sharp benchmark: when employee pay equity is hard to verify, the reduced-form relation between SRI and the employee gender pay gap should be weak once we absorb broad correlated trends with rich fixed effects. Proposition 2 pinpoints when investor influence should reappear: because disclosure and action are complements, the SRI–pay-gap slope should be more negative in firms with higher board quality, proxied by female directors. Proposition 3 shifts attention from outcomes to information: higher board quality should produce more disclosure, so firms with female directors should communicate more about gender equality (for example, in earnings calls). We take these implications to the data in Sections 4–5 as reduced-form hypothesis tests, and re-use the same moments as the identifying targets of the structurally estimated dynamic extension in Section 6, which delivers the magnitudes and counterfactual policy effects that the qualitative propositions cannot.

3 Data and Measures

The model emphasizes that the central friction is informational: investors can easily observe governance choices such as board composition, but they do not directly observe employee-level pay equity. This distinction guides our measurement choices. We therefore combine administrative employee data that allow us to measure the gender pay gap within firm-year with public data on board composition, institutional ownership, and managerial communication, so that the objects in the empirics align closely with the model's action, sustainable demand, board quality, and disclosure precision.

3.1 Data and Sample Construction

We construct a longitudinal dataset of public companies from 2001 to 2021 using the 2021 snapshot of the U.S. Census Bureau's Longitudinal Employer-Household Dynamics (LEHD) data. LEHD data are collected from the unemployment insurance records of states participating in the program. The missing types of employment differ slightly from state to state due to variations in state unemployment laws, but these data generally exclude agricultural employees, federal employees, domestic workers, employees of nonprofit organizations, and employees of religious organizations. LEHD research extracts are released in discrete vintages ("snapshots") rather than being updated annually. Our analysis uses the 2021 LEHD snapshot, which contains wage records spanning 2001–2021 for participating states. Prior work relying on older vintages (e.g., the 2014 snapshot) was mechanically constrained to a shorter panel that largely predates the rapid post-2014 growth in sustainable investing (Gibson Brandon et al., 2022). Using the 2021 snapshot is therefore critical for studying sustainable investing in the modern era. The starting year of analysis is 2001 because eight states were first included in LEHD data in early 2000, and the socially responsible investment variable was made available in 2001.[5] Researchers who are not affiliated with the U.S. Census Bureau have access to the 26 states.[6] Some companies may be headquartered in non-sample states (for example, in Florida) but have establishments in LEHD states (for example, California), and they are included in the sample as long as they pass the filing criteria described below.

The LEHD data are merged with Compustat data at the firm-year level using the Compustat–SSEL Bridge; and are further merged with BoardEx and CRSP. After merging these data with Compustat, BoardEx, and CRSP, we filter the data to include only U.S.-incorporated firms (Compustat or CRSP acronym: FIC) whose common stocks ($10 \leq \text{SHRCD} \leq 11$) are listed on the NYSE, AMEX, and Nasdaq exchanges ($1 \leq \text{EXCHCD} \leq 3$). Additionally, sample firms need to

[5] BoardEx data starts from 2000. As Section 3.3 elaborates, we use female directors and institutional investment in the rolling window to identify gender-sensitive institutional investors. Therefore, the analysis starts from 2001.

[6] The states are Arizona, California, Colorado, Connecticut, Delaware, Indiana, Iowa, Maine, Maryland, Massachusetts, Nevada, New Jersey, New Mexico, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, South Carolina, South Dakota, Tennessee, Utah, Virginia, Washington, Wisconsin, and Wyoming.

have at least 10 employees after the top seven highest-paid employees have been removed. Because we do not directly observe the occupations of individuals, we exclude the top seven highest-paid employees to focus on the employee-level gender pay gap. The median number of members of the board of directors during the sample period is seven. We further restrict the sample to firms with at least one member on their board of directors per BoardEx data and with valid institutional ownership data within LSEG 13F Holding data. After filtering, we combine the data with data from the CRSP Mutual Fund database. The resulting number of observations is 54,000 firm-years, which is rounded to the nearest 500 observations for the observance of the US Census disclosure requirement.

3.2 Measures: Gender Pay Gap

We measure the gender pay gap by estimating abnormal salary differences after controlling for individual characteristics within a firm-year, as is done in Goldin et al. (2017). Using this residual-based approach, we can measure the unexplained part of the wage difference between male and female employees after controlling for age, experience, race, education levels, and country of origin. Specifically, for each firm-year, we construct a panel with all employees except for the top seven highest-paid employees. In this way, we can more accurately measure the gender pay gap at the employee level, rather than at the director level. We then regress the logarithm of annual wages on an indicator variable for gender along with other individual characteristics within each firm-year.[7]

$$\begin{aligned}\log\left(AnnualWage\right)_{i,t} =& \beta_{f,t} * 1\left(Female\right)_i \\ &+ Race_i + BirthCountry_i + Education_i + Experience_{i,t} + Age_{i,t} \quad (13)\end{aligned}$$

The definitions of other individual characteristics are given in Appendix Table A.1. Here, the coefficient $\beta_{f,t}$ is the within-firm-year *log wage* difference between female and male employees after

[7]LEHD classifies gender only based on gender-at-birth, rather than individuals' sexual identities by year. In this paper, we use the term "gender" to represent gender-at-birth for the sake of brevity.

controlling for worker characteristics. We take the negative value of $\beta_{f,t}$ and define it as the gender pay gap; for readability, we report the pay gap in percentage-point units (i.e., $Gap_{f,t} \equiv -100 \times \beta_{f,t}$). Because the dependent variable is log wages, $Gap_{f,t} = x$ can be interpreted as female wages being approximately x% lower than male wages (exactly, $w_F/w_M = \exp(-x/100)$).

Figure 1 depicts the kernel density plot of the gender pay gap. To avoid the risks of revealing the identities of individual companies as required by the Census Bureau, we use a kernel density plot instead of a histogram and truncate the data at the 5% and 95% levels. The figure indicates that the gender pay gap of all firm-years after truncation lies in positive regions, meaning that females are disadvantaged in most companies across the years examined. The average gender pay gap is 24.8%. Interpreting the log-wage specification, this magnitude corresponds to female wages about 22% lower than male wages in logs (i.e., $e^{-0.248} \approx 0.78$), which is close to that reported in the literature.[8]. The standard deviation of the gender pay gap is 15.5%. This implies that some firms have a near-zero gender pay gap while others have large gender pay gaps.

As an alternative, we do not rely on the parametric assumptions of equation (13). We take a simple approach, subtracting the mean (median) of the female workers' wages from the mean (median) of the male workers' wages. We scale this value on the basis of the mean (median) wages of all workers. The average gender pay gap is 29.3% based on the difference in the mean and 28.8% based on the difference in the median. The simple difference in the mean or in the median is greater than the gender pay gap estimated with equation (13), and this difference is statistically significant at the 1% level. A greater gender pay gap without controlling for characteristics implies that social discrimination outside firms results in undesirable characteristics for females, such as lower education levels and limited experience.

While the gender pay gap can be interpreted as inequality in the quality aspect of job supply, we also examine the quantity aspect by examining the proportions of female workers in a company.

[8]Previous papers find that the gender pay gap is 24.7% from 2009 to 2011 in the United States (Goldin, 2014), 21.2% from 1993 to 2019 in the United Kingdom (Lagaras et al., 2022), and 15.4% from 2003 to 2005 in Denmark (Bennedsen et al., 2022)

Specifically, we measure the proportion of female employees within a firm-year. Similar to the gender pay gap, we exclude the top seven highest-paid individuals within each firm-year. During the entire sample period, the proportion is 42.2%, implying that there are fewer females than males in a firm. This number is consistent with statistics from the Bureau of Labor Statistics, showing that the female labor participation rate (56.5%) is lower than that of its male counterpart (67.8%) in 2021.

Figure 2 shows a time series of the gender pay gap and the proportions of employees by gender. Panel A shows that the gender pay gap has decreased steadily over the last two decades. The results are consistent for different measures of the gender pay gap. The gap is 28% for 2001, and it decreases to 21% for 2021. When we use the difference in the mean (median), it decreases from 34% (33%) to 24% (24%, respectively).[9] These results regarding a secular decline in the gender pay gap are consistent with those of prior studies. For example, Blau and Kahn (2017) finds a decreasing trend in the gender pay gap from 1980 to 2010 in the Panel Study of Income Dynamics (PSID). Additionally, the proportion of female employees decreases slightly from 43% in 2001 to 41% in 2021. This finding is consistent with those of previous studies (Olivetti and Petrongolo, 2016) and policy reports showing that female participation rates decreased after the Global Financial Crisis and the COVID-19 crisis.[10] However, the proportion of female board directors dramatically increases, rising from 9% to 28%. This is because of investors' recent preference for more females on the board of directors and because some jurisdictions, such as California in 2018, require certain quotas in terms of female directors at companies (Gertsberg, Möllerstrom, and Pagel, 2021) and the big three investment companies required portfolio companies to have at least one female director since 2017 (Gormley et al., 2023).

[9]The difference between the residual-based measure and the two simple measures decreases over time from 7% to 3%, and it implies that the disadvantages in characteristics that women had decrease over time.

[10]For further discussions, see the Bureau of Labor Statistics Report 1103, Apr 2023.

3.3 Measures: Socially Responsible Investments

For the main explanatory variables, we utilize two separate methods to identify socially responsible investments. First, we adopt the revealed preference approach, measuring changes in institutional holdings around changes in the composition of the board of directors with regard to female members over the previous 5 years. Institutional investors usually use the proportion of female directors to gauge gender equality within a company. For example, State Street Global Advisor, Vanguard, and BlackRock, which are the three largest investment companies, use the number of female directors to measure gender equality. Prior studies also suggest that institutional investors have a preference for firms with more female directors (Knippen, Shen, and Zhu, 2019; Friedman, 2020; Gormley et al., 2023). By examining institutional investors' trades when firms appoint female directors, we identify institutions that reveal a preference for gender equality.

Revealed-preference SRI (13F). We construct the revealed-preference measure in three steps. First, for each institution-year (i, t), we estimate how the institution reallocates across firms in response to changes in board gender composition using a rolling five-year window of firm-year observations:

$$\Delta \frac{Investment}{AssetsUnderManagement}_{i,f,t-n} = \gamma_{i,t} * \Delta \frac{FemaleDirectors}{AllDirectors}_{f,t-n} + Controls_{f,t-n} \quad (1 \leq n \leq 5) \tag{14}$$

Controls include firm size, past returns, and profitability.

Second, we classify institution i as socially responsible in year t if $\gamma_{i,t} > 0$ and is statistically significant.

Third, we then aggregate holdings by socially responsible institutions and scale by shares outstanding to obtain firm-year socially responsible ownership.[11] This approach offers an advantage in that it can capture the general demand for social responsibility regardless of institution types because 13F includes various institutional investors, such as mutual funds, hedge funds, and

[11] It measures ownership rather than investment, i.e., changes in ownership. We still name it as socially responsible investment, since it is a commonly used phrase in literature and media.

pension funds. However, it may capture other demands if the nomination of a female director and institutional investment are jointly correlated with omitted demands for stocks. Additionally, it may capture the potential demands of institutional investors who have a preference for board-level gender equality but not necessarily for employee-level gender equality.

To complement the aforementioned drawbacks of the first measure, we select mutual fund names that include words related to social concerns, as outlined in Van der Beck (2025), classifying these funds as socially responsible institutional investors. We aggregate socially responsible mutual funds' holdings within a firm-year and divide them by the number of shares outstanding.[12] This approach more cleanly targets stated social preferences because the fund name signals a social mandate, though it is narrower than 13F-based ownership and may understate the total universe of socially motivated capital. We cannot conduct a similar analysis with other types of investors than mutual funds because data on fund-level names are not available except for mutual funds. However, it significantly underestimates the entire demand for social responsibility because it does not include institutional investors other than mutual funds and because mutual funds are known to incorporate social factors in their prospectus even though they are not focused on ESG funds (Nofsinger, Sulaeman, and Varma, 2019). In summary, compared to the first approach, the second approach has a lower probability of type-1 errors at the cost of a higher probability of type-2 errors. Thus, we use both approaches to complement each other.

Table 1 describes the summary statistics of the main variables and control variables. Since ranking variables (such as the median and maximum) are subject to higher disclosure requirements by the U.S. Census Bureau, we report the mean, standard deviation, and skewness. All continuous variables are winsorized at the 1% and 99% levels. The definitions of control variables are provided in Appendix Table A.1. As shown in Figure 1, the gender pay gap is positive and subject to large

[12] Van der Beck (2025) measures the mutual funds' demand for environmental, social, and/or governance factors. We start with his list of words. However, because gender equality is only clearly related to the social factor, we do not include words that are related to only environmental or governance concerns. After filtering them, the word list we use is: social, impact, fair, gender, screen, ethical, conscious, SRI, ESG, and CSR. The last three words are case-sensitive, and other words are not.

standard deviations. The positive skewness of the pay gap also indicates that some firm-years have a very large gender gap. When we control for characteristics, under this measure, the standard deviation is lower, and the skewness is closer to zero than it is under measures based on the mean or median. This implies that a large portion of the variation in the gender pay gap arises from variations in preexisting discrimination against female employees, such as education.

Socially responsible investment accounts for 0.65% of outstanding shares when we use the revealed preference approach and 0.03% when we use mutual fund names. This number is significantly smaller than that provided by media reports on ESG investing.[13] This is because we focus only on social factors while other measures rely on the self-reporting of institutional investors, which is subject to self-reporting biases (Boffo and Patalano, 2020; Chen, Cohen, and Gurun, 2021; Gibson Brandon et al., 2022). We rely on investors' actions, such as adjustments made to ownership and fund names, so our measures account for companies with less investment.

In the last column of Table 1, we show the averages of the Compustat companies. We restrict the Compustat firms to those incorporated in the United States, those with common stocks that are traded on the NYSE, AMEX, or Nasdaq, those that have at least ten employees, and those with nonmissing observations in the LSEG 13F Holding data. Because there are no data on employees' gender and wage in Compustat, we do not report the gender equality variables. The characteristics of the sample firms are comparable to the average characteristics across Compustat firms. If all employees are hired in non-LEHD states, they are omitted from our samples, so the number of our sample firms is approximately 6.3% less than the number of Compustat firm-years during the sample periods.

[13]For example, Gibson Brandon et al. (2022) reports that 38.4% of institutional holdings are by institutional investors that signed the UN Principles for Responsible Investment (PRI) in North America in 2017.

4 Relation Between Socially Responsible Investment and the Gender Pay Gap

We begin with the simplest implication of the model. Proposition 1 predicts a "null under opacity": if employee-level pay equity is not credibly inferable from public information, sustainable-investing demand should not systematically induce real action, and the reduced-form relation between SRI and the employee gender pay gap should weaken once we control for broad time trends and other correlated shocks with rich fixed effects. We therefore estimate standard firm-year panel regressions of the pay gap on lagged SRI ownership under progressively more demanding fixed-effect structures.

We employ a standard empirical methodology, regressing the gender pay gap on lagged socially responsible investment with a firm-year panel. Although we use the lagged independent variables to alleviate endogeneity, the results are qualitatively similar when we examine the contemporaneous relation. We include control variables related to labor costs, such as firm size, profitability, and investment (e.g. Brown and Medoff, 1989; Card, Devicienti, and Maida, 2014). Depending on the columns, we include various fixed effects such as industry-fixed effects (3-digit Standard Industrial Classification (SIC)), state-fixed effects, and year-fixed effects.[14] Alternatively, we include industry-times-year fixed effects or state-times-year fixed effects, which account for time-varying industry shocks or regional shocks to the size of the gender pay gap. Because both the dependent variable and the explanatory variables are correlated within a firm, we cluster standard errors at the firm level.

Table 2 shows the relation between the gender pay gap and socially responsible investment. The relation is negative in every specification, but the statistical and economic significance differ sharply with the fixed effects. Column 1 shows that the coefficient of socially responsible investment is -0.481 and statistically significant at the 1% level. Interpreting units, a one-percentage-point increase in SRI ownership (about 0.73 standard deviations) is associated with a 0.48 *percentage-point* lower

[14]Firms can have multiple establishments in different states for each year. In this case, we set the establishment with the most employees as their location of the state-fixed effects.

pay gap. Relative to the mean pay gap of 24.8 percentage points (Table 1), this is about a 2% reduction in the average gap. Adding firm characteristics in Column 2 does not materially change the estimate. However, the relation attenuates once we absorb broad correlated shocks with fixed effects. Column 3 includes industry-, state-, and year-fixed effects, and Column 4 includes industry×year and state×year fixed effects. In Column 4, the coefficient decreases to -0.058 and is statistically indistinguishable from zero (p-value equals 30.8%). The sharp attenuation suggests that the negative relation in parsimonious specifications is largely driven by common trends and other broad shocks rather than within-industry/region variation.

Regarding the control variables, we find a robust positive relation between the gender pay gap and both firm age and firm size. Previous papers note that male employees benefit in larger firms, possibly because of the career interruption female employees experience due to motherhood (Oi and Idson, 1999; Bertrand, Goldin, and Katz, 2010). The effects of leverage flip the signs depend on the inclusion of fixed effects.

Column 5 uses an alternative measure of the gender pay gap based on the difference in mean, and Column 6 relies on the difference in the median. The results are qualitatively the same as Column 4, meaning that the effects of socially responsible investment are not significantly different from zero. In Column 7, we measure socially responsible investment with the names of mutual funds and reach the same conclusion.

Our preferred specification in Column 4 delivers the paper's central benchmark for economic magnitude once we net out broad time-varying industry and regional shocks. The 90% confidence interval for the SRI coefficient ranges from -0.152 to 0.036, implying that even the most negative plausible slopes are modest in size. We interpret this pattern as consistent with Proposition 1's "null under opacity": when the underlying outcome is hard for outsiders to verify, sustainable demand can exist without translating into systematic changes in the real internal action. At the same time, the confidence interval leaves room for heterogeneity across governance environments,

which motivates the interaction and heterogeneity tests in Section 5.

In Appendix Table A.2, we redo the analysis in Table 2 but replace socially responsible investment with all institutional investment or non-socially responsible investment. All institutional investment is defined as the sum of institutional holdings in 13F over outstanding shares, and non-socially responsible investment is all institutional investments minus socially responsible investments. There is a positive and significant relation between the gender pay gap and all institutional investment (or non-socially responsible investment), implying that in Table 2, socially responsible investment is at least more negatively sensitive to the gender pay gap than general institutional investment is.

Next, we replace the gender pay gap with the proportion of female employees in a firm. Table 3 presents the results indicating that socially responsible investment is weakly correlated with a lower proportion of female workers in a company. The relation is statistically significant at the 10% level when we include various fixed effects, as shown in Columns 2 and 3. A negative relation indicates that socially responsible investment is at least not positively correlated with the proportion of female workers in a company. This effect is strikingly different from the effects of socially responsible investment on the proportion of female directors on the board. Columns 4 to 6 indicate that socially responsible investment is positively correlated with the proportion of female directors, and this relation is statistically significant at the 5% level when we include fixed effects. This finding is consistent with the prior studies showing that socially responsible investment is correlated with director-level gender equality. Our results indicate that the argument cannot be directly extended to employees.

The results in Tables 2 and 3 show that, although socially responsible investments are associated with a greater proportion of female directors, they are not significantly related to the gender pay gap. This discrepancy arises from differences in the level of information availability regarding directors versus employees. Information on the proportions of directors is readily available to all investors in

disclosures, but the proportions and wage information of employees are not available to investors.

Furthermore, we test the implications of the availability of information related to gender equality for the market valuation of a company. When investors prefer firms with a lower gender pay gap, we can expect firms to have higher market valuations after controlling for firm characteristics. However, if the employee-level gender pay gap is not communicated to investors, the gender pay gap may have a nonsignificant relation with market valuations.

Specifically, in Table 4, we regress the year-end market value of assets over the book value of assets on the current year's employee-level gender pay gap and the proportion of female directors. We include control variables for firm size, firm age, and profitability to control for the determinants of market valuations. We also include industry-times-year fixed effects and state-times-year fixed effects.

Column 1 in Table 4 indicates that the employee-level gender pay gap is not significantly related to market valuations. Although not significant, the sign of the coefficient is negative. This finding is starkly different from the results regarding the proportion of female board of directors in Column 2. A percentage point increase in the proportion of female directors is related to a 0.59 percentage point increase in the market valuation, and these relations are economically and statistically significant. In Column 3, we include both the gender pay gap and the proportion of female directors. Surprisingly, the coefficient of the gender pay gap is negative and statistically significant at the 10% level. The results show that although director-level gender equality is positively related to the demand of investors, the employee-level gender pay gap is not related to higher market valuations.

In summary, once we absorb time-varying industry and regional shocks with granular fixed effects, socially responsible investment is not significantly related to the employee gender pay gap or the proportion of female employees, even though it is positively related to female board representation. This contrast is consistent with the idea that investors can move outcomes that are easy to observe, while having weaker effects on opaque employee-level outcomes. In the following

section, we show that the relation between socially responsible investment and the gender pay gap becomes stronger in firms with at least one female director, and we examine why.

5 Sensitivities Depending on the Female Board of Directors

The model also delivers a sharper cross-sectional prediction. Proposition 2 implies that sustainable ownership has stronger real effects when board quality is higher, because higher-quality boards reduce the cost of producing credible information and thereby make action more "priceable." In the data, we proxy this board-quality channel with female board representation. We therefore test whether the relation between SRI and the employee gender pay gap is more negative in firms with female directors by estimating interaction specifications and related heterogeneity tests.

5.1 Interaction Between Socially Responsible Investment and Female Directors

The drive for gender equality on the board of directors has been prominent. Many institutional investors voluntarily implement explicit or implicit investment mandates expressing that they will not invest in a company without female members on their boards of directors (e.g., State Street, BlackRock, and California State Teachers' Retirement System). Owing to this social drive, the proportion of female directors on firms' boards increased from 9% in 2001 to 28% in 2021. In this section, we investigate whether the presence of female directors relates to the sensitivity between socially responsible investment and the employee-level gender pay gap. Firms with more female directors pay more attention to employee-level gender equality. Also, females in higher ranks have a preference for gender equality by themselves. Previous studies, such as Tate and Yang (2015), find that female leadership in a plant leads to a lower gender pay gap.

The presence of female directors can strengthen the aforementioned relation in two ways. First, female directors can convey information about gender equality to outside investors, decreasing information asymmetry. Second, female directors are more likely to implement equal pay for employees when there are institutional demands for equal pay. Previous studies, such as Tate

and Yang (2015), find that female leadership decreases the gender pay gap, implying decreased agency problems for female leadership on the topic of gender equality.

To test the effects of female directors on the relation between socially responsible investment and the gender pay gap, we include an interaction variable between socially responsible investment and an indicator variable for female directors. This indicator equals one when a firm-year includes at least one female director at the end of the year. The unconditional average of this indicator variable of the Compustat company is 61.8%.

Table 5 presents interaction specifications. The coefficient on lagged SRI captures the slope in firms without female directors ($1(\#FemaleDirectors \geq 1) = 0$), and the interaction coefficient captures the incremental slope when the board includes at least one female director. In specifications with richer fixed effects (Columns 2–3), the interaction term is negative and statistically significant. In Column 3 (with industry×year and state×year fixed effects), the SRI slope is 0.117 when the board has no female director, while the incremental slope is -0.266 when the board has at least one female director; the implied slope for firms with female directors is therefore negative (0.117-0.266 = -0.149). This pattern is consistent with Proposition 2's complementarity: sustainable ownership is more strongly associated with smaller pay gaps in governance environments where information production and credible communication are plausibly cheaper. The interaction results are qualitatively similar when we use alternative pay-gap measures (Columns 4–5) and when we use the independent fund-name SRI proxy (Column 6). Column 7 shows no comparable interaction for the fraction of female employees, suggesting the heterogeneity operates through pay rather than headcount.

The standalone female-director indicator is not robust once we absorb time-varying industry and state shocks, which is not surprising given the strong secular trends in board composition. The key object for Proposition 2 is the *interaction*—the differential SRI–pay-gap slope in firms with female directors—and that estimate remains negative in our preferred specifications. We interpret this

interaction as suggestive reduced-form evidence of complementarity between sustainable demand and information production, not as a claim that either female directors or sustainable ownership are individually "necessary" for reducing pay gaps.

In Appendix Table A.3, we replace the gender pay gap with the proportion of female employees. Unlike the results on the gender pay gap in Table 5, the interaction between socially responsible investment and female directors is not statistically or economically significant. This result implies that socially responsible investment is not related to the quantity-related aspects of gender inequality, regardless of whether there are female directors.

Alternative Explanations Subsection 4.1. shows the robust coefficient of the interaction between socially responsible investment and the female director indicator. However, the significant coefficient of the interaction term may arise from an omitted variable that is correlated with the existence of female directors.

First, firms with at least one female director are more likely to have a female CEO, and the presence of a female CEO may explain the significance of the previous results. In Column 1 of Table 6, we replace the female director indicator with a female CEO indicator. Alone, the female CEO indicator variable is significantly correlated with a smaller gender pay gap, which is consistent with previous findings showing that female managers alleviate the gender inequality (Tate and Yang, 2015). However, the interaction effect between socially responsible investment and the female CEO indicator is not significantly different from zero, making this effect clearly different from the effects of female directors. Together, these findings imply that female CEOs alleviate the gender pay gap, but this effect does not depend on the level of socially responsible investment. This is a stark difference from the case of female directors, as Column 3 in Table 5 indicates that female directors are effective when coupled with socially responsible investment.

Second, the existence of a female director is not linked to a positive relation between non-socially responsible investment and the gender pay gap. In Column 2, we measure non-socially responsible

investment by subtracting socially responsible investment from total institutional ownership as identified in 13F. Although the interaction between non-socially responsible investment and the existence of a female director is positive marginally significant at the 10% level, the magnitude (-0.016) of this effect is much smaller than that of the interaction between socially responsible investment and the existence of a female director (-0.266 of Column 3 in Table 5). It is also smaller than the magnitude of the coefficient of the non-socially responsible investment variable alone (0.022). This implies that there is no negative relation between non-socially responsible investment and the gender pay gap in firms with at least one female director.

The significant coefficient of the interaction effect between female directors and socially responsible investment may stem from the non-linear relation between socially responsible investment and the gender pay gap. In other words, the gender pay gap may be negatively related to socially responsible investment only under high levels of such investment. If the existence of a female director is a proxy of higher socially responsible investment, the coefficient of the interaction term may come from the nonlinear effects of socially responsible investment. In Column 3 of Table 6, we address this concern by including the squared term of socially responsible investment as an additional control variable. The interaction term remains highly significant. More importantly, the magnitude of the coefficient (0.265) does not change much from that in the benchmark results (0.266) in Table 5. The coefficient of squared socially responsible investment is zero, implying that the relation between socially responsible investment and the gender pay gap is not quadratic. Taken together, Column 2 indicates that the effect of female directors is not due to the nonlinear effect of socially responsible investment.

Finally, the existence of female directors may be a proxy for the effects that arose during the latter part of the sample. Van der Beck (2025) argues that attention to ESG-friendly funds has increased since 2012. A total of 48.4% of firms had at least one female director before 2012, and this number has increased to 74.0% that time. Therefore, the significance of the interaction term may indicate that socially responsible investment had a greater effect after 2012, when ESG

investing increased in popularity. However, we show that the significance of the interaction term remains highly significant when we include year-fixed effects in Table 5. Additionally, we include the interaction between the indicator variable for years after 2012 and socially responsible investment in Column 4 of Table 6. The interaction between socially responsible investment and female directors remains significant, and the magnitude does not change substantially. This result indicates that the effect of the board of directors does not arise from the changes that occurred during the sample period.

Sensitivities Depending on the Number of Female Directors We show that the relation between socially responsible investment and the gender pay gap becomes significant when there is at least one female director. However, a natural question arises: How many female directors should be in a firm to strengthen the relation between socially responsible investment and a smaller pay gap?

In this subsection, we divide the indicator variable for female directors into multiple indicators to denote the number of female directors. Specifically, we include indicator variables for one female director, two female directors, and at least three female directors. Then, we interact each indicator variable with socially responsible investment. Table 7 presents the results. The coefficient of the interaction between socially responsible investment and "1(Female Director = n)" indicates the extent to which the effect of socially responsible investment differs under n female directors versus zero female directors. The interaction between two female directors and socially responsible investment has the largest coefficient, and it is statistically significant at the 1% level regardless of which fixed effects we use. In contrast, the interaction effect between one female director and socially responsible investment is negative but smaller in magnitude than the interaction for two female directors when we include industry-, state-, and year-fixed effects. The interaction between at least three female directors and socially responsible investment is not statistically significant at the 5% level, but the coefficient is negative, and it is not statistically significantly different from the interaction between two female directors and socially responsible investment.

The results of this exercise indicate that two female directors have the most significant reinforcing effect on the sensitivity between the gender pay gap and socially responsible investment.

5.2 Communication on Gender Equality and Female Directors

Finally, Proposition 3 makes a prediction about information rather than outcomes: higher board quality should be associated with greater information production, and thus with more disclosure or communication about gender equality. To test this implication directly, we examine whether firms with female directors talk more about gender equality in earnings calls. This provides evidence on the disclosure channel that the model highlights as a prerequisite for sustainable ownership to affect hard-to-observe employee outcomes.

This exercise is not meant to establish that firms implement pay-equity changes; earnings-call language can be strategic and may reflect "cheap talk." In our framework, however, the relevant object is public-facing information production: more gender-equality discussion is consistent with higher disclosure precision τ and with a lower cost of communicating gender-related policies to outsiders. We therefore treat the transcript-based measure as a noisy proxy for information production rather than as a direct measure of underlying action.

We test whether companies with female directors pay more attention to gender-related information than companies without female directors. To do so, we test whether managers mention gender issues more often in earnings calls when there are more female directors.

Specifically, we combine earnings calls from Capital IQ, financial information from Compustat, and board compositions from BoardEx.[15] We start with 58,564 firm-years from 2001 to 2021 as in Table 1.[16] After filtering out firm-years without earnings calls or valid control variables, 32,863

[15]For this analysis, we use different samples from previous analyses. This is because the U.S. Census Bureau recommends that researchers conduct analyses with public datasets if the analysis does not require the use of restricted data. This section of analysis does not directly include employees' wage information, so we conduct the analysis with public datasets. As Table 1 indicates, the firm characteristics of Compustat companies are comparable to those of the samples used in previous analyses.

[16]Although Capital IQ provides data from 2001, the sample coverage before 2008 is limited because earnings calls were rarer in the early 2000s, and Capital IQ's coverage was not as comprehensive as in the post-2008 period. Pre-2008 transcripts account for only 2.0% of the entire sample.

firm-years remain. We use a large language model to examine whether more sentences related to gender equality are mentioned in the calls of firms with more female directors. We classify each sentence in each earnings call and determine whether the sentence mentions a topic related to gender issues. We first identify sentences related to the narrower gender topic by focusing only on gender issues. In a second specification, we broaden our definition to include topics related to Diversity, Equity, and Inclusion (DEI). In Appendix Table A.1, we elaborate our definitions of gender- and DEI-related sentences. We use management presentations and Q&A sections between managers and analysts. We exclude sentences if they are spoken by operators. We scale the gender- or DEI-related sentences by the total number of sentences in an earnings call except for operator messages. We average across calls if there are multiple earnings calls within a year. A firm has missing data when there are no earnings calls in a given year.

We regress the proportion of gender- or DEI-related sentences on the previous year-end proportion of female directors. The main independent variable is the proportion of female directors, defined as the number of female directors divided by the total number of directors in a firm-year. As control variables, we use the same set of control variables used in the previous tables. Since fixed effects account for a large share of the variation in the previous analyses, we also include the same combinations of fixed effects in this analysis.[17]

Table 8 shows the results of the analysis. Because the mean proportions of gender-related and of gender- or DEI-related sentences are low (0.003% and 0.013%, respectively), we standardize both independent and dependent variables for readability. Columns 1 to 4 use the proportion of gender-related sentences as the dependent variable. The columns have different sets of control variables and fixed effects. Column 1 does not have any control variables or fixed effects. The results indicate that there is a statistically significant relation between the proportion of female directors and the proportion of gender-related sentences in earnings calls. The coefficient of 0.107

[17]Unlike in the analyses with Census restricted data, we use state information from Compustat. These reflect the most recent headquarters locations and therefore capture relocations if firms move their headquarters during the sample period.

indicates that the proportion of gender-related sentences is 0.107 standard deviations higher when the proportion of female directors is one standard deviation higher. This magnitude decreases as we include control variables and more granular fixed effects. Column 4 shows that the coefficient for female directors is 0.024, when we include the full set of control variables with industry-by-year fixed effects and state-by-year fixed effects. Columns 5 to 8 use the proportion of sentences related to gender or DEI as the dependent variable. The statistical and economic magnitudes of the effect of female directors are stronger than when we count sentences only related to gender. The coefficient for female directors is 0.182 in Column 5 and 0.038 in Column 8. This means that a one-standard-deviation increase in the proportion of female directors is associated with a 0.038 to 0.182 standard-deviation increase in the proportion of sentences related to gender or DEI.

In summary, the earnings-call evidence points in the same direction: firms with more female directors devote a higher share of their calls to gender- and DEI-related language, and this difference remains, though it shrinks, once we add controls and granular fixed effects. The effect is stronger when we use the broader topics.

6 Structural Estimation and Counterfactuals

Sections 4–5 test the qualitative content of Propositions 1–3 and, in doing so, produce the empirical moments that identify the dynamic version of the model below. The propositions deliver signs and cross-sectional comparative statics that are robust to functional form; this section delivers the magnitudes that they cannot: how much of the cross-sectional pay-gap distribution would close under a hypothetical disclosure mandate, how much of the empirical interaction between sustainable ownership and female directors can be attributed to the information-friction mechanism alone, and how that closure changes when a mandate is adopted during an episode of rising sustainable ownership. These questions require a fully specified dynamic model that can be estimated from the moments we report and simulated under counterfactual policies. This section develops that dynamic extension, estimates it by simulated method of moments, and reports a set of policy counterfactuals.

6.1 Dynamic extension of the model

We retain every economic assumption from Section 2 and embed them in a recursive dynamic environment. Time is discrete, $t = 1, 2, \ldots$; firms are indexed by i. Each firm has a persistent type $q_i \in \{q_L, q_H\}$ representing board quality (drawn once and held fixed) and a state variable $\lambda_{it} \in [0, \bar{\lambda}_{\max}]$ representing sustainable-investor intensity at the start of the period. The within-period sequence of actions, signals, and pricing is identical to the static model. Three idiosyncratic shocks are realized each period and are mutually independent across firms and over time: signal noise $\varepsilon_{it} \sim \mathcal{N}(0, 1/\tau_{it})$, outcome noise $u_{it} \sim \mathcal{N}(0, \sigma_u^2)$, and flow noise $\eta_{it} \sim \mathcal{N}(0, \sigma_\eta^2)$ affecting next-period ownership.

The within-period building blocks carry over from Section 2.4: the same convex action cost $C(a) = \theta a^2/2$, the same disclosure cost $H(\tau; q) = \kappa\tau^2/(2q)$, the same regulatory disclosure floor $\tau \geq \underline{\tau}$, the same pricing wedge $\omega(\lambda)\, m(y, \tau)$ with $m = K(\tau)y$, and the same outcome equation linking the gender pay gap to the firm's action,

$$G_{it} \;=\; \bar{G}_i \;-\; \psi\, a_{it} \;+\; u_{it}, \tag{15}$$

where $\bar{G}_i \sim \mathcal{N}(\bar{G}, \sigma_{\bar{G}}^2)$ is a firm fixed effect drawn at $t = 1$ and held fixed thereafter. The single new ingredient is that sustainable ownership λ is now slow-moving and adjusts gradually in response to perceived social performance:

$$\lambda_{i,t+1} \;=\; (1 - \rho)\, \bar{\lambda} \;+\; \rho\, \lambda_{it} \;+\; \gamma\, m(y_{it}, \tau_{it}) \;+\; \eta_{it}, \tag{16}$$

truncated to a feasible interval, where $m(y, \tau) = K(\tau)\, y$ is the investor's posterior mean about the firm's social performance under normal–normal updating and $y_{it} = a_{it} + \varepsilon_{it}$ is the public signal of the action; in conditional-mean terms, $\mathbb{E}[\gamma\, m(y_{it}, \tau_{it}) \mid a_{it}, \tau_{it}] = \gamma K(\tau_{it})\, a_{it}$. The persistence parameter ρ captures benchmark inertia (slow rebalancing of index funds, sticky mandates, screening lags); $\bar{\lambda}$ is the long-run unconditional mean of sustainable ownership; the elasticity γ measures how

sensitively sustainable flows respond to the investor's posterior mean about the firm's social performance; and η_{it} is idiosyncratic flow noise unrelated to the firm's perceived performance (e.g., index reconstitution, mandate redefinition, redemption pressure). The model is closed by the rational-expectations restriction that the law of motion in (16) coincides with the actual transition of λ.

6.2 Recursive firm problem and forward-looking incentives

The firm chooses $\{(a_{it}, \tau_{it})\}_{t\geq 1}$ to maximize the discounted sum of expected prices, $\mathbb{E}\big[\sum_t \beta^{t-1} P_{it}\big]$, with $\beta \in (0,1)$. Because q_i is fixed and λ_{it} is the only endogenous state, the firm's problem is recursive in λ given q. The Bellman equation is

$$V(\lambda; q) \;=\; \max_{a\geq 0,\ \tau\geq \underline{\tau}} \Big\{ -\tfrac{\theta}{2}a^2 - \tfrac{\kappa}{2q}\tau^2 + \omega(\lambda)\, K(\tau)\, a + \beta\, \mathbb{E}\big[V(\lambda'; q) \,\big|\, \lambda, a, \tau\big] \Big\}, \tag{17}$$

where λ' follows (16). Existence and uniqueness of V follow from standard arguments under bounded period payoffs, $\beta < 1$, and continuous laws of motion.

The forward-looking firm internalizes that today's action and disclosure raise the conditional expectation of tomorrow's ownership through the feedback term $\gamma K(\tau) a$ in (16). The first-order conditions for a and τ, evaluated at the conditional mean of λ', take the same form as in the static model with $\omega(\lambda)$ replaced by an *effective wedge*

$$\widetilde{\omega}(\lambda; q) \;\equiv\; \omega(\lambda) \;+\; \beta\, \gamma\, V_\lambda(\widetilde{\lambda}';\, q), \tag{18}$$

where V_λ is the partial derivative of the value function with respect to its first argument and $\widetilde{\lambda}'$ is the expected next-period state. The effective wedge has a transparent interpretation: the within-period valuation gain $\omega(\lambda)$ is augmented by the marginal value of building tomorrow's investor base, $\beta\gamma V_\lambda$. A firm that anticipates higher future ownership has a stronger incentive to disclose and act today, even when the within-period pricing motive alone would not justify it.

Conditional on $\widetilde{\omega}$, the period-t problem inherits the static closed forms of Section 2 with $\omega(\lambda)$

replaced by $\widetilde{\omega}(\lambda; q)$. Defining $\widetilde{A}(\lambda; q) \equiv \widetilde{\omega}(\lambda; q)^2 \sigma^4 q/(\theta\kappa)$ and letting $\widetilde{\tau}^\circ \equiv \sigma^{-2}\big(\widetilde{A}^{1/3} - 1\big)$ denote the unconstrained interior, equilibrium disclosure precision is

$$\tau^*(\lambda; q) \;=\; \max\big\{\underline{\tau},\; \widetilde{\tau}^\circ(\lambda; q)\big\}, \qquad a^*(\lambda; q) \;=\; \frac{\widetilde{\omega}(\lambda; q)}{\theta}\, K(\tau^*(\lambda; q)). \tag{19}$$

The recursive equilibrium is the fixed point in $(V, \widetilde{\omega})$ jointly determined by (17) and (18)–(19). The same two-region partition as in the static model carries through: when $\widetilde{A}(\lambda; q) \leq (1 + \sigma^2\underline{\tau})^3$, the regulatory floor binds and the firm discloses at $\underline{\tau}$; otherwise the firm voluntarily discloses above the floor. The dynamic extension does not change the qualitative content of Propositions 1–3; it adds an anticipation channel that strengthens the comparative statics of the static model.

6.3 Mapping to data, calibration, and identification

The model objects map to the empirical sample of Section 3 one-to-one. The action a_{it} is the unobserved firm-level effort to reduce the gender pay gap. The outcome G_{it} in (15) is the residual-based gender pay gap of Section 3.2. Sustainable ownership λ_{it} is the firm-year socially responsible ownership share of Section 3.3. Board quality is binary: $q_i = q_L$ for firm-years with no female director and $q_i = q_H$ for firm-years with at least one female director. Disclosure precision τ_{it} is unobserved; we proxy it by the share of gender-equality language in earnings calls (Section 5.2) under the assumption that the public-facing language content scales linearly with τ.

A subset of the parameters is calibrated outside the structural loop, either from the paper's own descriptive statistics or as standard normalizations:

- Discount factor $\beta = 0.95$.
- Prior variance $\sigma^2 = 1$ and precision-cost scale $\kappa = 1$ are normalizations: both enter the activity index $\widetilde{A}$ only through ratios with θ and ω_0, so the normalization is innocuous given that the latter are themselves normalized.
- Low-q normalization $q_L = 1$; $\Delta_q \equiv q_H/q_L$ is the structural parameter governing board-quality

complementarity.

- Ownership process: $\bar{\lambda} = 0.0065$ matches Table 1; we set the persistence $\rho = 0.85$, the perceived-performance loading $\gamma = 0.001$, and the flow-noise scale $\sigma_\eta = 0.005$ to standard values consistent with a moderately persistent ownership process with small idiosyncratic flow noise.

- Outcome process: $\bar{G} = 0.248$ and $\sigma_{\bar{G}} = 0.155$ (Table 1); the within-firm SD of G after firm fixed effects is $\sigma_u = 0.055$.[18]

- Visible-proxy noise: $\sigma_b = 0.126$ (calibrated to the cross-sectional standard deviation of the female-director share in Table 1, 0.1257 on the 0–1 scale).

- Population shares: a fraction 0.618 of firm-years has q_H (Section 5.1).

- Two further normalizations break the structural scale invariance: $\theta = 1$ (action cost as the unit) and $\omega_0 = 1$ (wedge intensity as the unit per unit of sustainable ownership). The model has the property that $(\theta, \omega_0, \psi, \Delta_q)$ admit a one-dimensional rescaling that leaves all moments unchanged, so a second normalization beyond $\theta = 1$ is required for point identification.

The remaining four parameters are estimated by simulated method of moments,

$$\Theta \equiv (\psi,\ \Delta_q,\ \underline{\tau},\ B). \tag{20}$$

ψ governs the strength with which the firm's hidden action translates into the measured pay gap; Δ_q governs the differential responsiveness of high-quality boards in the cross-section; $\underline{\tau}$ governs the regulatory disclosure floor; and $B \equiv \omega_b/\theta_b$ is the elasticity of the visible-governance proxy to sustainable ownership in $b_{it} = B\,\lambda_{it} + \sigma_b\,\nu_{it}$.

[18] The within-firm SD of G after firm fixed effects is not currently releasable under U.S. Census output review. As an interim disclosure-proof proxy we calibrate $\sigma_u = 0.055$ to the analogous within-firm SD estimated from the U.K. Gender Pay Gap Reporting panel (2,735 firm-year observations on 477 firms). We will replace this value with the Census estimate once the corresponding statistic is approved for release; $\bar{G}$ and $\sigma_{\bar{G}}$ in Table 1 are the U.S. Census values.

The five targeted moments are the empirical objects already reported in the paper:

1. β_1: slope of $G_{i,t+1}$ on λ_{it} with industry×year and state×year fixed effects (Table 2, Column 4).
2. β_2: interaction slope $G_{i,t+1}$ on $\lambda_{it} \times \mathbf{1}\{q_i = q_H\}$ with the same fixed effects (Table 5, Column 3).
3. $\overline{\text{Lang}}$: cross-sectional mean of earnings-call gender language.
4. s_{Lang}: cross-sectional standard deviation of earnings-call gender language.
5. β_3: slope of the female-director share $b_{i,t+1}$ on lagged sustainable ownership λ_{it} with the same fixed-effect structure (Table 3, Column 6).

With five moments and four estimated parameters, the system is over-identified by one degree of freedom; we examine the residual moment-by-moment fit reported in Panel B of Table 9 as a descriptive specification check rather than report a single scalar over-identifying statistic. Local identification of $(\psi, \Delta_q, \underline{\tau}, B)$ is intuitive: β_1 pins down ψ given the average within-firm slope of a on λ that the model produces; β_2 pins down Δ_q through the differential slope between q_H and q_L firms; $\overline{\text{Lang}}$ and s_{Lang} jointly pin down $\underline{\tau}$ together with the active-region disclosure dispersion; and β_3 pins down B directly through the elasticity of the visible-governance proxy. The visible-proxy channel is structurally orthogonal to the opaque-action channel (a, τ, G, Lang), so $\hat{B}$ is recovered without affecting the identification of the other parameters.

For each candidate Θ, we solve the Bellman equation (17) by value-function iteration on a discretized grid for λ, simulate a panel of 5,000 firms over 21 post-burn-in periods using common random numbers across Θ-evaluations, run the same regressions on the simulated panel that produce the empirical moments above, and form the criterion

$$\hat{\Theta} = \underset{\Theta \in \mathcal{T}}{\operatorname{argmin}} \; \big(m(\Theta) - \hat{m}\big)' W \big(m(\Theta) - \hat{m}\big), \qquad W = \operatorname{diag}\Big(1/\hat{m}_j^2\Big), \tag{21}$$

where $\hat{m}$ is the vector of empirical moments and W is a percent-deviation weighting matrix. Standard errors are computed by the SMM sandwich formula using a numerical Jacobian and an estimate of the empirical-moment covariance constructed from the paper's firm-clustered t-statistics for β_1, β_2, and β_3, and a firm-clustered block bootstrap on the transcript panel for the Lang moments.

6.4 Estimates

Table 9 reports the structural estimates and their standard errors (Panel A) and the implied moment fit (Panel B). The action-to-outcome elasticity $\hat{\psi} = 191.5$ scales the firm's hidden action into the measured pay gap. Its empirical bite depends on the equilibrium magnitude of a, which is endogenously small at baseline (average action $\bar{a} \approx 1.5 \times 10^{-6}$, so $\hat{\psi}\bar{a} \approx 0.03$ percentage points) and rises sharply under counterfactuals that activate more firms. Under the wedge shock of Section 6.5, for example, $\bar{a} \approx 4.2 \times 10^{-4}$ and $\hat{\psi}\bar{a} \approx 8.0$ percentage points, matching the closing of the pay gap reported in Table 10. The board-quality ratio $\hat{\Delta}_q = 668.8$ is large but identifies a structural multiplier rather than a literal effectiveness ratio: it indicates that the data require a strong complementarity between board diversity and disclosure technology to generate the observed interaction in Table 5. The regulatory baseline $\hat{\underline{\tau}} \approx 1.1 \times 10^{-4}$ is small in absolute terms but pins down the mechanical baseline of gender-related earnings-call language that listed firms cannot fall below. The visible-proxy elasticity $\hat{B} = 0.054$ governs how strongly sustainable ownership maps into the female-director share; its magnitude is small in absolute terms, consistent with the modest cross-sectional R^2 in Table 3.

Standard errors differ markedly across parameters in a way that maps directly to the precision of the data-side moments. $\hat{\Delta}_q$ and $\hat{\underline{\tau}}$ are tightly estimated (t-statistics of 87.9 and 9.5): the interaction coefficient β_2 identifies the board-quality multiplier with a small standard error, and the large-sample bootstrap on the earnings-call panel (N = 116,840 transcripts) pins down the regulatory disclosure baseline. The action-to-outcome elasticity $\hat{\psi}$ has a wide confidence interval

($t = 1.14$) because its identifying moment β_1 is itself statistically indistinguishable from zero in the data (Table 2, Column 4, $t = -1.02$); the structural estimate therefore inherits the data's imprecision on the average effect of sustainable ownership on the gender pay gap, which is the central reduced-form result of the paper. The visible-proxy elasticity $\hat{B}$ is similarly imprecise ($t = 0.70$) despite the empirical β_3 being statistically significant, reflecting an amplification of the moment standard error through cross-derivatives of the model's lambda dynamics. The moment-by-moment fit (five moments, four estimated parameters) is reported in Panel B as the gap between data and model moments scaled by the data-side SEs.

Panel B of Table 9 shows that the model matches the Lang moments and β_1 essentially within the data's own confidence interval, and matches β_3 exactly because the visible-proxy parameter B is independently identified. The residual misfit is concentrated in β_2: the model produces about half of the empirical interaction effect. We interpret this as a structural ceiling of the multiplicative q-K channel: the data has a stronger interaction than a one-dimensional board-quality amplifier can deliver. A specification with multiple amplification channels (e.g., board-conditional action cost in addition to disclosure cost) could close this remaining gap but would worsen the parsimony of the model and is not pursued here.

6.5 Counterfactual experiments

We use the estimated model to evaluate four policy counterfactuals that map directly onto active regulatory debates: a disclosure mandate, a reduction in the cost of credible disclosure, a shift in investor-pressure intensity, and an aggregate increase in sustainable ownership. Each experiment alters a single structural primitive, re-solves the recursive equilibrium, simulates the new stationary panel under common random numbers, and compares cross-sectional outcomes to the baseline. We also evaluate the combined effect of a disclosure mandate adopted alongside an ownership expansion, the empirically relevant setting in the Danish (2006) and U.K. (2017) natural experiments. Table 10 reports the headline cross-sectional effects.

Forced disclosure. We raise the regulatory baseline $\underline{\tau}$ from its estimated level to 1×10^{-2}, an order-of-magnitude tightening of the disclosure rule. The exercise corresponds to introducing a U.S. analogue of the U.K. 2017 gender-pay-gap reporting rule (Lagaras et al. (2022)) or the 2006 Danish equivalent (Bennedsen et al. (2022)). Because $\underline{\tau}$ enters the firm's problem through $K(\underline{\tau})$ in (19), raising it lifts the floor action $a^* = \omega(\lambda)K(\underline{\tau})/\theta$ for every firm currently in the pooling region. The cross-sectional mean of G falls by 1.75 percentage points, closing 7.2% of the empirical pay gap. The order of magnitude is in line with the post-rollout estimates reported for Denmark and the United Kingdom.

Disclosure-cost reduction. We reduce the precision-cost scale to $\kappa = 0.25$, a 75% reduction relative to the normalised baseline. This represents the supply-side analogue of forced disclosure: rather than mandating that firms disclose, the experiment makes credible disclosure substantially cheaper. Interpretations include the maturation of audit and attestation services, the standardisation of disclosure templates by regulatory authorities, or industry-level safe-harbor regimes that reduce legal exposure on good-faith disclosures. Because κ enters the activity index in the denominator, a 75% reduction quadruples $\widetilde{A}$ and substantially expands the active region: the share of strategically active firms rises from 0.05% to 7.97%, the cross-sectional mean of G falls by 3.98 percentage points (closing 16.4% of the empirical pay gap), and the mean of earnings-call gender language rises from 1.21 to 97.94 basis points.

Sustained increase in sustainable-investor pressure. We double the wedge-intensity parameter, $\omega_0 \to 2.0$. This represents a sustained future increase in the marginal valuation premium that sustainable investors attach to perceived social performance, the structural counterpart of an ESG-growth episode that materially elevates the price effect of socially responsible ownership. The model produces a non-linear response: the active-firm share rises from 0.05% to 7.97%, the cross-sectional mean of G falls by 8.00 percentage points (closing 32.9% of the empirical pay gap,

about half of its cross-sectional standard deviation), and the heterogeneity by q-type widens. The non-linearity reflects the threshold structure of the model: a modest fraction of firms are pushed across the separation cut-off, after which their disclosure and action rise smoothly with the wedge.

Aggregate sustainable-ownership shift. We raise the unconditional mean of sustainable ownership from $\bar{\lambda} = 0.65\%$ to 2.0%, corresponding to a projected continuation of the post-2014 ESG-growth trend. Because λ is slow-moving (AR(1) with $\rho = 0.85$), the stationary distribution shifts upward but not all firms enter the active region. The cross-sectional mean of G falls by 0.78 percentage points (closing 3.2% of the empirical pay gap) and the active-firm share rises from 0.05% to 2.11%. The effect is more modest than the wedge shock because the ownership channel works through the wedge $\omega_0 \lambda$, and only the right tail of the distribution crosses the activity threshold.

Disclosure mandate during an ESG-growth episode. The Danish 2006 and U.K. 2017 disclosure mandates were enacted during periods of rising aggregate sustainable ownership rather than in isolation. To map the model onto that setting, we evaluate the joint policy in which the regulatory floor and the aggregate ownership mean are simultaneously elevated. Table 11 reports the result. Panel A varies $\underline{\tau}$ in rows and $\bar{\lambda}$ in columns; Panel B decomposes the strongest-mix outcome into individual and interaction components. The disclosure mandate alone ($\underline{\tau} = 5{\times}10^{-3}$, baseline $\bar{\lambda}$) closes 0.87 percentage points of the pay gap; the ownership expansion alone (baseline $\underline{\tau}$, $\bar{\lambda} = 2.0\%$) closes 0.78 points. Implementing both simultaneously closes 2.62 points (10.8% of the empirical pay gap), 59% larger than the additive prediction. The structural source of this super-additivity is mechanical but informative: the mandate's mechanical impact on each firm's action is proportional to $\omega_0 \lambda K(\underline{\tau})/\theta$, so a higher aggregate $\bar{\lambda}$ raises the average λ on which the mandate operates. The model therefore implies that gender-pay disclosure rules adopted during rising sustainable-investor demand should produce larger pay-gap closures than the same rules adopted in environments of stagnant or contracting sustainable ownership, a falsifiable cross-country prediction.

Heterogeneity and dynamics. Two ancillary features of the counterfactuals merit emphasis. First, decomposing the cross-sectional effect of each policy by the initial-λ quartile of the firm shows that the cost reduction and the wedge shock concentrate disproportionately on firms in the right tail of the sustainable-ownership distribution (the structural intensive margin), whereas the disclosure mandate spreads more uniformly across firms by mechanically raising the floor for the pooling pool. Second, Figure 3 plots the cross-sectional mean of G year-by-year under a one-shot policy adoption. The disclosure mandate, the cost reduction, and the wedge shock generate near-instantaneous adjustments at the year of adoption, while the aggregate-ownership policy generates a gradual transition whose half-life is governed by the AR(1) persistence of λ. The combined mandate-and-ownership trajectory lies visibly below either component path, mirroring the super-additivity quantified in Table 11. The gradual ownership-driven adjustment is consistent with the empirical timing of post-rollout pay-gap closing observed in Denmark and the United Kingdom.

7 Conclusion

This paper studies when socially responsible investors can change firms' *internal* labor outcomes in the presence of information frictions. Guided by the model in Section 2, we focus on an outcome that investors typically cannot observe, namely the employee-level gender pay gap measured in restricted-access LEHD data, and test the "null under opacity" prediction in Section 4. After controlling for unobservable covariance within industries, regions, and time with rich fixed effects, we find an insignificant relation between socially responsible investment and the employee-level gender pay gap. The 90% confidence interval of the coefficient indicates that a one percentage-point increase in socially responsible investment is related to a -0.152% to 0.036% percentage point change in the gender pay gap in a firm. The relation is robust to the use of different measures for the gender pay gap and socially responsible investment, and socially responsible investment is not positively correlated with the proportion of female workers in a company. At the same time, socially responsible investment is positively related to female board representation, and market

valuations are related to board gender diversity but not to the employee pay gap.

We then test the model's cross-sectional prediction that investor demand has stronger real effects when governance makes information more credible. In Section 5, we find that the existence of female directors reinforces the relation between socially responsible investment and the gender pay gap. The 90% confidence interval indicates that a one percentage-point increase in socially responsible investment in a company with female directors is related to a -0.458% to -0.074% percentage point change in the gender pay gap. The results are not driven by the time trends of female directors, manager effects, or quadratic effects of socially responsible investment, and the relation between socially responsible investment and the gender pay gap is strongest when there are two female directors within a firm. Consistent with the information channel emphasized by the model, we also find suggestive evidence that firms with female directors communicate more about gender equality in earnings calls.

To put magnitudes on these patterns, we extend the model to a dynamic version in Section 6 and fit it to the reduced-form regressions reported above. The estimated model implies that a U.S. analogue of the 2017 U.K. gender-pay-gap disclosure mandate would close about 7% of the cross-sectional pay gap. A continuation of the post-2014 expansion of sustainable ownership would close another 3%. When a disclosure mandate is adopted during such an expansion, the joint policy closes about 11%, roughly 59% more than the sum of the two policies in isolation, because the mandate's bite on each firm scales with the ownership it operates on. We read these as informative estimates from a stylized model, not causal forecasts.

Although there is increasing demand for gender equality, most countries do not have disclosure requirements for gender equality. The lack of disclosure is an obstacle for investors striving to choose companies with gender equality. A few countries, such as Denmark in 2006 and the United Kingdom in 2017, have implemented disclosure requirements (Lagaras et al., 2022; Bennedsen et al., 2022). The United States attempted to implement a similar requirement, but the discussion halted

in 2018. The findings of this paper, together with the structural counterfactuals in Section 6, imply that detailed and credible information on gender equality is needed for socially responsible investment to be effective in changing opaque employee-level outcomes, and that the effect of any such disclosure mandate is larger when adopted during a period of expanding sustainable ownership.

References

Adams, Renée B. and Daniel Ferreira. (2009) Women in the boardroom and their impact on governance and performance. *Journal of Financial Economics*, *94*(2), 291–309.

Adams, Renée B., Benjamin E. Hermalin, and Michael S. Weisbach. (2010) The role of boards of directors in corporate governance: A conceptual framework and survey. *Journal of Economic Literature*, *48*(1), 58–107.

Admati, Anat R. and Paul Pfleiderer. (2000) Forcing firms to talk: Financial disclosure regulation and externalities. *The Review of Financial Studies*, *13*(3), 479–519.

Ahern, Kenneth R. and Amy K. Dittmar. (2012) The changing of the boards: The impact on firm valuation of mandated female board representation. *The Quarterly Journal of Economics*, *127*(1), 137–197.

Akerlof, George A. (1970) The market for "lemons": Quality uncertainty and the market mechanism. *The Quarterly Journal of Economics*, *84*(3), 488–500.

Armstrong, Christopher S., John E. Core, and Wayne R. Guay. (2014) Do independent directors cause improvements in firm transparency? *Journal of Financial Economics*, *113*(3), 383–403.

Bennedsen, Morten, Elena Simintzi, Margarita Tsoutsoura, and Daniel Wolfenzon. (2022) Do firms respond to gender pay gap transparency? *The Journal of Finance*, *77*(4), 2051–2091.

Berg, Florian, Julian F. Koelbel, and Roberto Rigobon. (2022) Aggregate confusion: The divergence of ESG ratings. *Review of Finance*, *26*(6), 1315–1344.

Bertrand, Marianne, Claudia Goldin, and Lawrence F. Katz. (2010) Dynamics of the gender gap for young professionals in the financial and corporate sectors. *American Economic Journal: Applied Economics*, *2*(3), 228–255.

Blau, Francine D. and Lawrence M. Kahn. (2017) The gender wage gap: Extent, trends, and explanations. *Journal of Economic Literature*, *55*(3), 789–865.

Boffo, Riccardo and Robert Patalano. (2020) *ESG investing: Practices, progress and challenges* (tech. rep.). OECD. Paris.

Brown, Charles and James Medoff. (1989) The employer size-wage effect. *Journal of Political Economy*, *97*(5), 1027–1059.

Card, David, Ana Rute Cardoso, and Patrick Kline. (2016) Bargaining, sorting, and the gender wage gap: Quantifying the impact of firms on the relative pay of women. *The Quarterly Journal of Economics*, *131*(2), 633–686.

Card, David, Francesco Devicienti, and Agata Maida. (2014) Rent-sharing, holdup, and wages: Evidence from matched panel data. *The Review of Economic Studies*, *81*(1), 84–111.

Chen, Huaizhi, Lauren Cohen, and Umit G. Gurun. (2021) Don't take their word for it: The misclassification of bond mutual funds. *The Journal of Finance*, *76*(4), 1699–1730.

Dezső, Cristian L. and David Gaddis Ross. (2012) Does female representation in top management improve firm performance? a panel data investigation. *Strategic Management Journal*, *33*(9), 1072–1089.

Dimson, Elroy, Oğuzhan Karakaş, and Xi Li. (2015) Active ownership. *The Review of Financial Studies*, *28*(12), 3225–3268.

Dyck, Alexander, Karl V. Lins, Lukas Roth, and Hannes F. Wagner. (2019) Do institutional investors drive corporate social responsibility? international evidence. *Journal of Financial Economics*, *131*(3), 693–714.

Edmans, Alex, Doron Levit, and Jan Schneemeier. (2024) *Socially responsible divestment* (tech. rep.) (Last revised November 10, 2024. Available at SSRN (No. 4093518).). Working paper (ECGI Finance Working Paper No. 823/2022; CEPR Discussion Paper No. 17262).

Flammer, Caroline. (2015) Does corporate social responsibility lead to superior financial performance? a regression discontinuity approach. *Management Science*, *61*(11), 2549–2568.

Friedman, Henry L. (2020) Investor preference for director characteristics: Portfolio choice with gender bias. *The Accounting Review*, *95*(5), 117–147.

Gertsberg, Marina, Johanna Möllerstrom, and Michaela Pagel. (2021) *Gender quotas and support for women in board elections* (NBER Working Paper No. 28463). National Bureau of Economic Research.

Gibson Brandon, Rajna, Simon Glossner, Philipp Krueger, Pedro Matos, and Tom Steffen. (2022) Do responsible investors invest responsibly? *Review of Finance*, *26*(6), 1389–1432.

Goldin, Claudia. (2014) A grand gender convergence: Its last chapter. *American Economic Review*, *104*(4), 1091–1119.

Goldin, Claudia, Sari Pekkala Kerr, Claudia Olivetti, and Erling Barth. (2017) The expanding gender earnings gap: Evidence from the LEHD-2000 census. *American Economic Review*, *107*(5), 110–114.

Gormley, Todd A, Vishal K Gupta, David A Matsa, Sandra C Mortal, and Lukai Yang. (2023) The big three and board gender diversity: The effectiveness of shareholder voice. *Journal of Financial Economics*, *149*(2), 323–348.

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

Heinkel, Robert, Alan Kraus, and Josef Zechner. (2001) The effect of green investment on corporate behavior. *Journal of Financial and Quantitative Analysis*, *36*(4), 431–449.

Hong, Harrison and Marcin Kacperczyk. (2009) The price of sin: The effects of social norms on markets. *Journal of Financial Economics*, *93*(1), 15–36.

Knippen, Jennifer M., Wei Shen, and Qi Zhu. (2019) Limited progress? the effect of external pressure for board gender diversity on the increase of female directors. *Strategic Management Journal*, *40*(7), 1123–1150.

La Porta, Rafael, Florencio Lopez-de-Silanes, Andrei Shleifer, and Robert W. Vishny. (2002) Investor protection and corporate valuation. *The Journal of Finance*, *57*(3), 1147–1170.

Lagaras, Spyridon, Maria-Teresa Marchica, Elena Simintzi, and Margarita Tsoutsoura. (2022) *Women in the financial sector* (SSRN Working Paper No. 4098229) (SSRN Working Paper; last revised May 2023). SSRN.

Matsa, David A. and Amalia R. Miller. (2013) A female style in corporate leadership? evidence from quotas. *American Economic Journal: Applied Economics*, *5*(3), 136–169.

Nofsinger, John R., Johan Sulaeman, and Abhishek Varma. (2019) Institutional investors and corporate social responsibility. *Journal of Corporate Finance*, *58*, 700–725.

Oi, Walter Y. and Todd L. Idson. (1999) Firm size and wages. In Orley Ashenfelter and David Card (Eds.), *Handbook of labor economics* (pp. 2165–2214, Vol. 3). Elsevier.

Olivetti, Claudia and Barbara Petrongolo. (2016) The evolution of gender gaps in industrialized countries. *Annual Review of Economics*, *8*(1), 405–434.

Pástor, L'uboš, Robert F. Stambaugh, and Lucian A. Taylor. (2021) Sustainable investing in equilibrium. *Journal of Financial Economics*, *142*(2), 550–571.

Riedl, Arno and Paul Smeets. (2017) Why do investors hold socially responsible mutual funds? *The Journal of Finance*, *72*(6), 2505–2550.

Shleifer, Andrei and Robert W. Vishny. (1997) A survey of corporate governance. *The Journal of Finance*, *52*(2), 737–783.

Spence, Michael. (1973) Job market signaling. *The Quarterly Journal of Economics*, *87*(3), 355–374.

Tate, Geoffrey and Liu Yang. (2015) Female leadership and gender equity: Evidence from plant closure. *Journal of Financial Economics*, *117*(1), 77–97.

Van der Beck, Philippe. (2025) *Flow-driven ESG returns* (SSRN Working Paper No. 3929359) (Swiss Finance Institute Research Paper No. 21-71; last revised Oct 2025; Journal of Finance forthcoming). SSRN.

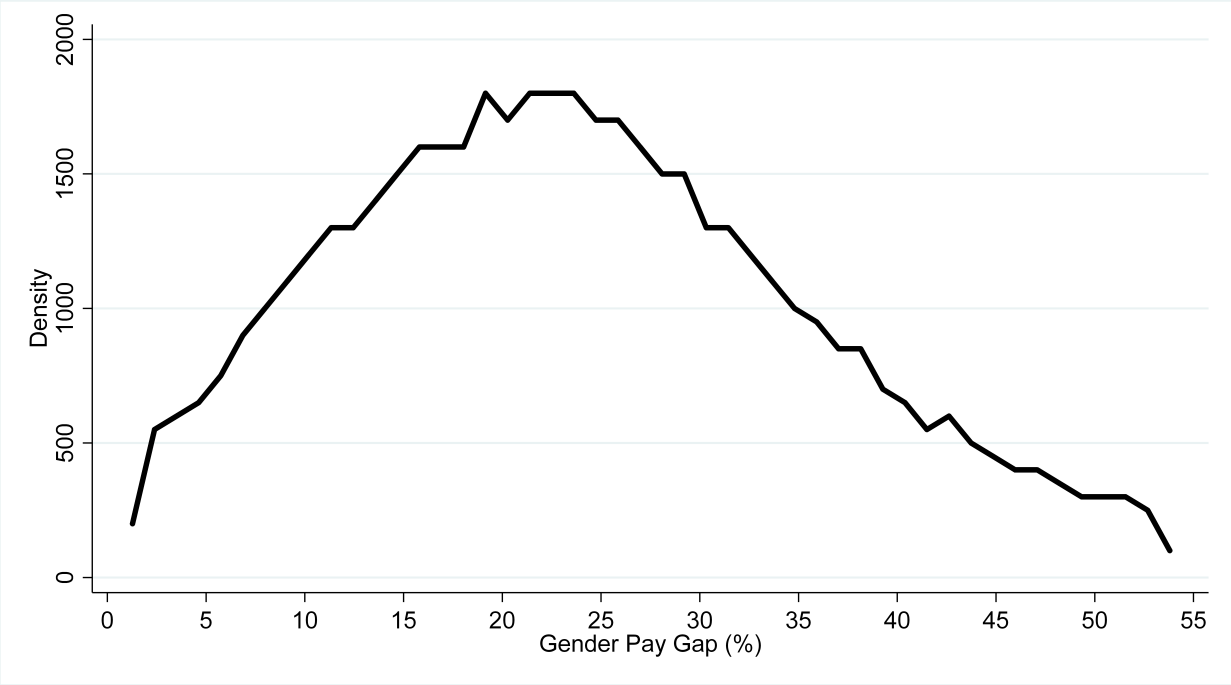
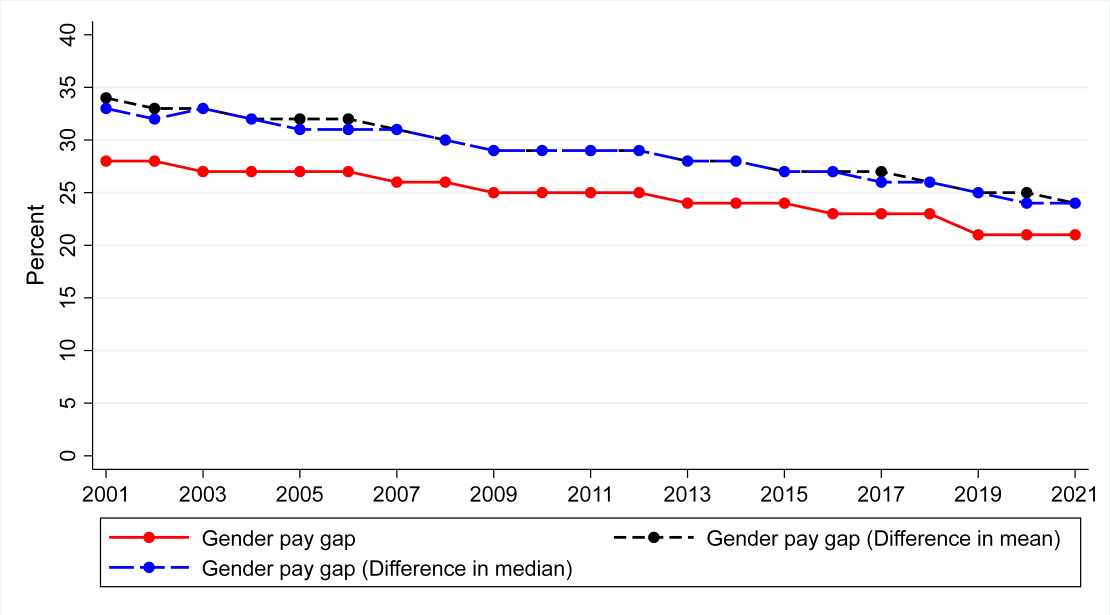
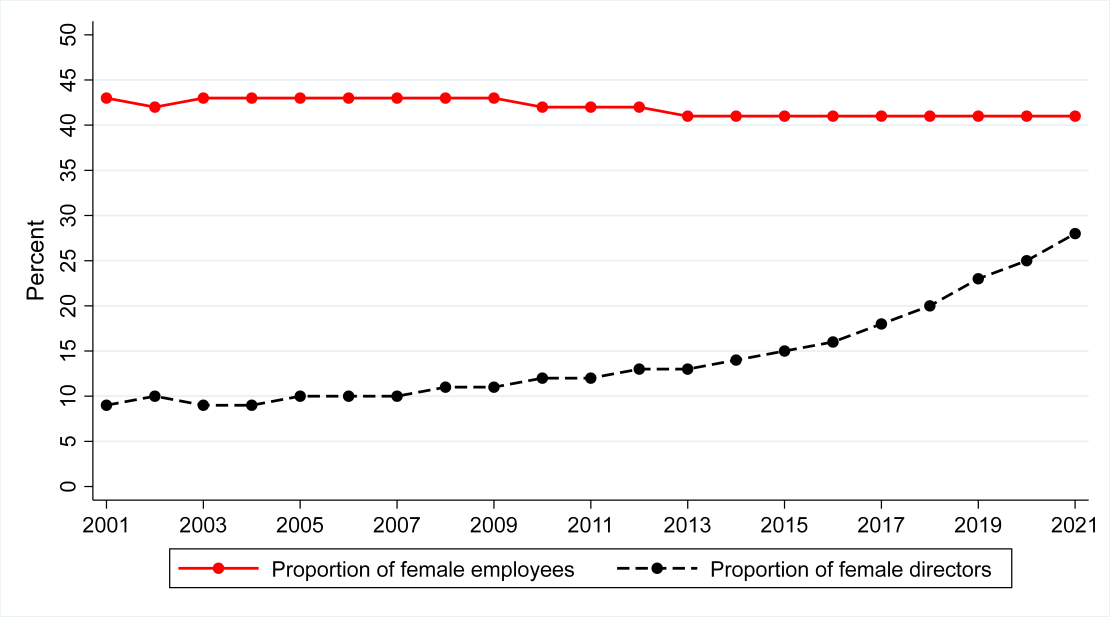


Figure 1: Kernel density plot of the gender pay gap. This figure presents the kernel density plot of the gender pay gap. We measure the gender pay gap by regressing the log annual salary on female indicators and other individual characteristics within a firm-year. Section 3.2 provides details on the definition of the gender pay gap. To comply with the US Census disclosure requirements, we drop the top 5% and the bottom 5% of the firm-year observations. The sample firms consist of all companies with at least 10 employees in Longitudinal Employer-Household Dynamics (LEHD) with valid financial data in Compustat from 2001 to 2021.



(a) Time trends of gender pay gaps



(b) Time trends of gender compositions of employees and directors

Figure 2: Time trend of the within-firm gender gap and gender composition. The figure shows the equally weighted average gender pay gap and female proportions of public companies from 2001 to 2021. Panel A shows the time trend of three measures of gender pay gaps. The benchmark measure is calculated by regressing the log annual salary on female indicators and other individual characteristics within a firm-year. The other two measures compare the mean (median) male wages and female wages. Section 3.2 provides details on the definition of the three measures of the gender pay gap. Panel B shows the time trends of the number of female employees over all employees and the number of female directors over all directors. Prior to averaging, we winsorize numbers at the 1% and 99% levels.

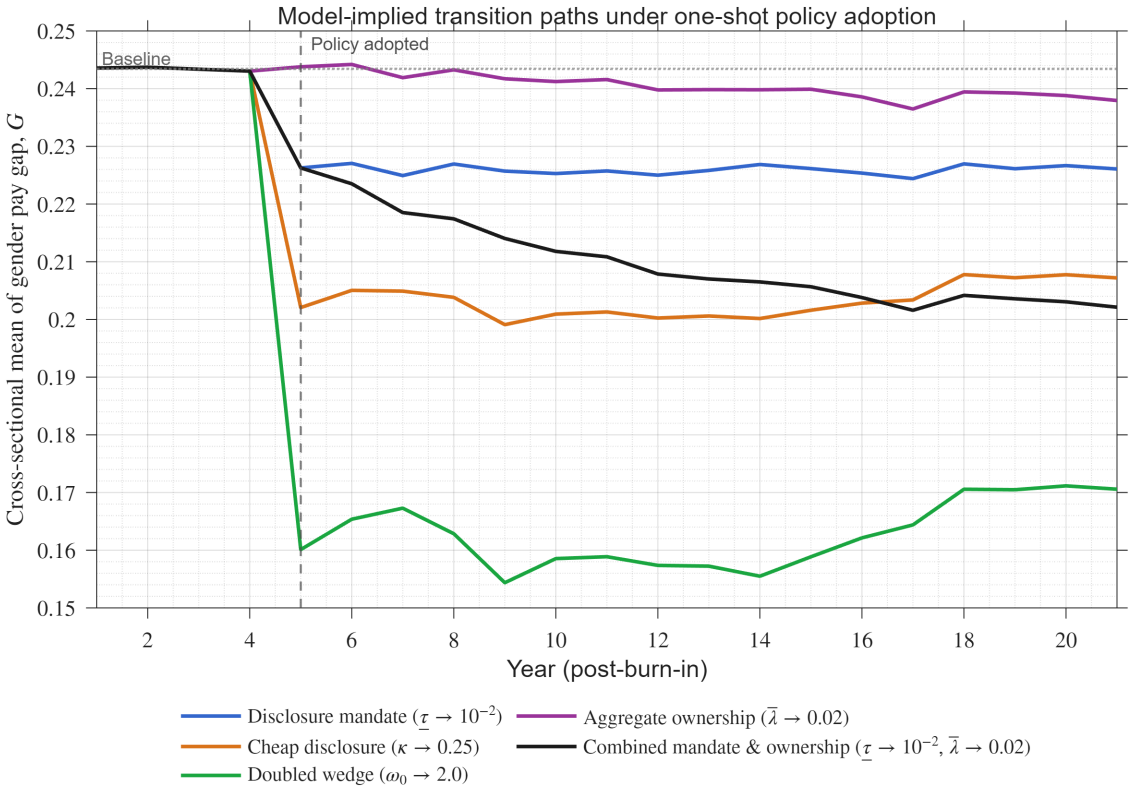


Figure 3: Model-implied transition paths of the cross-sectional mean of the gender pay gap, G, under one-shot policy adoption at year 5 (vertical dashed line). The horizontal dotted line marks the baseline mean pre-adoption. Each solid line corresponds to a policy counterfactual evaluated at the SMM-estimated parameter values of Table 9: the disclosure mandate raises the regulatory disclosure floor to $\underline{\tau} = 10^{-2}$; the cost reduction lowers the precision-cost scale to $\kappa = 0.25$; the wedge shock doubles the wedge intensity ($\omega_0 = 2.0$); the ownership expansion raises the aggregate mean of sustainable ownership to $\overline{\lambda} = 0.02$; the combined policy implements the disclosure mandate and the ownership expansion simultaneously. For visual distinctness in the transition figure, the disclosure mandate and the combined policy are evaluated at $\underline{\tau} = 10^{-2}$ rather than at the $\underline{\tau} = 5\times10^{-3}$ used in the headline counterfactual cell of Table 11. Years 1–4 are simulated under the baseline regime so that all paths coincide; at year 5 the post-policy regime takes effect and is held thereafter. Common random numbers are used across scenarios so that differences across paths reflect policy responses rather than sampling variation.

Table 1: Summary Statistics

The table provides summary statistics for the gender pay gap. The sample firms consist of all companies with at least 10 employees in Longitudinal Employer-Household Dynamics (LEHD) with valid financial data in Compustat from 2001 to 2021. The gender pay gap is measured in three different ways. First, it is measured as a regression coefficient on female employee indicators within a firm-year. Sections 3.2 and 3.3 provides additional details on the construction of the measure. The second measure is the mean of male wages minus the mean of female wages scaled by the mean of all employees' wages. The third measure is the median male wage minus the median female wage, scaled by a median of all employees. Definitions of other control variables are explained in Appendix Table A.1. We winsorize ratios at the 1% and 99% levels. In the last column, we report the average characteristics of all Compustat companies from 2001 to 2021 for comparison.

	Sample firms			Compustat firms
	Mean	Std	Skewness	Mean
Gender pay gap	24.80	15.49	0.54	-
Gender pay gap (Difference in mean)	29.28	20.60	0.87	-
Gender pay gap (Difference in median)	28.83	25.48	1.29	-
Proportion of female employees	42.04	20.26	0.38	-
Proportion of female directors	13.89	12.57	0.60	12.43
Socially responsible investment	0.65	1.36	3.50	0.85
SRI by mutual funds' name	0.03	0.09	4.10	0.03
Institutional investment	67.97	29.02	-0.64	60.86
Non-socially responsible investment	67.28	28.75	-0.64	59.98
ln(Assets)	21.21	1.94	0.28	20.61
ln(Employment)	7.55	1.70	0.37	7.14
ln(Firm age)	3.24	0.50	-1.58	2.45
Profitability	7.00	10.40	-1.50	3.16
Book leverage	59.28	25.87	0.25	55.67
Number of female directors	1.21	1.17	0.90	1.10
Number of firm-years	54,000			58,564

Table 2: Gender pay gap and socially responsible investment

The table presents regression results for the gender pay gap on lagged socially responsible investment and firm characteristics. The dependent variable is the gender pay gap, measured in three ways. The benchmark measure is calculated by regressing the log annual salary on female indicators and other individual characteristics within a firm-year. The other two measures compare the mean (median) male wages and female wages. Socially responsible investment of a firm is an aggregation of socially responsible institutional investors' holdings in 13F divided by the number of shares outstanding. An institutional investor is classified as a socially responsible institutional investor if it increases its holding when the proportion of female directors increases over the previous five years. Alternatively, we use mutual fund names and classify a mutual fund as a socially responsible investor if the name of the fund includes words related to the social agenda. Sections 3.2 and 3.3 provides details on the definition of the main dependent and independent variables. Definitions of all control variables can be found in Appendix Table A.1. All continuous variables are winsorized at the 1% and 99% levels. Numbers in parentheses represent t-statistics, with standard errors clustered by firm. Significance levels are denoted by *, **, and ***, indicating significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dependent variable	Gender pay gap	Gender pay gap	Gender pay gap	Gender pay gap	Gender pay gap (Mean)	Gender pay gap (Median)	Gender pay gap
Socially responsible	-0.481***	-0.446***	-0.073	-0.058	-0.004	-0.020	
Investment	(-7.49)	(-7.20)	(-1.43)	(-1.02)	(-0.06)	(-0.21)	
SRI by fund name							-0.557
							(-0.52)
ln(Assets)		1.537***	0.338***	0.366***	0.296*	0.457**	0.371***
		(10.99)	(2.88)	(2.92)	(1.77)	(2.35)	(2.95)
ln(Employment)		-1.518***	0.116	0.092	0.966***	-0.435*	0.093
		(-9.54)	(0.81)	(0.60)	(4.71)	(-1.77)	(0.61)
ln(Firm age)		1.137***	0.989***	0.927**	0.918*	1.259**	0.927**
		(3.00)	(2.65)	(2.33)	(1.79)	(1.98)	(2.33)
Profitability		-0.053***	-0.014	-0.019	-0.016	-0.056***	-0.019
		(-3.54)	(-1.19)	(-1.50)	(-0.99)	(-2.76)	(-1.49)
Leverage		0.019**	-0.028***	-0.030***	-0.045***	-0.037***	-0.030***
		(2.44)	(-4.86)	(-4.83)	(-5.65)	(-3.89)	(-4.83)
Constant	24.73***	-0.852	14.97***	14.92***	15.06***	20.39***	14.80***
	(110.10)	(-0.35)	(6.82)	(6.38)	(4.93)	(5.60)	(6.33)
SIC3-fixed	No	No	Yes	No	No	No	No
State-fixed	No	No	Yes	No	No	No	No
Year-fixed	No	No	Yes	No	No	No	No
SIC3*Year-fixed	No	No	No	Yes	Yes	Yes	Yes
State*Year-fixed	No	No	No	Yes	Yes	Yes	Yes
Adj. R-squared	0.00	0.04	0.37	0.35	0.40	0.37	0.35
N of firm-years	54,000	54,000	54,000	54,000	54,000	54,000	54,000

Table 3: Proportion of females and socially responsible investment

The table presents regression results for the proportion of females with lagged socially responsible investment and firm characteristics. The dependent variable is the number of female employees over total employment (Columns 1 to 3) or the number of female directors over all directors (Columns 4 to 6). Socially responsible investment of a firm is an aggregation of socially responsible institutional investors' holdings in 13F divided by the number of shares outstanding. An institutional investor is classified as a socially responsible institutional investor if it increases its holding when the proportion of female directors increases over the previous five years. Alternatively, we use mutual fund names and classify a mutual fund as a socially responsible investor if the name of the fund includes words related to the social agenda. Sections 3.2 and 3.3 provides details on the definition of socially responsible investment. Definitions of all control variables can be found in Appendix Table A.1. All continuous variables are winsorized at the 1% and 99% levels. Numbers in parentheses represent t-statistics, with standard errors clustered by firm. Significance levels are denoted by *, **, and ***, indicating significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable	Proportion of female employees			Proportion of female directors		
Socially responsible	-0.421***	-0.089*	-0.096*	0.285***	0.116**	0.114**
investment	(-4.81)	(-1.81)	(-1.70)	(5.60)	(2.52)	(2.18)
ln(Assets)	0.076	-0.498***	-0.520***	1.812***	1.634***	1.606***
	(0.40)	(-3.89)	(-3.80)	(22.26)	(18.38)	(16.92)
ln(Employment)	-0.582**	(0.20)	-0.215	0.272***	0.409***	0.428***
	(-2.35)	(-1.33)	(-1.34)	(2.74)	(3.92)	(3.80)
ln(Firm age)	-1.476***	0.830**	0.853**	1.814***	-0.051	0.016
	(-2.98)	(2.41)	(2.36)	(6.63)	(-0.19)	(0.06)
Profitability	-0.060***	-0.001	-0.004	0.001	0.030***	0.026**
	(-3.28)	(-0.11)	(-0.30)	(0.10)	(2.95)	(2.31)
Leverage	0.166***	0.017***	0.016**	0.012**	0.019***	0.019***
	(15.65)	(2.65)	(2.25)	(2.13)	(3.59)	(3.20)
Constant	40.42***	50.45***	51.04***	-33.39***	-25.13***	-24.83***
	(12.62)	(22.80)	(21.73)	(-23.19)	(-15.07)	(-13.98)
SIC3-fixed	No	Yes	No	No	Yes	No
State-fixed	No	Yes	No	No	Yes	No
Year-fixed	No	Yes	No	No	Yes	No
SIC3*Year-fixed	No	No	Yes	Yes	No	Yes
State*Year-fixed	No	No	Yes	Yes	No	Yes
Adj. R-squared	0.05	0.7	0.69	0.12	0.33	0.31
N of firm-years	54,000	54,000	54,000	54,000	54,000	54,000

Table 4: Market valuations and employee-level and board-level gender equality

The table presents regression results for the market valuations on the same-year employee-level gender pay gap and the proportion of female directors. The dependent variable is the market value of assets over the book value of assets in percentage. The employee-level gender pay gap is calculated by regressing the log annual salary on female indicators and other individual characteristics within a firm-year. The proportion of the female board of directors is the number of female directors over the total number of directors at the end of the fiscal year. Definitions of all control variables can be found in Appendix Table A.1. All continuous variables are winsorized at the 1% and 99% levels. Numbers in parentheses represent t-statistics, with standard errors clustered by firm. Significance levels are denoted by *, **, and ***, indicating significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)
Dependent variable	Market Assets/Book Assets		
Gender pay gap	-0.139		-0.152*
	(-1.60)		(-1.74)
Proportion of female directors		0.593***	0.598***
		(5.36)	(5.40)
ln(Assets)	-5.806***	-6.707***	-6.773***
	(-5.08)	(-5.84)	(-5.88)
ln(Employments)	1.206	0.972	0.947
	(0.97)	(0.78)	(0.76)
ln(Firm age)	-41.57***	-41.45***	-41.59***
	(-12.26)	(-12.29)	(-12.31)
Profitability	3.247***	3.228***	3.232***
	(14.86)	(14.8)	(14.82)
Leverage	0.163**	0.148*	0.153*
	(2.07)	(1.88)	(1.94)
Constant	403.7***	420.4***	418.3***
	(19.28)	(19.88)	(19.85)
SIC3*Year-fixed	Yes	Yes	Yes
State*Year-fixed	Yes	Yes	Yes
Adj-R-squared	0.29	0.30	0.30
N of firm-years	54,000	54,000	54,000

Table 5: Gender pay gap on interaction between female directors and socially responsible investment

The table presents regression results for the gender pay gap on lagged socially responsible investment, female directors, and firm characteristics. The dependent variable is the gender pay gap, measured in three ways, and the proportion of female employees over total employment. The benchmark measure is calculated by regressing the log annual salary on female indicators and other individual characteristics within a firm-year. The other two measures compare the mean (median) male wages and female wages. "1(Number of female directors $\geq$ 1)" equals one if there is at least one female director at the end of the previous year. Socially responsible investment of a firm is an aggregation of socially responsible institutional investors' holdings in 13F divided by the number of shares outstanding. An institutional investor is classified as a socially responsible institutional investor if it increases its holding when the proportion of female directors increases over the previous five years. Alternatively, we use mutual fund names and classify a mutual fund as a socially responsible investor if the name of the fund includes words related to the social agenda. Sections 3.2 and 3.3 provides details on the definition of the main dependent and independent variables. Definitions of all control variables can be found in Appendix Table A.1. All continuous variables are winsorized at the 1% and 99% levels. Numbers in parentheses represent t-statistics, with standard errors clustered by firm. Significance levels are denoted by *, **, and ***, indicating significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dependent variable	Gender pay gap	Gender pay gap	Gender pay gap	Gender pay gap (Difference in mean)	Gender pay gap (Difference in median)	Gender pay gap	Proportion of female employees
[1] Socially Responsible	-0.200*	0.106	0.117	0.179	0.252		-0.147
investment	(-1.86)	(1.18)	(1.16)	(1.45)	(1.53)		(-1.62)
[2] 1(Number of	-2.907***	-0.531*	-0.437	-0.552	-0.133	-0.456	1.518***
female directors $\geq$ 1)	(-7.52)	(-1.70)	(-1.29)	(-1.27)	(-0.24)	(-1.37)	(5.02)
[1] * [2]	-0.333***	-0.271***	-0.266**	-0.278*	-0.416**		0.065
	(-2.62)	(-2.60)	(-2.28)	(-1.88)	(-2.17)		(0.61)
[3] SRI by fund name						5.703***	
						(3.57)	
[2] * [3]						-8.082***	
						(-4.07)	
ln(Assets)	1.792***	0.390***	0.411***	0.350**	0.484**	0.419***	-0.640***
	(12.41)	(3.26)	(3.21)	(2.06)	(2.43)	(3.27)	(-4.57)
ln(Employment)	-1.473***	0.132	0.106	0.984***	-0.426*	0.112	-0.251
	(-9.30)	(0.92)	(0.69)	(4.79)	(-1.73)	(0.73)	(-1.57)
ln(Firm age)	1.330***	1.002***	0.941**	0.933*	1.273**	0.948**	0.830**
	(3.51)	(2.69)	(2.36)	(1.82)	(2.00)	(2.38)	(2.31)
Profitability	-0.055***	-0.014	-0.019	-0.016	-0.056***	-0.019	-0.004
	(-3.77)	(-1.17)	(-1.50)	(-0.99)	(-2.76)	(-1.49)	(-0.30)
Leverage	0.021***	-0.027***	-0.030***	-0.045***	-0.036***	-0.030***	0.015**
	(2.78)	(-4.79)	(-4.77)	(-5.59)	(-3.85)	(-4.77)	(2.09)
Constant	-5.412**	14.03***	14.09***	14.07***	19.78***	13.87***	52.99***
	(-2.16)	(6.31)	(5.94)	(4.53)	(5.32)	(5.85)	(22.13)
SIC3-fixed	No	Yes	No	No	No	No	No
State-fixed	No	Yes	No	No	No	No	No
Year-fixed	No	Yes	No	No	No	No	No
SIC3*Year-fixed	No	No	Yes	Yes	Yes	Yes	Yes
State*Year-fixed	No	No	Yes	Yes	Yes	Yes	Yes
Adj. R-squared	0.04	0.04	0.04	0.40	0.37	0.35	0.69
N of firm-years	54,000	54,000	54,000	54,000	54,000	54,000	54,000

Table 6: Alternative specifications determinants of the gender pay gap

The table presents regression results for the gender pay gap on lagged socially responsible investment, firm characteristics, and other determinants. The dependent variable is the gender pay gap, calculated by regressing the log annual salary on female indicators and other individual characteristics within a firm-year. The socially responsible investment of a firm is an aggregation of socially responsible institutional investors' holdings in 13F divided by the number of shares outstanding. An institutional investor is classified as a socially responsible institutional investor if it increases its holding when the proportion of female directors increases over the previous five years. Definitions of all control variables can be found in Appendix Table A.1. All continuous variables are winsorized at the 1% and 99% levels. Numbers in parentheses represent t-statistics, with standard errors clustered by firm. Significance levels are denoted by *, **, and ***, indicating significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(4)
Dependent variable		Gender pay gap		
[1] Socially responsible	-0.063		0.112	0.121
investment	(-1.09)		-1.07	-1.17
[2] 1(Number of female		0.364	-0.437	-0.438
directors $\geq$ 1)		-0.52	(-1.29)	(-1.29)
[3] Non-Socially responsible		0.022***		
investment		-2.84		
[4] 1(Female CEO)	-1.748**			
	(-2.26)			
[1] * [4]	0.139			
	-0.42			
[2] * [3]		-0.016*		
		(-1.78)		
[1] * [2]			-0.265**	-0.264**
			(-2.27)	(-2.20)
[1] * [1(Year $\geq$ 2012)]				-0.012
				(-0.11)
[Socially responsible			0	
investment]^2			-0.31	
ln(Assets)	0.371***	0.347***	0.411***	0.411***
	-2.96	-2.66	-3.21	-3.21
ln(Employment)	0.092	0.095	0.106	0.106
	-0.6	-0.61	-0.69	-0.69
ln(Firm age)	0.947**	0.984**	0.941**	0.941**
	-2.38	-2.47	-2.36	-2.36
Profitability	-0.019	-0.025*	-0.019	-0.019
	(-1.48)	(-1.90)	(-1.50)	(-1.50)
Leverage	-0.030***	-0.028***	-0.030***	-0.030***
	(-4.82)	(-4.52)	(-4.77)	(-4.77)
Constant	14.81***	14.06***	14.09***	14.09***
	-6.34	-5.95	-5.94	-5.94
SIC3*Year-fixed	Yes	Yes	Yes	Yes
State*Year-fixed	Yes	Yes	Yes	Yes
Adj. R-squared	0.35	0.35	0.35	0.35
N of firm-years	54,000	54,000	54,000	54,000

Table 7: The relation between the gender gap and female director composition by the number of female directors

The table presents regression results for the gender pay gap on lagged socially responsible investment, female directors, and firm characteristics. The dependent variable is the gender pay gap, calculated by regressing the log annual salary on female indicators and other individual characteristics within a firm-year. 1(Number of female directors = n) equals one if there are n female directors at the end of the previous year. The socially responsible investment of a firm is an aggregation of socially responsible institutional investors' holdings in 13F divided by the number of shares outstanding. An institutional investor is classified as a socially responsible institutional investor if it increases its holding when the proportion of female directors increases over the previous five years. All continuous variables are winsorized at the 1% and 99% levels. Numbers in parentheses represent t-statistics, with standard errors clustered by firm. Significance levels are denoted by *, **, and ***, indicating significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)
Dependent variable		Gender pay gap	
[1] Socially responsible	-0.211**	0.101	0.114
investment	(-1.96)	(1.12)	(1.13)
1(Female Director = 1)	-1.696***	-0.423	-0.35
	(-4.38)	(-1.34)	(-1.02)
[1]* 1(Female Director = 1)	-0.285**	-0.187	-0.180
	(-2.00)	(-1.59)	(-1.38)
1(Female Directors = 2)	-3.711***	-0.649*	-0.447
	(-7.76)	(-1.66)	(-1.04)
[1]* 1(Female Directors = 2)	-0.460***	-0.382***	-0.404***
	(-2.92)	(-3.00)	(-2.81)
1(Female Directors $\geq$ 3)	-7.162***	-1.527***	-1.485***
	(-10.65)	(-2.93)	(-2.61)
[1] * 1(Female Directors $\geq$ 3)	-0.124	-0.294*	-0.273
	(-0.62)	(-1.91)	(-1.53)
ln(Assets)	2.083***	0.452***	0.470***
	(14.16)	(3.74)	(3.63)
ln(Employment)	-1.477***	0.136	0.110
	(-9.41)	(0.95)	(0.72)
ln(Firm age)	1.577***	1.013***	0.953**
	(4.16)	(2.72)	(2.39)
Profitability	-0.056***	-0.013	-0.019
	(-3.87)	(-1.15)	(-1.48)
Leverage	0.023***	-0.027***	-0.029***
	(3.06)	(-4.68)	(-4.67)
Constant	-12.09***	12.76***	12.86***
	(-4.64)	(5.68)	(5.36)
SIC3-fixed	No	Yes	No
State-fixed	No	Yes	No
Year-fixed	No	Yes	No
SIC3*Year-fixed	No	No	Yes
State*Year-fixed	No	No	Yes
Adj. R-squared	0.06	0.37	0.35
N of firm-years	54,000	54,000	54,000

Table 8: Discussion of Gender and DEI during earnings calls

The table presents regression results of the proportion of gender- or DEI-related sentences in earnings calls on female director representation and firm characteristics. The dependent variable is the ratio of the number of gender- or DEI-related sentences spoken in earnings calls to the total number of sentences in the earnings call. We use a large language model (OpenAI's GPT-5.2) to identify whether a sentence is related to the topic of DEI. Columns 1 to 4 include only sentences related to gender. Columns 5 to 8 include both gender- and DEI-related sentences. The prompt used for classification is listed in Appendix Table A.1. The main independent variable is the percentage of female directors among all directors on a board in the previous year. Definitions of all control variables are provided in Appendix Table A.1. All continuous variables are winsorized at the 1% and 99% levels. Numbers in parentheses represent t-statistics, with standard errors clustered by firm. Significance levels are denoted by *, **, and ***, indicating significance at the 10%, 5%, and 1% levels, respectively. For readability, both the dependent variables and the independent variables are standardized.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dep. variable		Gender-related sentences				Gender- or DEI-related sentences		
% of Number of	0.107***	0.096***	0.028***	0.024**	0.182***	0.160***	0.039***	0.038***
female directors	(10.01)	(9.09)	(2.78)	(2.08)	(17.21)	(15.57)	(4.28)	(3.87)
ln(Assets)		0.003	0.025	0.034		0.016	0.022	0.017
		(0.24)	(1.32)	(1.62)		(1.28)	(1.11)	(0.80)
ln(Employment)		0.048***	0.030*	0.021		0.068***	0.083***	0.087***
		(4.08)	(1.65)	(1.02)		(5.26)	(3.84)	(3.64)
Log(Firm age)		-0.021**	-0.006	-0.011		-0.020**	-0.005	-0.012
		(-2.57)	(-0.76)	(-1.21)		(-2.27)	(-0.58)	(-1.30)
Profitability		-0.004	-0.002	-0.007		0.001	0.006	-0.002
		(-0.48)	(-0.22)	(-0.75)		(0.14)	(0.78)	(-0.28)
Leverage		0.013	0.008	0.005		0.016*	0.005	-0.003
		(1.62)	(0.88)	(0.47)		(1.93)	(0.57)	(-0.36)
SIC3-fixed	No	No	Yes	No	No	No	Yes	No
State-fixed	No	No	Yes	No	No	No	Yes	No
Year-fixed	No	No	Yes	No	No	No	Yes	No
SIC3*Year-fixed	No	No	No	Yes	No	No	No	Yes
State*Year-fixed	No	No	No	Yes	No	No	No	Yes
Adj. R-squared	0.01	0.01	0.06	0.08	0.03	0.04	0.15	0.19
N of firm-years	32,863	32,863	32,863	32,863	32,863	32,863	32,863	32,863

Table 9: Structural estimates and moment fit

The table reports the simulated method of moments estimates of the dynamic info-friction model of Section 6. Panel A reports the point estimates of the four free parameters and their standard errors computed by the SMM sandwich formula, $V_\theta = (G'WG)^{-1}G'W\,\Omega\,WG(G'WG)^{-1}$, with a numerical Jacobian and an empirical moment-covariance matrix Ω constructed as a diagonal matrix whose entries are the firm-clustered standard errors of each moment in the data: standard errors for β_1, β_2, and β_3 are read from the t-statistics in Tables 2, 5, and 3, respectively; standard errors for $\overline{\text{Lang}}$ and s_{Lang} are obtained by a 1,000-replication firm-clustered bootstrap on the 116,840-transcript panel (4,827 firm clusters). Panel B reports the moment fit and the data-side SE of each moment, comparing the empirical moments to the simulated moments produced by the model at the SMM optimum. Two parameters are normalised: the action-cost scale $\theta = 1$ and the wedge intensity $\omega_0 = 1$. The remaining calibrated primitives are described in Section 6.3.

Panel A: Estimates

Parameter	Symbol	Estimate	SE	Economic meaning
Action-to-outcome elasticity	ψ	191.53	168.73	Percentage-point pay-gap reduction per unit of action
Board-quality ratio	Δ_q	668.82	7.61	High-q effectiveness multiplier over low-q boards
Regulatory disclosure floor	$\underline{\tau}$	1.09×10^{-4}	1.15×10^{-5}	Baseline disclosure intensity from rules
Visible-proxy elasticity	B	0.054	0.076	Slope of board diversity on sustainable ownership

Panel B: Moment fit

Moment	Source	Data	SE (data)	Model
β_1 (slope G on lagged λ)	Table 2, Col 4	−0.058	0.057	−0.076
β_2 (interaction with q_H)	Table 5, Col 3	−0.266	0.117	−0.111
β_3 (slope of board diversity on λ)	Table 3, Col 6	0.114	0.052	0.114
$\overline{\text{Lang}}$ (basis points)	Earnings calls, winsorized 1%/99%	1.329	0.043	1.208
s_{Lang} (basis points)	Earnings calls, winsorized 1%/99%	7.473	0.133	8.237

Table 10: Headline counterfactual policy effects

The table reports the cross-sectional effects of five policy counterfactuals at the SMM-estimated parameter values of Table 9. The baseline row reports the simulated cross-sectional mean of the gender pay gap (mean G), the active fraction of firms (those whose disclosure precision strictly exceeds the regulatory floor $\underline{\tau}$), and the active fraction conditional on q_H. Each subsequent row alters a single structural primitive: the disclosure mandate raises the regulatory disclosure floor; the cost reduction lowers the precision-cost scale; the wedge shock raises the wedge intensity; the ownership expansion raises the aggregate mean of sustainable ownership; the combined row implements a moderate version of the disclosure mandate and the ownership expansion simultaneously. The column labelled "% closing" reports the policy-induced change in mean G relative to the baseline pay gap.

Scenario	Policy lever	Mean G	Δ (pp)	% closing	Active firms	Active q_H
Baseline	—	0.2435	—	—	0.05%	0.07%
Disclosure mandate	$\underline{\tau} \to 1\times10^{-2}$	0.2260	−1.75	7.2%	0.04%	0.07%
Cheap disclosure	$\kappa \to 0.25$	0.2037	−3.98	16.4%	7.97%	12.90%
Wedge intensity ↑	$\omega_0 \to 2.0$	0.1635	−8.00	32.9%	7.97%	12.90%
Aggregate $\bar{\lambda}$ ↑	$\bar{\lambda} \to 0.020$	0.2357	−0.78	3.2%	2.11%	3.41%
Mandate + ownership	$\underline{\tau} \to 5\times10^{-3}$, $\bar{\lambda} \to 0.020$	0.2173	−2.62	10.8%	2.09%	—

Table 11: Counterfactual interaction: disclosure mandate and aggregate sustainable ownership

The table reports the joint effect of varying the regulatory disclosure floor $\underline{\tau}$ and the unconditional mean of sustainable-investor ownership $\bar{\lambda}$ at the SMM-estimated parameter values of Table 9. Panel A reports each cell as the simulated cross-sectional mean of the gender pay gap (mean G, left of the slash) and the implied pay-gap closing relative to the baseline (in percentage points, right of the slash) across the 3×3 grid. Panel B decomposes the combined effect at the strongest policy mix into the sum of individual-policy effects and the residual super-additive interaction term. All other primitives are held at the baseline calibration.

Panel A: Mean pay gap and pay-gap closing (mean G / Δ in pp)

	$\bar{\lambda} = 0.65\%$ (baseline)	$\bar{\lambda} = 1.0\%$	$\bar{\lambda} = 2.0\%$
$\underline{\tau}$ baseline	0.2435 / —	0.2432 / −0.03	0.2357 / −0.78
$\underline{\tau} = 1\times10^{-3}$	0.2419 / −0.16	0.2412 / −0.23	0.2323 / −1.12
$\underline{\tau} = 5\times10^{-3}$	0.2348 / −0.87	0.2323 / −1.12	0.2173 / −2.62

Panel B: Super-additivity decomposition at the strongest policy mix

	Pay-gap closing (pp)
Disclosure mandate alone: $\underline{\tau} = 5\times10^{-3}$, $\bar{\lambda}$ baseline	−0.87
Ownership expansion alone: $\underline{\tau}$ baseline, $\bar{\lambda} = 2.0\%$	−0.78
Additive prediction (sum)	−1.65
Actual combined effect	−2.62
Interaction term (super-additivity)	−0.97
Interaction as % of additive prediction	59%

A Additional Tables

Table A.1: Construction methods for variables

The table explains how we construct dependent variables and control variables. All fractional numbers are expressed in percentage terms.

Variable	Description
Gender pay gap	Following Goldin et al. (2017), we regress the logarithm of annual wage on an indicator variable for gender along with other individual characteristics within each firm-year. We exclude top seven high income individuals within a firm-year in order to exclude managers or directors. After the regression, we take the negative value of $\beta_{f,t}$ to measure the gender pay gap. $\log\left(AnnualWage\right)_{i,t} = \beta_{f,t} * 1\left(Female\right)_i + Race_i + BirthCountry_i + Education_i + Age_{i,t} + Experience_{i,t}$ "1(Female)" takes one if the gender at birth is female and zero if it is male. "Race" is four indicator variables, taking value of one if an individual at birth is an Asian-American, African-American, Hispanic-American, or other races, respectively. White-American individuals are benchmark. "BirthCountry" is an indicator variable which takes one if an individual is born outside of the United States. "Education" is three indicator variables, taking value of one if an individual's final education level is high school or equivalent, college or associate degree, and Bachelor's degree or advanced degree, respectively. Individuals without high school diploma are benchmark. "Age" is a integer variable of biological age. "Experience" is number of years since an individual had first valid salary data in each firm.
Gender pay gap (Difference in mean)	Within a firm-year, we subtract female employees' average wage from male employees' average salary and divide it by all employees' average wage. We exclude top seven high income individuals within a firm-year in order to exclude managers or directors.
Gender pay gap (Difference in median)	Within a firm-year, we subtract female employees' median wage from male employees' median salary and divide it by all employees' median wage. We exclude top seven high income individuals within a firm-year in order to exclude managers or directors.
Socially responsible investment (SRI)	Sensitivity of institution-year holdings to changes in board gender composition, estimated over a rolling five-year window. *Step 1:* Estimate $\gamma_{i,t}$ from $\Delta \frac{Investment}{AssetsUnderManagement}_{i,f,t-n} = \gamma_{i,t} \Delta \frac{FemaleDirectors}{AllDirectors}_{f,t-n} + Controls_{f,t-n}$ for $1 \leq n \leq 5$. *Step 2:* Institution i is classified as socially responsible in year t if $\gamma_{i,t} > 0$ and significant. *Step 3:* Firm-year SRI is the fraction of shares held by socially responsible institutions.
SRI by fund name	As outlined in Van der Beck (2025), we use mutual fund names with words related to social concerns to classify them as socially responsible institutional investors. The word list we use is: social, impact, fair, gender, screen, ethical, conscious, SRI, ESG, and CSR. The last three words are case-sensitive, and other words are not case-sensitive. We aggregate socially responsible mutual funds' holdings within a firm-year and divide them by the number of shares outstanding
Institutional investment	Sum of shares held by all institutional investors observed in LSEG 13F Holding data divided by the number of shares outstanding.

Table A.1: (Continued) Construction methods for variables

Variable	Description
Non-socially responsible investment	Institutional investment minus socially responsible investment
Market-to-book assets	Market value of assets (PRCC_F*CSHO) as a percentage of book value of assets (AT) at the fiscal year end.
1(Number of female directors ≥ 1)	Indicator variable equal to one if there is at least one female director at the end of the fiscal year
ln(Assets)	Log of real assets (AT*1,000,000).
ln(Employment)	Log of total employments. It includes entire states, not only the LEHD states.
ln(Firm age)	Log of years since first CRSP listing
Profitability	Net Income (NI) divided by lagged assets (AT)
Leverage	Book leverage defined as total debt (DLC + DLTT) divided by total assets (AT)

Table A.1: (Continued) Construction methods for variables

Variable	Description
Proportion of Gender- or DEI-related sentences	Proportion of gender- or DEI-related sentences in the earnings call. We use a large language model (OpenAI's GPT-5.2) to classify whether a sentence is related to either the topic of gender or DEI. The definitions in the prompt are as follows: GENDER (gender equality / women in the workforce): the sentence discusses any of the following in a workplace context: – Equal pay, opportunity, or advancement regardless of gender; closing the gender pay gap; removing barriers to women's advancement; ensuring fair hiring across genders; – Workforce representation by gender: counts, percentages, ratios, or growth in the share of women employees, women in management/leadership, women on the board, female engineers, etc.; – Gender-balance targets or quotas in hiring, succession planning, or board composition; – Parental-leave, maternity, family-friendly, or flexible-work policies discussed in terms of supporting women's careers or work-life balance; – Women's leadership development, women's mentorship, female-focused recruiting/retention programs, Women's employee resource groups; – Explicit recognition of progress on gender representation as a company priority or outcome. DEI (diversity, equity, and inclusion of people in the workplace): the sentence discusses any of the following: – Fair treatment and full participation of people from underrepresented or marginalized demographic groups (race, ethnicity, gender, age, disability, LGBTQ+, veterans, etc.); valuing diverse perspectives among employees; – Equal access to opportunities; fostering welcoming workplace environments; or representation outcomes for demographic groups beyond gender alone. If a sentence includes both gender- and DEI-related topics, it is counted as one sentence. The measures are scaled by the total number of sentences spoken in the earnings call. If there are multiple earnings calls in a quarter, we take the average of the values. We set it missing if there are no earnings calls within a year.

Table A.2: Additional evidence on determinants of gender pay gap

The table presents regression results for the gender pay gap on lagged investor and firm characteristics. The dependent variable is the gender pay gap, calculated by regressing the log annual salary on female indicators and other individual characteristics within a firm-year. Institutional investment is the aggregate holding of any institutional investors on LSEG 13F holding data divided by total outstanding shares. Non-socially responsible investment is calculated by subtracting socially responsible investment from the total institutional investment. An institutional investor is classified as a socially responsible institutional investor if they increase the holding when the proportion of female directors increases for the previous five years. Section 2 provides details on the definition of the main dependent and independent variables. Definitions of all control variables can be found in Appendix Table A1. All continuous variables are winsorized at the 1% and 99% levels. Numbers in parentheses represent t-statistics, with standard errors clustered by firm. Significance levels are denoted by *, **, and ***, indicating significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)
Dependent variable		Gender pay gap	
Institutional investment	0.011**		
	(1.98)		
Non-socially responsible		0.012**	
investment		(2.02)	
Proportion of			-0.028**
female board of directors			(-2.06)
log(Total employments)	0.078	0.078	0.103
	(0.51)	(0.50)	(0.67)
log(Firm age)	0.960**	0.961**	0.929**
	(2.41)	(2.41)	(2.33)
Net income/Assets	-0.024*	-0.024*	-0.019
	(-1.83)	(-1.84)	(-1.46)
log(Assets)	0.308**	0.307**	0.410***
	(2.41)	(2.40)	(3.23)
Book Leverage	-0.029***	-0.029***	-0.030***
	(-4.66)	(-4.66)	(-4.75)
Constant	15.31***	15.33***	14.21***
	(6.56)	(6.57)	(6.04)
SIC3*Year-fixed	Yes	Yes	Yes
State*Year-fixed	Yes	Yes	Yes
Adj-R-squared	0.35	0.35	0.35
N of firm-years	54,000	54,000	54,000

Table A.3: Proportion of females and socially responsible investment and female directors

The table presents regression results for the proportion of females with lagged socially responsible investment, female directors, and firm characteristics. The dependent variable is the number of female employees over total employment. Socially responsible investment of a firm is an aggregation of socially responsible institutional investors' holding in LSEG 13F Holding data divided by the number of shares outstanding. An institutional investor is classified as a socially responsible institutional investor if they increase the holding when the proportion of female directors increases for the previous five years. "1(Number of female directors $\geq$ 1)" equals one if there is at least one female director at the end of the previous year. Definitions of all control variables can be found in Appendix Table A1. All continuous variables are winsorized at the 1% and 99% levels. Numbers in parentheses represent t-statistics, with standard errors clustered by firm. Significance levels are denoted by *, **, and ***, indicating significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)
Dependent variable	Proportion of female employees		
[1] Socially responsible investment	-0.521***	-0.116	-0.147
	(-3.82)	(-1.45)	(-1.62)
[2] 1(Number of	4.219***	1.587***	1.518***
female directors $\geq$ 1)	(7.81)	(5.62)	(5.02)
[1] * [2]	0.089	0.028	0.065
	(0.53)	(0.30)	(0.61)
ln(Assets)	-0.278	-0.623***	-0.640***
	(-1.41)	(-4.75)	(-4.57)
ln(Employment)	-0.641***	-0.237	(0.251)
	(-2.61)	(-1.58)	(-1.57)
ln(Firm age)	-1.740***	0.811**	0.830**
	(-3.52)	(2.37)	(2.31)
Profitability	-0.057***	-0.002	-0.004
	(-3.12)	(-0.14)	(-0.30)
Leverage	0.163***	0.016**	0.015**
	(15.41)	(2.49)	(2.09)
Constant	46.6***	52.46***	52.99***
	(14.02)	(23.25)	(22.13)
SIC3-fixed	No	Yes	No
State-fixed	No	Yes	No
Year-fixed	No	Yes	No
SIC3*Year-fixed	No	No	Yes
State*Year-fixed	No	No	Yes
Adj-R-squared	0.06	0.7	0.69
N of firm-years	54,000	54,000	54,000

B Model Derivations

This appendix provides the full algebra underlying the equilibrium expressions and comparative statics used in Section 2. To keep notation light, throughout we write

$$\omega \equiv \omega(\lambda),$$

treating λ as predetermined within the period.

B.1 Bayesian updating: deriving the posterior mean $m(y, \tau)$ and pass-through $K(\tau)$

Prior and likelihood. The prior is

$$a \sim \mathcal{N}(0, \sigma^2),$$

and the public signal is

$$y = a + \varepsilon, \qquad \varepsilon \sim \mathcal{N}\left(0, \frac{1}{\tau}\right),$$

so the likelihood is

$$y \mid a \sim \mathcal{N}\left(a, \frac{1}{\tau}\right).$$

Posterior density. Bayes' rule implies

$$\begin{aligned} p(a \mid y) &\propto p(y \mid a)\, p(a) \\ &\propto \exp\left\{-\frac{\tau}{2}(y-a)^2\right\} \cdot \exp\left\{-\frac{1}{2\sigma^2}a^2\right\}. \end{aligned}$$

Combine terms in the exponent:

$$\begin{aligned} -\frac{\tau}{2}(y-a)^2 - \frac{1}{2\sigma^2}a^2 &= -\frac{\tau}{2}(y^2 - 2ay + a^2) - \frac{1}{2\sigma^2}a^2 \\ &= -\frac{\tau}{2}y^2 + \tau a y - \frac{1}{2}\left(\tau + \frac{1}{\sigma^2}\right)a^2. \end{aligned}$$

Ignoring the constant term $-\frac{\tau}{2}y^2$ (constant in a), we can write the kernel as

$$\exp\left\{\tau a y - \frac{1}{2}\left(\tau + \frac{1}{\sigma^2}\right)a^2\right\}.$$

Completing the square. Let the posterior precision be

$$\pi \equiv \tau + \frac{1}{\sigma^2}.$$

Then

$$\begin{aligned}\tau a y - \frac{\pi}{2}a^2 &= -\frac{\pi}{2}\left(a^2 - 2\frac{\tau y}{\pi}a\right) \\ &= -\frac{\pi}{2}\left[\left(a - \frac{\tau y}{\pi}\right)^2 - \left(\frac{\tau y}{\pi}\right)^2\right] \\ &= -\frac{\pi}{2}\left(a - \frac{\tau y}{\pi}\right)^2 + \frac{\pi}{2}\left(\frac{\tau y}{\pi}\right)^2.\end{aligned}$$

The last term is constant in a, so the posterior is Normal:

$$a \mid y \sim \mathcal{N}\left(\frac{\tau}{\tau + \sigma^{-2}}\, y,\ \ \frac{1}{\tau + \sigma^{-2}}\right).$$

Posterior mean and the Kalman gain. Define the posterior mean as

$$m(y, \tau) \equiv \mathbb{E}[a \mid y, \tau] = \frac{\tau}{\tau + \sigma^{-2}}\, y = \frac{\tau\sigma^2}{1 + \tau\sigma^2}\, y.$$

Define the pass-through (Kalman gain)

$$K(\tau) \equiv \frac{\tau\sigma^2}{1 + \tau\sigma^2} \in [0, 1). \tag{22}$$

Then

$$m(y, \tau) = K(\tau)\, y.$$

Expected perceived action given the true action. Since $\mathbb{E}[y \mid a] = a$,

$$\mathbb{E}[m(y, \tau) \mid a, \tau] = \mathbb{E}[K(\tau)y \mid a, \tau] = K(\tau)\mathbb{E}[y \mid a] = K(\tau)a. \tag{23}$$

B.2 Ex ante objective: expected price as a function of (a, τ)

The reduced-form price is

$$P = V_0 - \frac{\theta}{2}a^2 - \frac{\kappa}{2q}\tau^2 + \omega\, m(y, \tau).$$

Taking expectations conditional on (a, τ) and using (23),

$$\begin{aligned}\mathbb{E}[P \mid a, \tau] &= V_0 - \frac{\theta}{2}a^2 - \frac{\kappa}{2q}\tau^2 + \omega\, \mathbb{E}[m(y, \tau) \mid a, \tau] \\ &= V_0 - \frac{\theta}{2}a^2 - \frac{\kappa}{2q}\tau^2 + \omega\, K(\tau)a.\end{aligned}$$

Thus the firm-board objective is

$$\max_{a\geq 0,\ \tau\geq 0}\ V_0 - \frac{\theta}{2}a^2 - \frac{\kappa}{2q}\tau^2 + \omega\, K(\tau)a. \tag{24}$$

B.3 Stage 2: optimal action $a^*(\lambda, \tau)$ given τ

Fix $\tau \geq 0$. The a-dependent part of (24) is

$$-\frac{\theta}{2}a^2 + \omega K(\tau)a.$$

Differentiate with respect to a:

$$\frac{\partial}{\partial a}\left(-\frac{\theta}{2}a^2 + \omega K(\tau)a\right) = -\theta a + \omega K(\tau).$$

The first-order condition is

$$-\theta a + \omega K(\tau) = 0 \quad \Longrightarrow \quad a^*(\lambda, \tau) = \frac{\omega}{\theta}K(\tau).$$

Using $K(\tau) = \frac{\tau\sigma^2}{1+\tau\sigma^2}$ gives

$$a^*(\lambda, \tau) = \frac{\omega(\lambda)}{\theta} \cdot \frac{\tau\sigma^2}{1 + \tau\sigma^2}. \tag{25}$$

In particular, if $\tau = 0$ then $K(0) = 0$ and $a^*(\lambda, 0) = 0$.

B.4 Stage 1: board choice of τ (endogenous precision)

B.4.1 Step 1: substitute the best response $a^*(\lambda, \tau)$

Plug (25) into (24). The a-dependent terms become

$$\begin{aligned} -\frac{\theta}{2}a^{*2} + \omega K(\tau)a^* &= -\frac{\theta}{2}\left(\frac{\omega}{\theta}K(\tau)\right)^2 + \omega K(\tau)\left(\frac{\omega}{\theta}K(\tau)\right) \\ &= -\frac{\omega^2}{2\theta}K(\tau)^2 + \frac{\omega^2}{\theta}K(\tau)^2 \\ &= \frac{\omega^2}{2\theta}K(\tau)^2. \end{aligned}$$

Therefore the board solves

$$\max_{\tau \geq 0} \; V_0 - \frac{\kappa}{2q}\tau^2 + \frac{\omega^2}{2\theta}K(\tau)^2. \tag{26}$$

Dropping V_0 does not affect the argmax.

B.4.2 Step 2: compute $K'(\tau)$ and $K(\tau)K'(\tau)$

Recall

$$K(\tau) = \frac{\tau\sigma^2}{1+\tau\sigma^2}.$$

Differentiate:

$$K'(\tau) = \frac{\sigma^2(1+\tau\sigma^2) - (\tau\sigma^2)(\sigma^2)}{(1+\tau\sigma^2)^2} = \frac{\sigma^2}{(1+\tau\sigma^2)^2}.$$

Then

$$K(\tau)K'(\tau) = \left(\frac{\tau\sigma^2}{1+\tau\sigma^2}\right)\left(\frac{\sigma^2}{(1+\tau\sigma^2)^2}\right) = \frac{\tau\sigma^4}{(1+\tau\sigma^2)^3}. \tag{27}$$

B.4.3 Step 3: first-order condition for τ

Let

$$f(\tau) \equiv -\frac{\kappa}{2q}\tau^2 + \frac{\omega^2}{2\theta}K(\tau)^2.$$

Then

$$f'(\tau) = -\frac{\kappa}{q}\tau + \frac{\omega^2}{\theta}K(\tau)K'(\tau) = \tau\left[-\frac{\kappa}{q} + \frac{\omega^2\sigma^4}{\theta(1+\tau\sigma^2)^3}\right].$$

Thus $\tau = 0$ is always a stationary point. For an interior solution $\tau > 0$, the bracketed term must equal zero:

$$-\frac{\kappa}{q} + \frac{\omega^2\sigma^4}{\theta(1+\tau\sigma^2)^3} = 0 \quad \Longleftrightarrow \quad (1+\tau\sigma^2)^3 = \frac{\omega^2\sigma^4 q}{\theta\kappa}. \tag{28}$$

Define

$$A(\lambda, q) \equiv \frac{\omega(\lambda)^2\sigma^4 q}{\theta\kappa}. \tag{29}$$

Then (28) becomes

$$(1+\tau\sigma^2)^3 = A(\lambda, q),$$

so the interior candidate is

$$\tau^{\text{int}}(\lambda, q) = \frac{1}{\sigma^2}\left(A(\lambda, q)^{1/3} - 1\right). \tag{30}$$

B.4.4 Step 4: why there is a threshold (when $\tau^* = 0$ vs. $\tau^* > 0$)

From (30), $\tau^{\text{int}}(\lambda, q) > 0$ if and only if $A(\lambda, q) > 1$.

Define the bracketed term in $f'(\tau)$ for $\tau > 0$:

$$g(\tau) \equiv -\frac{\kappa}{q} + \frac{\omega^2\sigma^4}{\theta(1+\tau\sigma^2)^3}.$$

Note: (i) $g(\tau)$ is strictly decreasing in τ; (ii) $g(0) = \frac{\kappa}{q}\left(A(\lambda, q) - 1\right)$; (iii) $\lim_{\tau\to\infty} g(\tau) = -\kappa/q < 0$. Therefore:

- If $A(\lambda, q) \leq 1$, then $g(0) \leq 0$ and $g(\tau) < 0$ for all $\tau > 0$, so $f'(\tau) < 0$ for all $\tau > 0$ and the maximizer is the corner $\tau^*(\lambda, q) = 0$.
- If $A(\lambda, q) > 1$, then $g(0) > 0$ and $g(\tau) \to -\kappa/q < 0$ as $\tau \to \infty$, so there exists a unique $\tau > 0$ with $g(\tau) = 0$, which is the unique interior maximizer.

Putting the cases together,

$$\tau^*(\lambda, q) = \begin{cases} 0, & \text{if } A(\lambda, q) \leq 1, \\ \dfrac{1}{\sigma^2}\left(A(\lambda, q)^{1/3} - 1\right), & \text{if } A(\lambda, q) > 1. \end{cases} \tag{31}$$

B.5 Closed-form equilibrium $K(\tau^*)$ and $a^*(\lambda, q)$ on the active region

Assume $A(\lambda, q) > 1$, so $\tau^* > 0$. From (28),

$$(1 + \tau^*\sigma^2)^3 = A(\lambda, q) \quad \Longrightarrow \quad 1 + \tau^*\sigma^2 = A(\lambda, q)^{1/3}.$$

Then

$$K(\tau^*) = \frac{\tau^*\sigma^2}{1 + \tau^*\sigma^2} = \frac{A^{1/3} - 1}{A^{1/3}} = 1 - A^{-1/3}.$$

Substitute into $a^* = \frac{\omega}{\theta} K(\tau^*)$ to obtain

$$a^*(\lambda, q) = \frac{\omega(\lambda)}{\theta}\Big(1 - A(\lambda, q)^{-1/3}\Big), \qquad A(\lambda, q) = \frac{\omega(\lambda)^2\sigma^4 q}{\theta\kappa}, \tag{32}$$

valid on the active region $A(\lambda, q) > 1$. On the null region $A(\lambda, q) \leq 1$, we have $\tau^* = 0$ and therefore $a^* = 0$.

B.6 Comparative statics in the active region

Throughout, assume $A(\lambda, q) > 1$.

B.6.1 How a^* varies with precision (for fixed τ)

For fixed τ, from (25),

$$a^*(\lambda, \tau) = \frac{\omega}{\theta} K(\tau), \quad K'(\tau) = \frac{\sigma^2}{(1 + \tau\sigma^2)^2} > 0,$$

so

$$\frac{\partial a^*(\lambda, \tau)}{\partial \tau} = \frac{\omega}{\theta} K'(\tau) > 0, \qquad \frac{\partial a^*(\lambda, \tau)}{\partial \omega} = \frac{1}{\theta} K(\tau) > 0 \quad (\tau > 0).$$

B.6.2 How τ^* varies with q and ω

On $A(\lambda, q) > 1$, (30) implies

$$\tau^*(\lambda, q) = \frac{1}{\sigma^2}\left(\left(\frac{\omega(\lambda)^2\sigma^4 q}{\theta\kappa}\right)^{1/3} - 1\right),$$

hence

$$\frac{\partial\tau^*(\lambda, q)}{\partial q} > 0, \qquad \frac{\partial\tau^*(\lambda, q)}{\partial\omega} > 0.$$

B.6.3 Board quality amplifies the marginal effect of sustainable investor strength (complementarity)

Rewrite $A^{-1/3}$ as

$$A(\lambda, q)^{-1/3} = \left(\frac{\theta\kappa}{\sigma^4}\right)^{1/3} \omega(\lambda)^{-2/3} q^{-1/3}.$$

Define

$$B \equiv \left(\frac{\theta\kappa}{\sigma^4}\right)^{1/3}.$$

Then, on the active region,

$$a^*(\lambda, q) = \frac{\omega}{\theta}\left(1 - B\,\omega^{-2/3} q^{-1/3}\right) = \frac{1}{\theta}\left(\omega - B\,\omega^{1/3} q^{-1/3}\right).$$

Differentiate:

$$\frac{\partial a^*}{\partial\omega} = \frac{1}{\theta}\left(1 - \frac{B}{3}\omega^{-2/3} q^{-1/3}\right), \qquad \frac{\partial^2 a^*}{\partial q\,\partial\omega} = \frac{B}{9\theta}\omega^{-2/3} q^{-4/3} > 0.$$

Thus, in the active region, the marginal effect of sustainable-investor strength on action is larger when board quality is higher.

B.7 Mapping to the outcome (e.g., gender pay gap)

Suppose the empirical outcome satisfies

$$G = \bar{G} - \psi a + u, \qquad \psi > 0.$$

Then for any parameter x,

$$\frac{\partial \mathbb{E}[G]}{\partial x} = -\psi \frac{\partial a^*}{\partial x}.$$

In particular, on the active region:

$$\frac{\partial^2 \mathbb{E}[G]}{\partial q \, \partial \omega} = -\psi \frac{\partial^2 a^*}{\partial q \, \partial \omega} < 0,$$

so the (negative) sensitivity of the gender pay gap to sustainable investor strength becomes more negative when board quality is higher.

B.8 Forced disclosure / minimum precision ("forcing firms to talk")

Consider a rule imposing $\tau \geq \underline{\tau}$ for some $\underline{\tau} > 0$. Given any feasible τ, the best response remains

$$a^*(\lambda, \tau) = \frac{\omega(\lambda)}{\theta} K(\tau).$$

If the constraint binds, induced action is

$$a^{reg}(\lambda) = \frac{\omega(\lambda)}{\theta} K(\underline{\tau}) = \frac{\omega(\lambda)}{\theta} \cdot \frac{\underline{\tau}\sigma^2}{1 + \underline{\tau}\sigma^2} > 0 \quad \text{whenever} \quad \omega(\lambda) > 0.$$

Thus, minimum disclosure can restore real effects for firms that would otherwise choose $\tau^* = 0$.

C Auxiliary Results for the Dynamic Model

This appendix collects closed-form results for the two-period special case of the dynamic model in Section 6. Setting the horizon to $T = 2$ and shutting down the regulatory floor (i.e., letting $\underline{\tau} = 0$ in this subsection) yields a backward-induction problem with explicit period-2 value, an explicit period-1 effective wedge, and three sharp propositions on the qualitative content of the forward-looking machinery. All economic assumptions and notation are inherited from Section 6; for brevity we write $\omega(\lambda) \equiv \omega_0 \lambda$ for the within-period wedge.

C.1 Two-period closed form

Period-2 policies and value. Period 2 is the static problem of Section 2 with state λ_2. Define the activity index $A(\lambda, q) \equiv \omega(\lambda)^2 \sigma^4 q/(\theta\kappa)$. Optimal policies on the unconstrained problem are

$$\tau_2^*(\lambda_2; q) = \frac{1}{\sigma^2}\Big(A(\lambda_2, q)^{1/3} - 1\Big)\mathbf{1}_{\{A>1\}}, \qquad a_2^*(\lambda_2; q) = \frac{\omega(\lambda_2)}{\theta}\Big(1 - A(\lambda_2, q)^{-1/3}\Big)\mathbf{1}_{\{A>1\}}. \tag{33}$$

On the period-2 active region $A(\lambda_2, q) > 1$, the optimized period-2 payoff (net of V_0) reduces to

$$V_2(\lambda_2; q) = \frac{\omega(\lambda_2)^2}{2\theta} K(\tau_2^*)^3 = \frac{\omega(\lambda_2)^2}{2\theta}\Big(1 - A(\lambda_2, q)^{-1/3}\Big)^3. \tag{34}$$

The cubic in $K(\tau_2^*)$ reflects savings on both the action and the precision cost relative to the inactive benchmark. The derivation is in Section C.3 below.

Period-1 effective wedge. The period-1 first-order conditions reduce to the static problem of Section 2 with $\omega(\lambda_1)$ replaced by the recursive effective wedge

$$\widetilde{\omega}(\lambda_1; q) \;=\; \omega(\lambda_1) + \beta\gamma\, V_2'\big((1-\rho)\bar{\lambda} + \rho\lambda_1 + \gamma K(\tau_1) a_1; q\big), \tag{35}$$

which is a one-dimensional fixed point in $\widetilde{\omega}$ given λ_1. Once $\widetilde{\omega}$ is determined, the period-1 policies inherit the closed-form structure of (33) with $\omega(\lambda_1)$ replaced by $\widetilde{\omega}(\lambda_1; q)$ throughout.

C.2 Three propositions

Proposition D1 (Anticipation premium). *Whenever the firm anticipates entering the period-2 active region for some realization of λ_2, $\widetilde{\omega}(\lambda_1; q) > \omega(\lambda_1)$. Therefore period-1 disclosure and action are weakly higher than in the static benchmark, and the period-1 active region strictly contains the static active region.*

Proposition D2 (Path dependence and the low-information trap). *In the unconstrained limit $\underline{\tau} = 0$, for a non-empty range of parameters and starting states λ_1, two distinct two-period paths are consistent with optimization: a low-information trap with $(\tau_t^*, a_t^*) = (0, 0)$ in both periods, and an active path with positive disclosure and action in both periods. Two firms with identical primitives and identical λ_1 may rationally follow different paths. Introducing a strictly positive regulatory floor $\underline{\tau} > 0$ selects the active path uniquely whenever the floor is large enough to lift the firm's continuation value above the trap.*

Proposition D3 (Dynamic policy levers). *Both higher board quality q and a higher regulatory floor $\underline{\tau}$ shift the period-1 active-region threshold inward by strictly more than they shift the static threshold. The dynamic policy multiplier is at least as large as the static multiplier and is strictly larger whenever the period-2 active region is non-empty.*

The qualitative content of these three results extends to the infinite-horizon model in Section 6: anticipation cumulates across all future periods; multiplicity in the unconstrained limit is a property of the recursive equilibrium; and both policy multipliers compound with the discount factor. The regulatory floor introduced in Section 2 eliminates the equilibrium multiplicity of Proposition D2 and turns the comparative-statics result of Proposition D3 into a sharp counterfactual: tightening $\underline{\tau}$ has a larger general-equilibrium effect on action than the partial-equilibrium static derivative would suggest.

C.3 Auxiliary derivations

Closed form for the period-2 value. On the period-2 active region, $1 + \tau_2^* \sigma^2 = A(\lambda_2, q)^{1/3}$, so $K(\tau_2^*) = 1 - A^{-1/3}$. The period-2 value (net of V_0) is

$$\begin{aligned} V_2(\lambda_2; q) &= -\frac{\theta}{2}(a_2^*)^2 - \frac{\kappa}{2q}(\tau_2^*)^2 + \omega(\lambda_2)\, K(\tau_2^*)\, a_2^* \\ &= \frac{\omega(\lambda_2)^2}{2\theta}\, K(\tau_2^*)^2 - \frac{\kappa}{2q\sigma^4}\left(A^{1/3} - 1\right)^2 \\ &= \frac{\omega(\lambda_2)^2}{2\theta}\, K(\tau_2^*)^3, \end{aligned}$$

where the last line uses $\kappa/(q\sigma^4) = \omega(\lambda_2)^2/(\theta A)$ from the definition of A.

Proof of Proposition D1. By (35), $\widetilde{\omega}(\lambda_1; q) - \omega(\lambda_1) = \beta\gamma\, V_2'(\widetilde{\lambda}_2; q) \geq 0$ with strict inequality when $V_2' > 0$. Period-1 policies inherit the static closed forms in $\widetilde{\omega}$-space; they are increasing in $\widetilde{\omega}$ on the active region and zero on the inactive region. Hence the active region in $\widetilde{\omega}$-space contains the active region in ω-space. □

Proof of Proposition D2. Restrict attention to $\underline{\tau} = 0$. Choose primitives such that $A(\lambda_1, q) < 1$ but close to 1. The static equilibrium has $\tau_1^* = a_1^* = 0$. In the dynamic problem, equation (35) admits two solutions: a trap $(\tau_1, a_1) = (0, 0)$ with $\widetilde{\omega} = \omega(\lambda_1)$ and $\widetilde{A} < 1$ consistent with optimality of the trap; and an active candidate $(\tau_1, a_1) \gg 0$ with $\widetilde{\lambda}_2$ above the period-2 activity threshold, so $V_2' > 0$ and $\widetilde{\omega} > \omega(\lambda_1)$ supports active period-1 policies. By continuity in parameters, a non-empty open set supports both equilibria. With $\underline{\tau} > 0$, the period-2 value at the trap candidate is strictly positive because $K(\underline{\tau}) > 0$ generates a positive baseline action; the trap candidate then fails to be consistent with $\widetilde{A} < 1$ as soon as $\underline{\tau}$ is sufficiently large. □

Proof of Proposition D3. By the envelope theorem applied to the period-1 problem, $\partial a_1^*/\partial\zeta$ for $\zeta \in \{q, \underline{\tau}\}$ contains a within-period term identical to $\partial a_2^*/\partial\zeta$ plus a dynamic term proportional to $\partial V_2'/\partial\zeta \geq 0$. V_2' is increasing in q on the active region by direct differentiation of (34) and increasing

in $\underline{\tau}$ on the previously inactive region by activation of $K(\underline{\tau}) > 0$ in the period-1 expectation of λ_2. The same envelope argument applies to τ_1^*. $\square$