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# Power of values-based investors on ESG actions of value-orientated managers*

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## Abstract

This study examines how for-profit firms obtain capital from values-based, socially responsible investors by undertaking environmental, social, and governance (ESG) actions within a search model. In this model, the two parties are matched and benefit from informational advantages throughout the search process. The paper shows that an increase in the number of socially responsible investors encourages the for-profit firms capable of taking ESG actions to consistently take such actions, even if doing so may result in negative marginal pecuniary returns. Consequently, the paper concludes that regulators aiming to encourage firms to adopt more ESG actions should incentivize investors to prioritize ESG performance in their investment decisions. It also demonstrates that strengthening shareholder rights or promoting corporate governance reforms does not necessarily motivate firms to pursue ESG actions.



**JEL Classification:** D83, G23, G32, M14.

**Keywords:** ESG, search, social impact, socially responsible investor, competitive capital market, bargaining, value versus values motivations.

## 1. Introduction

This paper attempts to provide a theoretical model to investigate pressing questions the financial research community faces regarding the relationship between investors' environmental, social, and governance (ESG) priorities and firms' ESG actions, by employing a search model in which socially responsible investors (SRIs) search for value-oriented firms to be matched with. By matching with each other, socially responsible investors and the matched firms gain informational advantages over other players in the competitive capital market. When they are matched, the investors and the firms endogenously undertake bilateral bargaining; however, if the search or bargaining fails, both parties have no choice but to randomly find a match in the competitive capital market. This setting captures the reality in which SRIs often spend time and effort to find firms that value financial performance but also have the technology to improve their ESG performance, and when they are matched, they negotiate their shares of the total product.[1] [2]

In her 2023 Presidential Address, Starks (2023) distinguishes between values- and value-oriented players in financial markets with ESG concerns. Values-oriented investors or firms view the ESG qualities of an investment as aligning with nonpecuniary factors, while value-oriented investors or firms perceive the ESG qualities of an investment as integral to its financial value. This paper studies how values-oriented investors can influence value-oriented firms to actively take ESG actions. Therefore, to shed light on this aspect, the players in this paper are limited to the investors and the firms. All firms are value-oriented, but I distinguish them into two types: those that have the technology to improve ESG performance and hence can take ESG actions if they find it worthwhile to do so (hereafter referred to as G-firms), and those without such technology and hence only pursue financial performance (hereafter referred to as B-firms). Investors are either values-oriented, so-called SRIs, or value-oriented, so-called for-profit investors (hereafter referred to as FPIs).

[1] Typically, in practice, private equity placements by institutional investors such as private equity funds, book-building and selling processes in initial and seasoned equity offerings, allocating newly issued shares to SRIs, and trading equities in the over-the-counter market follow these processes. Moreover, the model can represent green bonds traded in the over-the-counter market if we do not consider the costly engagement efforts investors make at a later stage (none of the results in the paper are affected by removing the engagement effort stage). Indeed, some green bonds are traded in the over-the-counter market or by private negotiations between investors and firms (See Green Bond Market Summary).

[2] For illustrative purposes, Figure 2 from Feldhutter et al. (2024) demonstrates the significant growth in the issuance of sustainability-linked bonds during 2018–2024, which can, to some extent, indicate the growth of ESG investments.

It is assumed that there are always more firms than investors, and only SRIs conduct the search to match themselves with one of the G-firms. In fact, even if FPIs also conduct search activities, the main results in this paper remain unchanged. The SRIs that fail in the search or bilateral bargaining and all FPIs randomly match with the G- or B-firms in the competitive capital market.

In this setting, the first question I attempt to answer is, do G-firms increase their ESG activities/investments if the proportion of SRIs rises in the market? This question is timely as the world is experiencing growth in socially responsible capital. The second question is, will an increase in the bargaining power of socially responsible investors impact the ESG activities/investments of G-firms? The background of this second question is the increasing influence of investors on firms' governance, which could be triggered by, for example, the increase in the equity share of institutional investors and governance reform in the US, while for Japan it is not only the increase in the equity share of institutional investors but also the recent reduction of the cross-shareholdings in Japanese firms.[3]

These two questions are examined in two different models. The first one, which is referred to as the basic model in this paper, investigates the abovementioned questions in a setting in which SRIs search for G-firms but with a cost that is constant, which is set as zero (0) for simplicity. The incentive for the SRIs is that matching allows them to capture more surplus through the search of G-firms. The other model, which is an extension of the basic model, is only different from the basic model in that the model explicitly incorporates nonconstant search costs for SRIs.

The structure of the basic model is as follows. Two types of investors, SRIs and FPIs, both pursue financial value, but the SRIs also pursue positive ESG performance. Two types of firms, G-firms and B-firms, are both value-oriented, each constrained by financial limitations and seeking capital for a project. Only G-firms have the technology to invest in activities with ESG outcomes, which is hereafter referred to as "ESG actions." As B-firms have no such technology, they do not undertake any ESG actions and are not affected by the ESG actions of G-firms. Initially, investors do not know whether a firm is G- or B-type. G-firms benefit by negotiating with the SRIs, and they do not gain any extra profits by entering the competitive capital market. They undertake ESG actions prior to the matching process, which affects their pecuniary and ESG performances in a

[3]See Nomura (2024).

later stage, where both types form the expected total product in the negotiation. If an SRI encounters a G-firm during the search process, the SRI evaluates the firm's ESG actions from a values-oriented perspective. Knowing this, when determining the level of their ESG actions, G-firms must consider the extent to which these actions could incrementally enhance their total products, because the greater the number of ESG actions, the greater the surplus they capture through bargaining with SRIs.

The SRIs and G-firms that fail in bargaining subsequently turn to the competitive capital market in which they are randomly matched with partners. This means the SRI could match with either a G- or B-firm, and the G-firm could match with either an SRI or FPI. However, in the competitive capital market, they cannot identify the type of investors or firms prior to forming partnerships. Consequently, the expected payoff for SRIs (G-firms) is modeled as a combination of two possibilities: one in which they match with a G-firm (an SRI) through the initial search & matching process, and another in which they match with either a G-firm or a B-firm (an SRIs or FPIs) in the competitive capital market. In the former case, the SRI and the G-firm negotiate the distribution of their payoffs through generalized Nash bargaining due to their information advantages.

The first main result of the basic model is that an increase in the number of SRIs consistently raises G-firms' ESG actions, regardless of whether this increase in ESG actions marginally enhances or reduces the pecuniary returns of the G-firms. The second main result is that increasing the bargaining power of SRIs decreases G-firms' ESG actions.

The intuition for the increase in the G-firms' ESG actions caused by the increase in the amount of socially responsible capital is explained by the G-firms' incentives in both the search & matching stage and the competitive capital market stage. The latter involves the threat point or the disagreement payoffs of G-firms and SRIs, which are endogenously determined in the model.[4] To start with, in the search & matching stage, more SRIs in the market imply an increase in the probability of matching with an SRI and entering negotiations. Then, for each G-firm, it is worthwhile to increase ESG actions so that the total product to be split between itself and the SRI will be as large as possible. In short, investing in larger ESG actions increases a G-firm's expected payoff. Next, in the

[4]The disagreement payoffs for the G-firms and SRIs are the expected payoffs obtained in the competitive capital market. As there are always more firms than investors, the disagreement payoff for a G-firm is zero (0). The disagreement payoff for an SRI is the weighted average of the expected payoff for matching with a G-firm and the expected payoff for matching with a B-firm.

competitive capital market stage, the SRIs who did not match or failed in bargaining with the G-firms face fewer G-firms. This is because G-firms are likely to have been matched in the search process when the number of SRIs increases. With less probability of matching with G-firms, an increase in the number of ESG actions reduces the SRI's marginal disagreement payoff, thereby lowering the SRI's bargaining position.[5] From these two effects, an increase in the number of SRIs always increases the number of ESG actions of G-firms.

The intuition for the second result for the basic model is straightforward in that if the bargaining power of the SRI increases relative to that of the G-firms, then a larger portion of the total product will be taken by the SRI in the negotiation. Therefore, the increase in the bargaining power of the SRIs reduces the incentive for G-firms to invest in ESG actions.

In the extended model, in which SRIs exert costly search effort, we consider the effect of two parameters, the number of SRIs and the bargaining power of the SRIs, and conduct comparative statics on two variables: ESG actions of the G-firms and the search efforts of the SRIs. The result is that an increase in the number of SRIs enhances both the ESG actions and the search efforts under three conditions: if the SRIs' bargaining power is sufficiently large; if the matching intensity without SRIs' search efforts is high; and if the ratio of the SRIs to all firms is relatively low. However, under the extended model, an increase in SRIs' bargaining power does not necessarily reduce G-firms' ESG actions or SRIs' search efforts.

The intuition for the results in the extended model appears in how the key parameters impact G-firms' expected marginal surplus with respect to ESG actions and SRIs' expected marginal surplus with respect to search efforts, as the only difference between the extended and basic models lies in SRIs' search efforts.[6]

For the effect of an increase in the number of SRIs, G-firms' expected marginal surplus with respect to the number of ESG actions increases. It also increases SRIs' expected marginal surplus with respect to search efforts if the abovementioned three conditions hold. As the change in the parameter affects these two endogenous variables—the ESG

[5] Recall that B-firms do not undertake ESG actions, nor are they affected by the ESG actions of the G-firms.

[6] The expected marginal surplus is defined as the difference between the expected marginal product and the expected disagreement payoff.

action and the bargaining power—together, these two variables interact with each other. However, the results are the same as the case in which the parameter affects each variable independently. That is, both the ESG actions and the search efforts increase as long as the abovementioned three conditions hold.

For the effect of an increase in the bargaining power of the SRIs on the ESG actions of G-firms and the search effort of the SRIs, the result is ambiguous. The results also depend on the effect on G-firms' expected marginal surplus with respect to ESG actions and SRIs' expected marginal surplus with respect to search efforts. Indeed, as SRIs gain more bargaining power, G-firms' expected marginal surplus with respect to ESG actions decreases, whereas SRIs' expected marginal surplus with respect to search efforts increases. Given the interaction between the effects of ESG actions and search efforts, these opposing forces create a complex dynamic.

Finally, the findings on the increase in the number of SRIs carry several policy implications. If SRIs' search efforts are not a significant factor, a regulator aiming to encourage G-firms to increase ESG actions may consider implementing policies that motivate SRIs to pay closer attention to the ESG performance of G-firms. Even if SRIs' search efforts must be considered, the regulator may still implement policies that encourage SRIs to be more attentive to G-firms' ESG performance, particularly if SRIs hold significant bargaining power, the matching intensity (without SRIs' efforts) is high, and the ratio of socially responsible capital to all firms remains relatively low. This approach mirrors a current trend in practice, where regulators support the activities of nongovernmental organizations (NGOs) and nonprofit organizations (NPOs) aligned with ESG and sustainable development goals (SDGs).

However, the findings on the increase in SRIs' bargaining power suggest some caution regarding regulatory policies that grant SRIs greater influence over firms—for example, corporate governance reform policies and the strengthening of shareholder rights—if SRIs' search efforts are not negligible.

The remainder of this paper is organized as follows. Section 2 reviews the existing literature. Section 3 describes the basic model. Section 4 characterizes the equilibrium of the basic model, and Section 5 discusses the comparative static results. Section 6 extends the basic model by considering the search effort of SRIs. Section 7 concludes the paper. The proofs for all the propositions, corollaries, and lemmas are provided in the Appendix.

## 2. Literature

The model presented in this paper contributes to the existing theoretical studies on sustainable investing and its implications for socially responsible investors. Pástor, Stambaugh, and Taylor (2021) derive an ESG factor in an equilibrium asset pricing model, highlighting that sustainable investing can have a positive social impact by encouraging firms to adopt greener practices and directing real investment toward environmentally friendly firms. Chen (2024) develops a model that considers how firms' incentives for green transition and greenwashing are influenced by ESG investors. Chen demonstrates that when ESG information is easily manipulable while financial information is not, stronger preferences for ESG among investors may lead to increased greenwashing and a reduction in actual ESG actions. Adachi-Sato and Osano (2024) investigate the engagement roles of sustainable and passive fund managers, especially in their efforts to attract capital from SRIs. Their study sheds light on the fund ownership effect caused by different types of fund managers interacting with different types of investors and derives the implications for sustainable investing.

Several studies have explored the impact of SRIs on equilibrium allocation when firms face financing constraints and seek funds from both SRIs and traditional FPIs. Chowdhry, Davies, and Waters (2019) show that to mitigate project owners' incentives to prioritize profits excessively, SRIs must hold financial claims if the project owners cannot commit to social aims while raising capital solely from FPIs. Examining the situation in which socially responsible and commercial investors compete to finance for-profit entrepreneurs, Green and Roth (2021) delineate strategies for SRIs that result in high social welfare and financial returns. Oehmke and Opp (2024) investigate the optimal financial arrangement for a socially responsible fund engaging with entrepreneurs interested in ESG, and they delineate the conditions under which a socially responsible fund incentivizes entrepreneurs to mitigate externalities, even in cases where for-profit financial capital is readily available. Their analysis reveals that overall surplus is typically maximized in an economy with a balanced presence of socially responsible and for-profit financial capital. This finding suggests that socially responsible and for-profit financial investors mutually complement each other.

Bisceglia, Piccolo, and Schneemeier (2023) examine the situation in which both socially

responsible and purely profit-motivated investors invest in firms' shares. They find that investors' ownership holdings affect firms' corporate social responsibility investments by shaping firms' ownership structures and objective functions. According to their findings, investments made by socially responsible investors tend to generate product market power and crowd out the green investments of firms excluded from SRIs ' portfolios. Consequently, if the crowding-out effect predominates, firms' overall green investments and welfare are higher in the absence of socially responsible investors.[7] Landier and Lovo (2024) analyze how investors' preferences, production technologies, and capital market frictions affect the size, emission threshold, and investment policies of socially responsible funds. They find that a firm's incentive to mitigate negative externalities grows with the amount of available socially responsible capital. However, while their research examines search and matching frictions (capital market frictions) between firms and FPIs, it does not consider these frictions between firms and SRIs.

By contrast, this study considers a situation where the search and matching activities of SRIs and firms provide them with informational advantages over other agents in the competitive capital market, including for-profit firms with no ESG technology and FPIs. These informational advantages allow ESG-action firms to negotiate with SRIs who seek both financial returns and social impact. Within this framework, the study illustrates that an expansion of socially responsible capital can incentivize firms to increase their ESG actions, even though their actions may decrease their financial returns. Even if SRIs incur costs when searching for matches with firms, the growth of socially responsible capital can still lead to an increase in firms' ESG actions under certain conditions. This study is also the first to examine how SRIs' bargaining power influences firm management. In addition, it models "value versus values" motivations in sustainable finance, as discussed by Starks (2023).

## 3. Basic Model

The economy consists of four groups of agents: value-oriented firms with the technology to take ESG actions (G-firms), value-oriented firms with no technology to take ESG

[7]Heinkel, Kraus, and Zechner (2001); Edmans, Levit, and Schneemeier (2022); and Broccardo, Hart, and Zingales (2022) examine the problem of divestment. When a social planner sets a minimum susceptibility standard that all investments and production must satisfy, Inderst and Opp (2022) ask whether such labeling is socially optimal.

actions (B-firms), values-oriented socially responsible investors (SRIs), and value-oriented for-profit investors (FPIs). Time $t$ is 0–5. All players are risk-neutral. The presence of a safe asset normalized to deliver a zero total net product is assumed. This section presents the basic model that characterizes the optimal ESG action decisions of the G-firms. In Section 6, the model is extended in which the SRIs choose the search effort.

**3.1. Preferences and technology.—**

There is a measure $S$ of SRIs whose investment strategy considers not only financial performance but also social impact/performance. A measure $P$ represents FPIs, who are purely interested in financial performance. It is assumed that $S + P = N$, where $N$ is a fixed measure of investors. Each investor is given one unit of capital but lacks the skill to run a firm.

There is a measure $\zeta F$ of G-firms and a measure $(1-\zeta)F$ of B-firms, where $\zeta \in (0, 1)$. The key difference between G- and B-firms is that G-firms can take ESG actions $e$ at $t = 0$, which increase social impact and affect pecuniary returns, whereas B-firms cannot. It is assumed that the measure of firms is larger than the measure of investors, namely, $F > N$, and that the measure of G-firms is larger than the measure of SRIs, namely, $\zeta F > S$. Each type of firm requires one unit of capital to start a project but is not endowed with capital.[8] If a firm cannot raise capital, its payoff is 0. However, if a firm receives the requisite capital, it produces publicly observable pecuniary returns $\pi \geq 0$ and publicly observable social impact $w \geq 0$ at the final stage.

Pecuniary returns exclusive of capital cost, $\pi$, are a function of the ESG actions of a G-firm, $e \geq 0$. Social impact, $w$, is an increasing function of $e$ and the ESG engagement effort of an SRI, $a \geq 0$, at $t = 4$. Specifically, I assume that $\pi(e) = \pi_0 + \pi_1 e$ and $w(e, a) = w_0 + w_1 e + w_2 a$, where $\pi_0 > 0$, $w_0 > 0$, $w_1 > 0$, and $w_2 > 0$. As the firm's ESG actions $e$ may lead to either $\pi_1 \geq 0$ or $\pi_1 < 0$, the sign of $\pi_1$ is not predetermined. However, for simplicity, the marginal total product of the G-firms is assumed to be positive, $\pi_1 + w_1 > 0$, indicating that $\pi + w$ increases with $e$.[9] A G-firm taking ESG actions $e$ bears a cost $c_F(e)$, where $c_F(0) = 0$, $c_F'(e) > 0$, $c_F''(e) > 0$, $\lim_{e\to 0} c_F'(e) = 0$, and $\lim_{e\to\infty} c_F'(e) = \infty$.[10]

[8] The G-firm has only a limited amount of funds that enables it to pay for the cost of ESG actions.

[9] If this assumption is not satisfied, all G-firms will refrain from taking ESG actions. To avoid this trivial case, I impose this assumption.

[10] I assume that $\pi$ is not necessarily decreasing in $e$ and that $\pi$ is linear in $e$. As a result, I require

Similarly, an SRI takes the ESG engagement effort and incurs a cost $c_S(a)$, where $c_S(0) = 0$, $c'_S(a) > 0$, $c''_S(a) > 0$, $\lim_{a\to 0} c'_S(a) = 0$, and $\lim_{a\to\infty} c'_S(a) = \infty$. By contrast, because a B-firm cannot take any ESG actions, its pecuniary returns are $\pi_0$ and its social impact is $w_0$, that is, $\pi_1 = w_1 = w_2 = 0$ holds for the B-firms.[11]

**3.2. Timeline of the model and information structure.—**

At the beginning of $t = 0$, a G-firm selects an ESG action level $e \geq 0$ to maximize its expected payoff less the ESG action cost. At $t = 1$, SRIs undertake search activities to identify firms engaged in ESG-related initiatives, with a particular focus on locating G-firms. If the two parties successfully connect, they negotiate the distribution of the firm's project returns at $t = 2$. This negotiation involves the total product, defined as the sum of pecuniary returns, $\pi$, and the social impact benefiting the SRI, $w$. The rationale for this bargaining procedure is discussed in Section 3.3. If the two parties do not find one another, they find a partner randomly in the competitive capital market. At $t = 2$, the remaining G-firms and all B-firms can be randomly matched with the remaining SRIs and all FPIs in the competitive capital market. The B-firms continuously raise funds for their projects through the competitive capital market. FPIs, focused exclusively on financial performance, do not engage in search activities relative to ESG issues; instead, they participate directly in the competitive capital market to allocate their funds to firms.[12] Then, at $t = 3$, each firm begins the project with the capital provided by investors. At $t = 4$, if an SRI is matched with a G-firm, regardless of whether they bargain with the G-firm or meet the G-firm in the competitive capital market, the SRI chooses an engagement effort level $a \geq 0$ to the firm to maximize their payoff. Finally, at $t = 5$, the project's total product is realized, and all agents receive their respective payoffs.

To achieve equilibrium in this model timeline, the following two points must be verified: (i) SRIs have the incentive to search for G-firms at $t = 1$; (ii) even if an SRI searches and identifies a B-firm at $t = 2$, the SRI has no incentive to engage in bargaining with the B-firm. These two points are addressed at the end of Section 4.2, following the discussion

$c_F(e)$ to be increasing and convex in $e$.

[11] However, even if the social impact of B-firms can be improved through the engagement efforts of SRIs, meaning $w_2 > 0$ holds for the B-firms, all results in this paper remain valid.

[12] In fact, even if FPIs engage in search activities, the main results remain unchanged if $(1-\zeta)F > P\lambda_P$, where $\lambda_P$ represents the matching intensity of FPIs. To simplify the analysis, I assume that FPIs directly participate in the competitive capital market.

of the bargaining problem.

The information structure of the model is as follows. It is assumed that neither SRIs nor FPIs initially recognize any firm's type. Specifically, if an SRI engages in search activities at $t = 1$, they can only identify a firm's type after being matched with it. However, if both the SRI and the FPI enter the competitive capital market at $t = 2$, they can only identify a firm's type after being matched with a firm in the competitive capital market.[13] In addition, when both the SRI and the FPI are matched with a G-firm, they can observe the G-firm's ESG action level upon identifying the type of firm. Conversely, once a firm is matched with an investor, it can also identify the investor's type. This final assumption is justified if SRIs need to specify their investment strategy to attract funding.

**3.3. Search and bargaining with the competitive capital market.—**

This subsection characterizes two processes. First, it characterizes the process in which SRIs must exclusively search for G-firms to finance their required capital, and second, it characterizes the competitive capital market. I start with the first process by assuming that an SRI is randomly matched with a G-firm undertaking an ESG action $e$ with a probability $\frac{S}{\zeta F}\lambda$, where $\lambda \in (0, 1)$ represents the matching intensity.

After an SRI is matched with a G-firm, the two parties negotiate the distribution of the sum of the firm's total products through generalized Nash bargaining. This paper considers search frictions wherein SRIs exclusively search for G-firms outside the competitive capital market. Search frictions make it challenging for each SRI to find suitable investment opportunities. Hence, once an SRI matches with a G-firm, the SRI does not wish to fail in the bargaining process with the G-firm, enabling the G-firm to capture a portion of the value on the bargaining table.[14] Indeed, search frictions outside the competitive capital market provide G-firms with an informational advantage over SRIs and create bilateral bargaining situations. In practice, if SRIs and G-firms engage in transactions through private equity placements by institutional investors—such as private equity

[13] Alternatively, this paper could assume that an investor entering the competitive capital market cannot identify a firm's type. Although this assumption complicates the analysis, the main conclusions in this paper remain unchanged.

[14] Note that G-firms only receive zero if they match with the investors in the competitive capital market, as defined at the threat point. This is described in the last paragraph of this subsection, where the competitive capital market is formalized. Therefore, entering the bargaining process with the SRIs is a rational choice for the G-firms as well.

funds, book-building and selling processes in initial and seasoned equity offerings, allocating newly issued shares to SRIs, or trading equities and bonds in the over-the-counter market—the trading process inevitably involves bilateral bargaining between the participants.[15] Thus, these aspects are modeled as a generalized Nash bargaining process.

If an SRI is matched with a G-firm upon successful search, the two parties negotiate the distribution of the project's total pecuniary returns and social impact through generalized Nash bargaining. The pecuniary amount paid to the G-firm as compensation for the social impact is determined through this bargaining process. This setup implies that the G-firm evaluates ESG actions based solely on their financial value, while the SRI values these actions for both their pecuniary and nonpecuniary benefits. Notably, the G-firm's interest is confined to the pecuniary return, $\pi(e)$, rather than the social welfare, $w(e)$. As a result, the SRI transfers a portion of their pecuniary returns to the G-firm while retaining all social welfare benefits.[16]

A G-firm holds bargaining power of $1-\beta \in (0,1)$ when negotiating with an SRI, while the SRI's bargaining power is $\beta$. If bargaining fails, the G-firm's outside option is to raise capital in the competitive capital market, and the SRI's outside option is to invest funds there.

In the second process, the competitive capital market is formalized. As described, in this market, unmatched G-firms from $t=1$ and all B-firms can seek funding for their projects at $t=2$, whereas unmatched SRIs from $t=1$ and all FPIs invest their funds in firms at $t=2$. However, because $N<F$, some of the unmatched G-firms from $t=1$ and B-firms face the risk of failing to secure financing. In addition, unmatched SRIs from $t=1$ and FPIs do not recognize in advance whether they will be matched with G-firms or B-firms. This uncertainty is resolved after these investors are matched with firms in the competitive capital market. Consequently, I assume that the payoffs for all firms in the competitive capital market are set to zero. This implies that all project surpluses generated by these firms are fully captured by investors in the competitive capital market.

[15] The model in this paper can represent green bonds traded in the over-the-counter market or private negotiations between investors and firms. See footnote 1.

[16] We assume that the pecuniary payoff of the SRI attained in this bargaining is positive because $\pi(e)$, in particular, $\pi_0$, is sufficiently large.

## 4. Equilibrium

In the subsequent analysis, the equilibrium decisions of each agent are derived. First, the maximization problem of the SRI with respect to an ESG engagement effort at $t = 4$ is derived. This is the case in which the SRI is matched with a G-firm in the competitive capital market at $t = 2$. Next, the bargaining problem between a G-firm and an SRI at $t = 2$ when the SRI successfully locates the G-firm at $t = 1$ is examined. In this problem, I also solve the maximization problem of the SRI with respect to the ESG engagement effort at $t = 4$ after bargaining at $t = 2$. Finally, the maximization problem of a G-firm with respect to the ESG action decision at $t = 0$ is examined.

### 4.1. SRI's ESG engagement decision in the competitive capital market.—

This subsection discusses the maximization problem of an SRI after they are matched with a G-firm in the competitive capital market at $t = 2$. In the competitive capital market, where the SRI captures all the surplus generated by the project of the G-firm, the maximization problem of the SRI is represented by

$$\max_{a \geq 0} \pi_0 + \pi_1 e + w_0 + w_1 e + w_2 a - c_S(a). \tag{1}$$

Hence, the first-order condition for problem (1) is given by

$$w_2 - c_S'(a) = 0. \tag{2}$$

From $w_2 > 0$ and the assumption of $c_S(a)$, the solution to (1) is positive and satisfies the second-order condition. Let $a^*$ denote the optimal solution that satisfies (2). Then, it follows from $\pi_0 > 0$, $w_0 > 0$, $w_2 > 0$, $\pi_1 + w_1 > 0$, $e \geq 0$, and the assumption of $c_S(a)$ that

$$\pi_0 + \pi_1 e + w_0 + w_1 e + w_2 a^* - c_S(a^*) > 0 \text{ and } w_2 a^* - c_S(a^*) > 0. \tag{3}$$

### 4.2. Bargaining process between a G-firm and an SRI.—

In this subsection, the bargaining problem between a G-firm and an SRI when the SRI successfully locates the G-firm at $t = 1$ as well as the SRI's maximization problem concerning the ESG engagement effort at $t = 4$ are examined. To proceed, the disagreement

points for both the G-firm and the SRI need to be defined. If bargaining fails, these agents turn to the competitive capital market. Consequently, the G-firm's disagreement point is 0, regardless of whether it encounters an SRI, an FPI, or no investors in the competitive capital market. Conversely, the SRI will always meet a G-firm or a B-firm in the competitive capital market because the measure of investors is smaller than the measure of firms. Given that the SRI captures all the surplus generated by the firm's project, their expected payoff $v(e, a^*)$ is represented by

$$v(e, a^*) = \frac{\zeta F - S\lambda}{F - S\lambda} \left[\pi_0 + \pi_1 e + w_0 + w_1 e + w_2 a^* - c_S(a^*)\right] + \frac{(1-\zeta)F}{F - S\lambda}(\pi_0 + w_0), \quad (4)$$

where the first term (second term) is their expected payoff when meeting a G-firm (B-firm) in the competitive capital market. Note that $\frac{\zeta F - S\lambda}{F - S\lambda}$ ($\frac{(1-\zeta)F}{F - S\lambda}$) is the probability that the SRI meets a G-firm (B-firm) in the competitive capital market.[17] Because of $N < F$ and $\zeta F > S$, the SRI is always matched with one of the two types of firms in this market.

Now, suppose that the SRI, matched with the G-firm at $t = 1$, optimally chooses their engagement effort $\widehat{a}$ at $t = 4$, which will be determined later in this subsection. Let $\Pi_G$ and $\Pi_S$ denote the bargaining payoffs agreed upon during bargaining at $t = 2$. Then, given the disagreement point $(0, v(e, a^*))$, the application of the generalized Nash bargaining solution determines $\Pi_G$ and $\Pi_S$ as follows:[18]

$$\Pi_G = (1 - \beta)\left[\pi_0 + \pi_1 e + w_0 + w_1 e + w_2 \widehat{a} - c_S(\widehat{a}) - v(e, a^*)\right], \quad (5)$$

$$\Pi_S = \beta[\pi_0 + \pi_1 e + w_0 + w_1 e + w_2 \widehat{a} - c_S(\widehat{a})] + (1 - \beta)v(e, a^*). \quad (6)$$

As discussed in Section 3.3, note that the bargaining payoff includes the reward to social impact in this scenario.

I investigate the SRI's maximization problem concerning their choice of the engagement effort $\widehat{a}$ at $t = 4$, following the bargaining with the G-firm at $t = 2$. Given (6), this

[17] Note that $F - \lambda S$ is the measure of the sum of G-firms and B-firms in the competitive capital market, $\zeta F - \lambda S$ is the measure of G-firms in the competitive capital market, and $(1 - \zeta)F$ is the measure of B-firms.

[18] Using $\Pi_G + \Pi_S = \pi_0 + \pi_1 + w_0 + w_1 e + w_2 \widehat{a} - c_S(\widehat{a})$, I can differentiate the generalized Nash product with respect to $\Pi_G$ to derive (5) and (6). Note that there is no effect of $\Pi_G$ through $\widehat{a}$ in this differentiation process because of the envelope theorem.

maximization problem is represented by

$$\max_{\widehat{a}\geq 0} \beta[\pi_0 + \pi_1 e + w_0 + w_1 e + w_2\widehat{a} - c_S(\widehat{a})] + (1-\beta)v(e, a^*). \tag{7}$$

The first-order condition for problem (7) is

$$w_2 - c_S'(a) = 0. \tag{8}$$

Let $\widehat{a}^*$ denote the optimal solution that satisfies (8). Comparing (2) and (8), I show that

$$\widehat{a}^* = a^* = c_S'^{-1}(w_2). \tag{9}$$

To ensure that the generalized Nash bargaining solution is meaningful, I need to verify whether $(\Pi_G, \Pi_S) > (0, v(e, a^*))$ holds. In fact, it follows from (4) to (6) with $\widehat{a}^* = a^*$ that

$$\Pi_G = (1-\beta)\frac{(1-\zeta)F}{F - S\lambda}\left[(\pi_1 + w_1)e + w_2 a^* - c_S(a^*)\right], \tag{5'}$$

$$\Pi_S = \beta\frac{(1-\zeta)F}{F - S\lambda}[(\pi_1 + w_1)e + w_2 a^* - c_S(a^*))] + v(e, a^*). \tag{6'}$$

Hence, using (3) and the assumptions of $\zeta F > S$, $\zeta \in (0, 1)$, $\lambda \in (0, 1)$, $\pi_1 + w_1 > 0$, and $e \geq 0$, I prove that $(\Pi_G, \Pi_S) > (0, v(e, a^*))$.

Building on the results presented in this subsection and as mentioned in Section 3.2, I can first analyze the incentive issues for SRIs to engage in their search activities at $t = 1$. Indeed, the result of $\Pi_S > v(e, a^*)$ confirms that SRIs have the incentive to seek G-firms at $t = 1$ because their expected bargaining payoffs exceed the expected payoffs they would obtain in the competitive capital market.

Next, to ensure that SRIs have no incentive to bargain with B-firms at $t = 2$ when matched with B-firms at $t = 1$, note that the total net product from G-firms, $\pi_0 + \pi_1 e + w_0 + w_1 e + w_2 a^* - c_S(a^*)$, exceeds that from B-firms, $\pi_0 + w_0$, because $e \geq 0$, $\pi_1 + w_1 > 0$, and (3). As SRIs can achieve $v(e, a^*) > \pi_0 + w_0$, it follows that SRIs have no incentive to engage in bargaining with B-firms at $t = 2$ if they were matched with B-firms at $t = 1$.

**4.3. G-firm's ESG actions.—**

Finally, the G-firm's optimal ESG action decision at $t = 0$ is characterized below. Using (5′) and (9), the G-firm's maximization problem is expressed as

$$\max_{e \geq 0} \frac{S\lambda}{\zeta F} (1 - \beta) \frac{(1 - \zeta)F}{F - S\lambda} [(\pi_1 + w_1)e + w_2 a^* - c_S(a^*)] - c_F(e), \tag{10}$$

where $\frac{S\lambda}{\zeta F}$ is the probability that the G-firm is successfully matched with an SRI and subsequently engages in bargaining with the SRI at $t = 2$. Consequently, $1 - \frac{S\lambda}{\zeta F}$ is the probability that the G-firm does not match with any SRI and thus enters the competitive capital market at $t = 2$.

The first-order condition for (10) is given by

$$\frac{S\lambda (1 - \beta)(1 - \zeta)}{\zeta(F - S\lambda)} (\pi_1 + w_1) - c'_F(e) = 0. \tag{11}$$

The left-hand side of (11) is the G-firm's expected marginal payoff concerning its ESG actions $e$. Because of the assumptions of $\zeta F > S$, $\zeta \in (0, 1)$, $\lambda \in (0, 1)$, $\pi_1 + w_1 > 0$, and the properties of $c_F(e)$, the solution $e^*$ to (11) satisfies the second-order condition and is uniquely determined within a positive range. Therefore, the equilibrium value of the G-firm's ESG actions, $e^*$, is determined by (11).

## 5. Comparative Statics

This section examines the impact of the model's key parameters on the G-firm's equilibrium ESG actions, $e^*$. Because the SRI's engagement effort $a^*$ at $t = 4$ is unaffected by these parameters, their influence on social impact is solely determined by their effects on $e^*$. Thus, the analysis focuses on how these parameters affect $e^*$. The key parameters under consideration are the measure of SRIs, $S$, and the bargaining power of SRIs relative to G-firms, $\beta$.

I first explore the effect of an increase in the measure of SRIs, $S$, on $e^*$. Parameter $S$ can be viewed as the amount of socially responsible capital. Thus, the recent trend characterized by investors' growing concern about firms' ESG performance can be captured as an increase in $S$.

By conducting comparative statics using (11), the following proposition is obtained:

**Proposition 1:**

*An increase in $S$ increases $e^*$, regardless of $\pi_1 > 0$ or $\pi_1 < 0$.*

Proposition 1 shows that as the measure of SRIs increases (i.e., a comparative statics with respect to $S$), the G-firm's equilibrium number of ESG actions, $e^*$, increases even if the G-firm's marginal pecuniary returns with respect to $e$ are negative (i.e., $\pi_1 < 0$).

The rationale for Proposition 1 is as follows. An increase in $S$ raises the probability that a G-firm will be matched with an SRI and subsequently bargain with the SRI at $t = 2$. Given that the G-firm's marginal total product with respect to $e$ is positive (i.e., $\pi_1 + w_1 > 0$), an increase in $S$ also reduces the SRI's marginal disagreement payoff with respect to $e$ because it reduces the probability of the SRI being matched with a G-firm in the competitive capital market.[19] This, in turn, increases the G-firm's marginal bargaining surplus with respect to $e$. As a result, an increase in $S$ boosts the G-firm's expected marginal payoff concerning $e$ at $t = 0$. Accordingly, an increase in $S$ leads to a higher $e^*$ because the G-firm is given incentives to enhance its ESG actions to capture more expected surplus from bargaining with the SRI.

The theoretical implication of Proposition 1 is as follows. As mentioned previously, an increase in $S$ can be viewed as an increase in ESG-focused capital. Thus, Proposition 1 suggests that when the G-firm is inclined to undertake positive actions on ESG, its level of actions increases as the number of ESG-concerned investors grows, even if the G-firm's marginal pecuniary returns from these actions are negative.

Next, I examine the effect of the bargaining power of SRIs over G-firms, $\beta$, on $e^*$. $\beta$ can be interpreted as the extent of the influence of SRIs on firm management. Hence, an increase in $\beta$ may imply extensive development in a social trend that gives SRIs greater influence over G-firms because socially responsible investments are beginning to be publicly considered significantly valuable for regulators seeking sustainable development.

The following proposition is with regards to an increase in $\beta_S$.

**Proposition 2:**

*An increase in $\beta$* decreases $e^*$.

Proposition 2 indicates that the increased bargaining power of the SRI (i.e., larger $\beta$)

[19] As an increase in $S$ raises the probability that the SRI is matched with a G-firm in the search and matching stage, it decreases the ratio of G-firms to all firms in the competitive labor market. Then, it follows from (4) that $\frac{\partial v(e,a^*)}{\partial e} > 0$ and $\frac{\partial^2 v(e,a^*)}{\partial e \partial S} < 0$.

decreases the ESG actions of the G-firm, $e^*$.

The rationale behind Proposition 2 is as follows. Because the G-firm's marginal total product with respect to $e$ is positive (i.e., $\pi_1 + w_1 > 0$), the first term on the left-hand side of (11) is positive. Thus, an increase in $\beta$ reduces the G-firm's expected marginal payoff when it successfully searches at $t = 1$ and bargains with an SRI at $t = 2$, as the SRI will claim a larger portion of the project's total returns. Consequently, an increase in $\beta$ leads to a lower $e^*$ because it diminishes the expected surplus transfer from the SRI to the G-firm through bargaining. Note that a change in $\beta$ has no effect on the disagreement payoff of each agent.

The theoretical implication of Proposition 2 is as follows. As discussed earlier, an increase in $\beta$ can be considered a social trend that gives SRIs greater influence on firm management. Hence, Proposition 2 suggests that the extensive development in this social trend decreases the G-firm's ESG actions.

By comparing the results of Propositions 1 and 2, this study demonstrates that the G-firm's ESG actions increase with the number of investors interested in the firm's ESG performance. Meanwhile, giving the SRI more power to influence firm management decreases the G-firm's ESG actions. Consequently, the regulator aiming to increase the firm's ESG actions should adopt policies that encourage investors to be conscious of the firm's ESG performance. An example of such policies is to support the activities of NGOs and NPOs that are geared toward ESG and SDGs. By contrast, this regulator may not necessarily benefit from making/supporting policies that give the SRI greater influence over firms. Examples of such policies include corporate governance reform and strengthening shareholder rights.

## 6. Search Efforts of SRIs

In this section, the basic model is extended by considering a matching model in which SRIs can choose an effort level to search for ESG-related firms at $t = 0$, thereby increasing the matching intensity between SRIs and G-firms at $t = 1$.

As in the basic model, each G-firm still expends ESG actions $e$ at $t = 0$, while each SRI also makes an engagement effort $a$ at $t = 4$. The actions and effort affect pecuniary returns, $\pi(e) = \pi_0 + \pi_1 e$, and the social impact of the project, $w(e, a) = w_0 + w_1 e +$

$w_2 a$. In addition, if a G-firm chooses ESG actions $e$, it bears a cost $c_F(e)$; and if an SRI takes an engagement effort $a$, it incurs a cost $c_S(a)$. I also continue to impose the same assumptions on $\pi(e)$, $w(e,a)$, $c_F(e)$, and $c_S(a)$ as those in the previous sections. By contrast, each SRI searches for ESG-related firms by expending a search effort $\ell$ at $t = 0$. If an SRI exerts a search effort $\ell$, it incurs a cost $c_M(\ell)$, where $c_M(0) = 0$, $c'_M(\ell) > 0$, $c''_M(\ell) > 0$, $\lim_{\ell \to 0} c'_M(\ell) = 0$, and $\lim_{\ell \to \infty} c'_M(\ell) = \infty$.

At $t = 0$, a G-firm that has taken ESG actions $e$ is randomly matched with an SRI that has exerted an effort $\ell \geq 0$, with a probability of $\frac{S}{\zeta F}\lambda(\ell)$, where $\lambda(0) \in (0,\, 1)$, $\lambda'(\ell) > 0$, $\lambda''(\ell) < 0$, and $\lim_{\ell \to \infty} \lambda_{S2}(\ell) < 1$. The matching intensity between a G-firm and an SRI, $\lambda_S(\ell)$, increases with the SRI's effort $\ell$.

As in the basic model, if a G-firm (or an SRI) fails to be matched with an SRI (or a G-firm) at $t = 1$, it enters the competitive capital market. If a G-firm and an SRI are successfully matched at $t = 1$ but fail to reach a bargaining agreement, they also turn to the competitive capital market.

The only difference between the basic model and the extended model lies in whether the matching intensity $\lambda$ depends on the SRI's engagement effort $\ell$ and the fact that the SRI bears the search effort cost $c_M(\ell)$. This difference leads to rewriting the SRI's disagreement point in (4) as follows:

$$v(e, \ell, a^*) = \frac{\zeta F - S\lambda(\ell)}{F - S\lambda(\ell)} \left[\pi_0 + \pi_1 e + w_0 + w_1 e + w_2 a^* - c_S(a^*)\right] + \frac{(1-\zeta)F}{F - S\lambda(\ell)}(\pi_0 + w_0). \tag{12}$$

Then, (5′) and (6′) are replaced by

$$\Pi_G = (1-\beta)\, \frac{(1-\zeta)F}{F - S\lambda(\ell)} \left[(\pi_1 + w_1)e + w_2 a^* - c_S(a^*)\right], \tag{13}$$

$$\Pi_S = \beta \frac{(1-\zeta)F}{F - S\lambda(\ell)} [(\pi_1 + w_1)e + w_2 a^* - c_S(a^*))] + v(e, a^*). \tag{14}$$

Because of (3) and the assumptions of $\zeta F > S$, $\zeta \in (0,\, 1)$, $\lambda(\ell) \in (0,\, 1)$, $\pi_1 + w_1 > 0$, and $e \geq 0$, note that $(\Pi_G, \Pi_S) > (0, v(e, \ell, a^*))$.

Now, using (13), the G-firm's maximization problem with respect to ESG actions at

time 0 is given as follows. As in the basic model, this problem is represented by

$$\max_{e\geq 0} \frac{S\lambda(\ell)}{\zeta F}(1-\beta)\frac{(1-\zeta)F}{F-S\lambda(\ell)}\left[(\pi_1+w_1)e+w_2a^*-c_S(a^*)\right]-c_F(e), \tag{15}$$

where the first term is the G-firm's expected payoff when it is successfully matched with an SRI and subsequently bargains with the SRI at $t=2$, while the second term is its cost of ESG actions. The probability of this event occurring is $\frac{S\lambda(\ell)}{\zeta F}$. Thus, $1-\frac{S\lambda(\ell)}{\zeta F}$ is the probability that the G-firm is not matched with any SRI at $t=1$, prompting it to enter the competitive capital market. Note that, in this case, the G-firm's payoff is zero. The first-order condition for (15) is expressed as

$$\frac{1-\zeta}{\zeta}\frac{S\lambda(\ell)}{F-S\lambda(\ell)}(1-\beta)(\pi_1+w_1)-c_F'(e)=0. \tag{16}$$

Here, the first term is the G-firm's expected marginal total product with respect to $e$, and the second term is its marginal cost with respect to $e$. Given the assumptions on $c_F(e)$, the solution to (16) satisfies the second-order condition and is uniquely determined as a positive solution.

As an SRI also chooses the search effort at $t=0$, it follows from (12) and (14) that their maximization problem at $t=0$ is now represented by

$$\begin{aligned}&\max_{\ell\geq 0}\lambda(\ell)\left\{\beta\frac{(1-\zeta)F}{F-S\lambda(\ell)}[(\pi_1+w_1)e+w_2a^*-c_S(a^*))]+v(e,\ell,a^*)\right\}\\&+\left[1-\lambda(\ell)\right]v(e,\ell,a^*)-c_M(\ell).\end{aligned} \tag{17}$$

where the first term indicates their expected total returns when matched with a G-firm at $t=1$ and subsequently bargaining with it at $t=2$; the second term reflects their expected total returns when unmatched with any G-firm at $t=1$, thereby entering the competitive capital market at $t=2$; and the third term expresses their search cost. Note that $\lambda(\ell)$ is the probability of the SRI being matched with a G-firm at $t=1$ because the measure of G-firms exceeds that of SRIs (i.e., $\zeta F>S$).

The first-order condition for problem (17) is

$$\frac{\lambda'(\ell)\beta(1-\zeta)F}{F-S\lambda(\ell)}[(\pi_1+w_1)e+w_2a^*-c_S(a^*)]$$

$$-\frac{[1-\beta\lambda(\ell)]S\lambda'(\ell)(1-\zeta)F}{[F-S\lambda(\ell)]^2}[(\pi_1+w_1)e+w_2a^*-c_S(a^*)]-c'_M(\ell)=0. \tag{18}$$

Here, the first term represents the SRI's expected marginal total returns with respect to $\ell$ through a change in the matching intensity; the second term indicates the SRI's expected marginal total returns with respect to $\ell$ through a change in the SRI's disagreement payoff; and the third term expresses the marginal cost with respect to $\ell$. Rearranging (18) leads to

$$\frac{\lambda'(\ell)(1-\zeta)F(\beta F-S)}{[F-S\lambda(\ell)]^2}[(\pi_1+w_1)e+w_2a^*-c_S(a^*)]-c'_M(\ell)=0. \tag{18$'$}$$

Given (3) and the assumptions of $\zeta F > S$, $\zeta \in (0,\, 1)$, $\pi_1 + w_1 > 0$, and $w_2 > 0$ along with the properties of $\lambda(\ell)$ and $c_M(\ell)$, the solution to (18$'$) exists in a positive range if $\beta F > S$. In the subsequent analysis, I assume that $\beta F > S$ and that the second-order condition for problem (17) is satisfied:

**Assumption 1:**

*(i)* $\beta > \frac{S}{F}$.

*(ii)* $\Gamma \equiv \left\{\lambda''(\ell)+\frac{2S[\lambda'(\ell)]^2}{F-S\lambda(\ell)}\right\}\frac{(1-\zeta)F(\beta F-S)}{[F-S\lambda(\ell)]^2}[(\pi_1+w_1)e+w_2a^*-c_S(a^*)]-c''_M(\ell)<0.$

Now, the equilibrium values of the ESG actions of the G-firm, $e^{**}$, and the search effort of the SRI, $\ell^{**}$, are simultaneously determined by (16) and (18$'$).

As $a^*$ remains unaffected by the key parameters, I focus on the comparative static results of $S$ and $\beta$ on $e^{**}$ and $\ell^{**}$. Furthermore, I impose the following assumption as a sufficient condition for $e$ (or $\ell$) to decrease as the marginal ESG action (or search effort) cost increases.

**Assumption 2:**

$$\Psi \equiv -c''_F(e)\Gamma-\frac{S\left[\lambda'(\ell)F\right]^2}{[F-S\lambda(\ell)]^4}\frac{(1-\zeta)^2(1-\beta)(\beta F-S)}{\zeta}(\pi_1+w_1)^2>0.$$

This assumption serves as a sufficient condition to ensure that an increase in the marginal cost of ESG actions undertaken by the G-firm decreases ESG actions, represented by $\frac{de^{**}}{dc'_F}<0$, and that an increase in the marginal cost of search effort by the SRI reduces search effort, represented by $\frac{d\ell^{**}}{dc'_M}<0$. See the Appendix for this proof.

By executing comparative statics on (16) and (18$'$) under Assumptions 1 and 2, I obtain the following proposition regarding the effect of an increase in $S$:

**Proposition 3:**

*An increase in $S$ increases $e^{**}$ and $\ell^{**}$, thus increasing the expected social impact within the economy, if $\beta > \frac{1}{2\lambda(0)} + \frac{S}{2F}$.*

Proposition 3 demonstrates that as the fraction of socially responsible capital (i.e., a larger $S$) increases, both the G-firm's ESG actions, $e^{**}$, and the SRI's search effort, $\ell^{*}$, increase if all of the following three conditions apply: the SRI's bargaining power, $\beta$, is sufficiently large, the baseline matching intensity $\lambda(0)$ (i.e., in the absence of the SRI's effort) is high, and the ratio of SRIs to firms, $\frac{S}{F}$, is relatively low. In addition, it is worth noting that the expected social impact in the economy rises with $e^{**}$ and $\ell^{**}$.

The intuition behind Proposition 3 is as follows. An increase in $S$ indicates a higher probability of a G-firm being matched with an SRI and subsequently engaging in bargaining with the SRI at $t = 2$. Given that $\pi_1 + w_1 > 0$ and $w_2 a^* - c_S(a^*) > 0$ from (3), this increase in $S$ raises the G-firm's expected marginal surplus from $e$ at time 0 (i.e., the first term on the left-hand side of (16)). Simultaneously, it increases the SRI's expected marginal surplus from $\ell$ (i.e., the first term on the left-hand side of (18′)) at time 0, provided that the conditions of Proposition 3 are met. Considering the interaction between the effects of $e$ and $\ell$, these combined effects ultimately lead the G-firm to increase $e^*$ and the SRI to increase $\ell^*$, assuming the conditions of Proposition 3 are satisfied. This occurs because the higher probability of matching encourages the G-firm to capture more expected surplus from an SRI by increasing its ESG actions, while it also gives incentives to the SRI to raise the probability of engaging in profitable bargaining with a G-firm by intensifying their search effort.

Next, this study discusses the effect of $\beta$ on $e^{**}$ and $\ell^{**}$. The following proposition presents the results regarding the effect of $\beta$.

**Proposition 4:**

*The impact of an increase in $\beta$ on $e^{**}$ and $\ell^{**}$ is ambiguous.*

In contrast to the basic model, Proposition 4 indicates that an increase in the bargaining power of the SRI (i.e., larger $\beta$) does not necessarily reduce the ESG actions of the G-firm, $e^{**}$, or necessarily increase the search effort of the SRI, $\ell^{**}$.

Intuitively, a larger $\beta$ increases the SRI's expected marginal surplus with respect to $\ell$ at time 0, as shown in the first term on the left-hand side of (18′). However, because

the first term on the left-hand side of (16) is positive, a larger $\beta$ reduces the G-firm's expected marginal surplus with respect to $e$ at time 0 when bargaining with an SRI, as the SRI captures a larger share of the total project returns. These two effects from an increase in $\beta$ motivate the SRI to increase $\ell$ and the G-firm to decrease $e$. However, given $\lambda'(\ell) > 0$, this increase in $\ell$ subsequently raises the G-firm's expected marginal surplus with respect to $e$ in (16), while a decrease in $e$ subsequently reduces the SRI's expected marginal surplus with respect to $\ell$ in (18′). Hence, combining these effects, the overall comparative statics of $\beta$ on $e^{**}$ and $\ell^{**}$ remain ambiguous.

The theoretical implications of the case in which the SRI incurs a search cost, as represented by Propositions 3 and 4, are summarized as follows. Proposition 3 suggests that a growing number of SRIs boost both the ESG actions of G-firms and the search effort of SRIs, provided that (a) SRIs possess sufficiently strong bargaining power, (b) the baseline matching intensity without SRIs' efforts is significant, and (c) the ratio of socially responsible capital to firms remains relatively low. Proposition 4 implies that an extensive social trend empowering SRIs to influence firm management does not necessarily reduce the ESG actions of G-firms or increase the search effort of SRIs.

In particular, a comparison of the results from Propositions 3 and 4 reveals interesting insights. Suppose that SRIs have a certain degree of influence over firm management and a reasonably strong ability to identify good ESG firms, while the available socially responsible capital remains limited. In this case, as more investors become interested in firms' ESG performance, firms are more likely to increase their investment in ESG actions. However, if SRIs gain greater influence over firm management, this does not necessarily lead firms to increase or decrease investment in ESG actions. Consequently, if SRIs' efforts in searching for ESG-committed firms have significant impacts, a regulator aiming to boost firms' ESG actions might consider policies that heighten investor concern for ESG performance, rather than policies that increase SRIs' influence over firms.

For example, in the abovementioned scenario, the regulator could increase the number of investors interested in firms' ESG performance by supporting the activities of NGOs and NPOs focused on ESG and SDGs. Conversely, under similar circumstances, the regulator may not necessarily benefit from implementing or supporting policies that grant SRIs greater influence over firms. Examples of such policies include corporate governance reforms and the strengthening of shareholder rights.

## 7. Conclusion

Using a search model, this study theoretically examines how for-profit firms capable of taking ESG actions secure financing from SRIs. The firms' ESG actions affect both their pecuniary returns and social performance. When a firm undertakes ESG actions, it increases the financial value it can achieve through bargaining with SRIs outside of the competitive capital market. Consequently, the firm may benefit from adopting a positive level of ESG actions, even if these actions reduce its pecuniary returns (while keeping them positive).

The comparative statics derive the following results:
(1) In a basic model in which SRIs make a search effort with zero cost to match with one of the firms that is capable of undertaking ESG actions.
(i) As the number of SRIs increases, firms capable of taking ESG actions increase their ESG actions.
(ii) When SRIs are granted greater power to influence firm management, firms capable of taking ESG actions are discouraged from taking ESG actions.
(2) In an extension in which SRIs make costly efforts to match with one of the firms that is capable of undertaking ESG actions.
(i) As the number of SRIs grows, firms capable of taking ESG actions are more likely to increase these actions under certain conditions.
(ii) The power of SRIs to influence firm management does not necessarily lead to an increase or decrease in the ESG actions of firms capable of taking such actions.

These results offer testable implications about how different ESG trends and issues may impact firms' ESG actions.

## Appendix

**Proof of Propositions 1 and 2:** Totally differentiating (11) with respect to $e$, $S$, and $\beta_S$ yields

$$c_F''(e)de = \frac{\lambda\,(1-\beta)\,(1-\zeta)F}{\zeta(F-S\lambda)^2}\,(\pi_1+w_1)\,dS - \frac{S\lambda(1-\zeta)}{\zeta(F-S\lambda)}\,(\pi_1+w_1)\,d\beta. \tag{A1}$$

By solving (A1), I obtain

$$\frac{de}{dS} = \frac{\lambda\,(1-\beta)\,(1-\zeta)F}{\zeta(F-S\lambda)^2 c_F''(e)}\,(\pi_1+w_1) > 0, \tag{A2}$$

$$\frac{de}{d\beta} = -\frac{S\lambda(1-\zeta)}{\zeta(F-S\lambda)c_F''(e)}\,(\pi_1+w_1) < 0. \tag{A3}$$

It follows from (A2) and (A3) that Propositions 1 and 2 are verified. ‖

**Proof of Propositions 3 and 4 and the implication of Assumption 2:** Totally differentiating (16) and (18′) with respect to $e$, $\ell$, $S$, and $\beta$ yields

$$\begin{aligned}
&\begin{bmatrix} -c_F''(e) & \frac{1-\zeta}{\zeta}\frac{S\lambda'(\ell)F}{[F-S\lambda(\ell)]^2}(1-\beta)(\pi_1+w_1) \\ \frac{\lambda'(\ell)(1-\zeta)F(\beta F-S)}{[F-S\lambda(\ell)]^2}(\pi_1+w_1) & \Gamma \end{bmatrix}\begin{bmatrix} de \\ d\ell \end{bmatrix} \\
&= -\begin{bmatrix} \frac{1-\zeta}{\zeta}\frac{F\lambda(\ell)}{[F-S\lambda(\ell)]^2}(1-\beta)(\pi_1+w_1) \\ \frac{\lambda'(\ell)(1-\zeta)F}{[F-S\lambda(\ell)]^3}\left\{\lambda(\ell)(\beta F-S)-F[1-\beta\lambda(\ell)]\right\}\left[(\pi_1+w_1)e+w_2a^*-c_S(a^*)\right] \end{bmatrix} dS \\
&+\begin{bmatrix} \frac{1-\zeta}{\zeta}\frac{S\lambda(\ell)}{F-S\lambda(\ell)}(\pi_1+w_1) \\ -\frac{\lambda'(\ell)(1-\zeta)F^2}{[F-S\lambda(\ell)]^2}[(\pi_1+w_1)e+w_2a^*-c_S(a^*)] \end{bmatrix} d\beta,
\end{aligned} \tag{A4}$$

where $\Gamma$ is defined in Assumption 1(ii). Solving (A4) and using (3), the assumptions of $\zeta F > S$, $\zeta \in (0,\,1)$, $\lambda(\ell) \in (0,\,1)$, $\lambda'(\ell) > 0$, $\pi_1 + w_1 > 0$, and $e \geq 0$, and Assumptions 1

and 2, I obtain

$$\begin{aligned}\frac{de^{**}}{dS} &= -\frac{1}{\Psi}\frac{1-\zeta}{\zeta}\frac{F\lambda(\ell)}{\left[F-S\lambda(\ell)\right]^2}(1-\beta)(\pi_1+w_1)\times \\ &\left\{\left[\lambda''(\ell)+\frac{S\left[\lambda'(\ell)\right]^2}{F-S\lambda(\ell)}\right]\frac{(1-\zeta)F(\beta F-S)}{\left[F-S\lambda(\ell)\right]^2}[(\pi_1+w_1)e+w_2a^*-c_S(a^*)]\right. \\ &\left.+\frac{S\left[\lambda'(\ell)\right]^2(1-\zeta)F^2}{\left[F-S\lambda(\ell)\right]^3}\left[\frac{1}{\lambda(\ell)}-\beta\right][(\pi_1+w_1)e+w_2a^*-c_S(a^*)]-c_M''(\ell)\right\} \\ &> 0, \qquad \text{if } \beta > \frac{1}{2\lambda(0)}+\frac{S}{2F}, \end{aligned} \tag{A5}$$

$$\begin{aligned}\frac{d\ell^{**}}{dS} &= \frac{1}{\Psi}c_F''(e)\frac{\lambda'(\ell)(1-\zeta)F\lambda(\ell)}{\left[F-S\lambda(\ell)\right]^3}\left\{\beta F-S-F\left[\frac{1}{\lambda(\ell)}-\beta\right]\right\}[(\pi_1+w_1)e+w_2a^*-c_S(a^*)] \\ &+\frac{1}{\Psi}\frac{\lambda'(\ell)(1-\zeta)F^2(\beta F-S)}{\left[F-S\lambda(\ell)\right]^4}\frac{1-\zeta}{\zeta}\lambda(\ell)(1-\beta)(\pi_1+w_1)^2 \\ &> 0, \qquad \text{if } \beta > \frac{1}{2\lambda(0)}+\frac{S}{2F}, \end{aligned} \tag{A6}$$

$$\begin{aligned}\frac{de^{**}}{d\beta} &= \frac{1}{\Psi}\frac{1-\zeta}{\zeta}\frac{S\lambda(\ell)}{F-S\lambda(\ell)}(\pi_1+w_1)\times \\ &\left\{\left[\lambda''(\ell)+\frac{2S\left[\lambda'(\ell)\right]^2}{F-S\lambda(\ell)}\right]\frac{(1-\zeta)F(\beta F-S)}{\left[F-S\lambda(\ell)\right]^2}[(\pi_1+w_1)e+w_2a^*-c_S(a^*)]-c_M''(\ell)\right\} \\ &+\frac{1}{\Psi}\frac{S\left[\lambda'(\ell)\right]^2(1-\zeta)^2F^3}{\left[F-S\lambda(\ell)\right]^4\zeta}(1-\beta)(\pi_1+w_1)[(\pi_1+w_1)e+w_2a^*-c_S(a^*)], \end{aligned} \tag{A7}$$

$$\begin{aligned}\frac{d\ell^{**}}{d\beta} &= \frac{1}{\Psi}c_F''(e)\frac{\lambda'(\ell)(1-\zeta)F^2}{\left[F-S\lambda(\ell)\right]^2}[(\pi_1+w_1)e+w_2a^*-c_S(a^*)] \\ &-\frac{1}{\Psi}\frac{S\lambda(\ell)\lambda'(\ell)(1-\zeta)^2F(\beta F-S)}{\left[F-S\lambda(\ell)\right]^3\zeta}(\pi_1+w_1)^2. \end{aligned} \tag{A8}$$

To prove the final inequality of (A5), note that if $\beta > \frac{1}{2\lambda(0)} + \frac{S}{2F} > \frac{1}{2\lambda(\ell)} + \frac{S}{2F}$,

$$\begin{aligned}
&\frac{S\left[\lambda'(\ell)\right]^2}{F - S\lambda(\ell)} \frac{(1-\zeta)F(\beta F - S)}{\left[F - S\lambda(\ell)\right]^2} [(\pi_1 + w_1)e + w_2 a^* - c_S(a^*)] \\
&> \frac{S\left[\lambda'(\ell)\right]^2 (1-\zeta)F^2}{\left[F - S\lambda(\ell)\right]^3} \left[\frac{1}{\lambda(\ell)} - \beta\right] [(\pi_1 + w_1)e + w_2 a^* - c_S(a^*)]. \qquad \text{(A9)}
\end{aligned}$$

Thus, it follows from (A9) with Assumptions 1(ii) and 2 that $\frac{de^{**}}{dS} > -\frac{\Gamma}{\Psi} > 0$ if $\beta > \frac{1}{2\lambda(0)} + \frac{S}{2F}$. It is found using (A5)–(A8) that Propositions 3 and 4 are verified.

Finally, to derive the implication of Assumption 2, let us consider the shifts of the cost functions from $c_F(e)$ to $c_F(e) + \varepsilon_1 e$ and from $c_M(\ell)$ to $c_M(\ell) + \varepsilon_2 \ell$. Then, totally differentiating (16) and (18′) with respect to $e$, $\ell$, $\varepsilon_1$, and $\varepsilon_2$, I obtain

$$\frac{de}{d\varepsilon_1} = \frac{\Gamma}{\Psi} \text{ and } \frac{de}{d\varepsilon_2} = -\frac{c_F''(e)}{\Psi}.$$

Hence, to obtain the well-behaved result given in the text, I need to assume $\Psi > 0$ because of $\Gamma < 0$ from Assumption 1(ii) and $c_F''(e) > 0$ from the convexity of $c_F(e)$. ‖

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