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Sustainable Investing Under Delegated Investment Management*

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Abstract

This paper considers how profit-motivated fund managers of sustainable and passive funds govern the firms in the portfolios that they construct using the capital collected from socially responsible investors. The fund managers choose their level of engagement with these firms to increase their profit and to reduce any negative externalities. Using the search model framework between fund managers and investors, we derive several novel implications regarding the effects of growing interest in environmental, social, and governance (ESG) investments, the limited impact of shareholder ESG engagement in firms with high-ESG proxies, and the effects of improvements in ESG engagement cost on the ESG and financial performances generated by portfolio firms.

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1. Introduction

In recent decades, growing preferences for environmental, social, and governance (ESG) investments have been observed among investors who derive non-pecuniary benefits from these investments; as a result, a rapid expansion in socially responsible or sustainable investment has occurred.[1] However, a large proportion of sustainable investments are made by institutional investment funds, such as sustainable funds (S-funds), the dominant investing strategy of which is to buy only the stocks of firms with high-ESG performance. These funds are often managed by asset managers who may pursue their own pecuniary profits. Therefore, it is of the utmost importance to motivate fund managers to engage in managing their portfolio firms not only to enhance pecuniary returns, but also to improve ESG performance. Furthermore, some scholars (e.g., Hartzmark and Shue, 2022) show that a sustainable investing strategy directing capital away from firms with low-ESG performance toward firms with high-ESG performance may be counterproductive in that it leads the former firms to lower their ESG performance without leading the latter firms to raise their ESG performance.

In recent years, the presence of passive funds (P-funds) has been significant.[2] P-fund managers create market portfolios aligned with an index and hence are considered to have little or no governance role in their portfolio firms. Many practitioners and scholars suggest that ESG activists have a big P-fund investment problem; that is, ESG activists who convince investors to ditch stocks with low-ESG characteristics are at risk of seeing their efforts undermined by the presence of P-funds.[3] However, the empirical evidence about the governance role of P-funds is mixed.[4] Thus, the governance role of the P-fund

[1] According to Alyssa Stankiewicz (Sustainable Fund Flows Reach New Heights in 2021's First Quarter, Morningstar, April 30, 2021, https://www.morningstar.com/articles/1035554/sustainable-fund-flows-reach-new-hights-in-2021s-first-quarter), as of March 21, 2021, assets in US sustainable funds totaled nearly $266 billion, which is a 12% increase over the previous quarter and a 125% increase year over year.

[2] The fraction of P-funds grew to just under 40% of the US fund market at the end of 2019 (Investment Company Institute 2020 Factbook).

[3] For example, see Billy Nauman (How Passive Investment Dulls the Green Wave, Financial Times, February 7, 2022, https://www.ft.com/content/ abd2a946-48d5-11ea-aee2-9ddbdc86190d). This problem is also related to the passive funds' incentive problem of underinvestment in stewardship (see Bebchuk and Hirst, 2019).

[4] See the literature cited in Corum, Malenko, and Malenko (pages 2–3, 2021). Indeed, Fichner, Heemskerk, and Garcia-Bernardo (2017) find that the top three US passive index fund companies that are large stakeholders in most of the Standard & Poor's (S&P) 500 firms—BlackRock, Vanguard, and State Street—do use coordinated voting strategies and influence the management of their invested companies through private engagements. McCahery, Sautner, and Starks (2016) report that large institutional in-

managers is becoming increasingly important.

This paper considers the governance role of profit-motivated managers of S- and P-funds when they must attract capital from investors with ESG preferences. The governance role of both fund managers is twofold: first, to engage in the management of their portfolio to improve ESG performance (i.e., to reduce any negative externalities), and second, to improve pecuniary returns. Both the efforts to reduce the portfolio firms' negative externalities and to increase their pecuniary returns are referred to as the fund manager's engagement efforts.

In this setting, we address the following questions. First, how does growing interest in ESG affect the negative externalities and pecuniary returns of various types of firms through a change in the S- and P-fund managers' engagement efforts toward their portfolio firms? Does growing interest in ESG really have a counterproductive effect in the presence of S- and P-funds? Second, we address the same questions when the impact of ownership engagement regarding ESG in firms with high-ESG performance is limited and further decreases relative to that in firms with low-ESG performance. It is our understanding that this paper is the first theoretical paper to examine how fund managers' engagement efforts toward their portfolio firms affect the negative externalities and pecuniary returns for various types of firms in the presence of S- and P-funds under growing interest in ESG, or the increasing tendency for shareholder ESG engagement to have a limited impact on firms with high-ESG performance. Finally, we examine how the ownership engagement efforts are affected when the cost of such efforts for each fund manager decreases.

To address these questions, we build an asset management market model in which ESG-conscious fund investors allocate their wealth between an S-fund, a P-fund, and outside investment opportunities, such as public bonds. These fund investors can invest their wealth in firms only via funds.[5] However, these funds are managed by for-profit fund managers who may not be keen on ESG. If fund investors decide to invest in an S-fund, P-fund, or both, they must search for these funds, which incurs a search cost. After matching, fund investors and the fund manager bargain over the asset management fee. Then, the fund manager invests in firms that differ in the sustainability of their

vestors with a longer time horizon and less concern about stock liquidity intervene more intensively with management through private engagements.

[5] We also consider liquidity investors, who directly invest in firms for various reasons but do not engage in the governance of the firms.

activities; the S-fund buys only the stocks of firms with high-ESG performance and the P-fund invests all of its money in the value-weighted market portfolio.[6] After investing, each fund manager chooses his costly ownership engagement effort levels to mitigate the negative externalities and to increase the profits of his portfolio firms.

Our first main results are as follows. When investors' ESG preferences are strengthening, the following three results are obtained. (i) If the investors are not very ESG conscious, the expected negative externality decreases but the expected profit increases for the high-ESG firms (hereafter referred to as G-firms) and all the firms in the market portfolio. (ii) When the investors are highly ESG conscious, the expected negative externality may decrease for G-firms and all the firms in the market portfolio. This occurs where the S-fund managers have a comparative advantage over the P-fund managers in improving firms' profit performance over improving their ESG performance. (iii) Growing interest in ESG always reduces the expected negative externalities but raises the expected profit for the low-ESG firms (B-firms).

The intuition behind these results is broken down into two parts: the direct effect and the fund ownership effect. To delineate the direct effect, note that the fund manager's engagement efforts are determined at the point where his expected marginal return equals his marginal cost of effort.[7] As the effort cost parameters are fixed, the fund manager's incentives are determined by his expected marginal return. For the ESG engagement effort, this is equal to the (degree of investors' ESG preferences)$\times$(fund fee)$\times$(fund ownership stake) established under bargaining between investors and the fund manager. Thus, stronger ESG preferences of investors directly raise fund managers' incentives for ESG effort. Later, we show that growing interest in ESG does not affect the asset management fee of either type of fund. However, the fund ownership effect that occurs through a change in the fund ownership stake is more complicated, as it involves investors' capital allocation among assets.

Indeed, if the ESG preferences of investors are not strong initially, fund investors' allocation of their wealth to both the S- and P-funds increases when the ESG preferences of investors are strengthened. This increases the S-fund (P-fund) ownership stake in G-

[6] In Appendix B.2, we introduce a non-sustainable fund that buys only the stocks of firms with low-ESG performance. Under certain conditions, our main results are unaffected.

[7] This holds for the effort to reduce the negative externality and the effort to increase pecuniary returns for both the S- and P-funds.

firms (both G- and B-firms) and reduces the ownership of liquidity investors in both G- and B-firms. This ownership change motivates both the S- and P-fund managers to exert more efforts on their portfolio firms, thus reducing the negative expected externalities and raising the expected profit for each firm. Note that the liquidity investors do not make engagement efforts.

By contrast, if the ESG preference of investors is initially strong, the fund investors may allocate less of their wealth to the S-fund as the ESG preference of investors increases, because the fund investors' rate of expected return from the S-fund may decrease. Then, the fund ownership effect arising from the reduction of the S-fund's ownership weakens the S-fund manager's engagement effort levels. However, if the S-fund managers have a comparative advantage in improving profit performance over ESG performance to the P-fund managers, the fund ownership effect from the reduction of ownership by the S-fund is dominated by the effect of the rise of ownership by the P-fund. Then, the expected negative externality decreases for both G-firms and market portfolio firms. However, for B-firms, the fund ownership effect works only through the changes in the ownership of the P-fund and liquidity investors. Consequently, growing interest in ESG always reduces the expected negative externality but raises the expected profit.

Regarding the fund fee, a strengthened ESG preference of investors changes fund investors' expected returns for both funds because it affects the expected disutilities of investors. However, the effects of such changes are canceled out by the changes in the expected profits of their portfolio firms to restore capital allocation conditions in equilibrium. Hence, a growing interest in ESG has no effect on fund investors' expected rates of returns for either type of funds, which implies that it has no effects on the fund fees for either fund with such fees determined through bargaining when investors' bargaining power is fixed.

Our second main result examines what happens when the impact of shareholder engagement regarding ESG in G-firms is limited and decreases relative to that in B-firms. The increasing tendency for shareholder ESG engagement to have a limited impact in G-firms increases both the expected negative externality and the expected profit for G-firms and market portfolio firms, but does not affect the expected negative externality or the expected profit for B-firms.

Intuitively, the increasing tendency for shareholder ESG engagement to have a limited

impact in G-firms directly weakens the incentives for ESG effort for both S- and P-fund managers in G-firms, but it does not affect this incentive for the P-fund managers in B-firms. We also need to consider the impact on the fund managers' effort incentive of a fund ownership effect occurring through a change in fund ownership stakes. However, in this case, the fund investors' expected rate of return can be adjusted in equilibrium so that it does not change in either fund, although the fund ownership effect operates in G-firms. As a result, management fees for both the S- and P-funds are unaffected. Furthermore, the increasing tendency for shareholder ESG engagement to have a limited impact in G-firms has no effect on the expected negative externality or the expected profit for B-firms because it does not directly affect the P-fund manager's ESG effort in B-firms, and the fund ownership effect does not operate in B-firms either.

Our third main result shows what happens when the ESG engagement cost becomes lower for the S- and P-fund managers, respectively. For both G-firms and market portfolio firms, in the case of either S- or P-funds, the reduction in the ESG engagement cost reduces both the expected negative externality and the expected profit. For B-firms, the reduction in the ESG engagement cost for the P-fund managers reduces both the expected negative externality and the expected profit.

Intuitively, the lower ESG engagement cost for one fund manager directly strengthens his incentives for ESG efforts, but it does not affect these incentives for the other fund manager, nor does it affect the asset management fee for either fund. Hence, the arguments for the case in which there is an increasing tendency for shareholder ESG engagement to have a limited impact on G-firms apply to deriving the above result for G-firms and market portfolio firms. Furthermore, as the S-fund does not buy B-firms, only the lower ESG engagement cost of the P-fund manager affects B-firms.

The theoretical implications of our results are as follows. Given that growing interest in ESG creates S-fund growth, our first results show that the effect of S-fund growth on the expected negative externality in the presence of the S- and P-funds depends on how keen the investors are on ESG and/or on the comparative advantage between each fund in improving ESG or achieving profit, because S-fund growth affects fund ownership stakes. Thus, under certain conditions, S-fund growth contributes to reducing the expected negative externality in all types of firms. However, if the conditions are not satisfied, S-fund growth may not contribute to reducing the expected negative externality except in the

case of B-firms. This is because the fund ownership effect works, unlike the argument of Hartzmark and Shue (2023), which mainly depends on a limited ESG impact on G-firms.

The increasing tendency for shareholder ESG engagement to have a limited impact on G-firms has a direct effect on both the ESG efforts of the S- and P-fund managers in G-firms. Given a possible effect from a change in fund ownership stakes, the derivation of the results is not straightforward. However, we can show that the fund ownership effect works only in G-firms. Hence, the interaction of the direct effect and the fund ownership effect in G-firms leads to our second result in the presence of the S- and P-funds.

Our results have several empirical implications as a result of imposing restrictions on the model parameters that cause S- and P-funds to have different types of costs and specialize in different types of engagement. To this end, we define expected financial returns as [expected profit of the firm] - [price of the firm]. Suppose that improving ESG performance can be achieved to a certain degree by setting broad, market-wide standards for ESG, rather than focusing on firm-specific operational improvements. Then, as will be discussed in Section 5, the S-fund has a more cost advantageous position to improve profit performance over ESG performance compared with the P-fund.

Under this environment, growing interest in ESG always improves ESG performance in any type of firm, and is likely to increase expected financial returns in any type of firm if investors' ESG preferences are not strong initially. In addition, it creates a positive association between ESG scores and the earnings before interest, taxes, depreciation, and amortization (EBITDA) attained by any type of firm if investors are not very ESG conscious initially. However, if these environmental conditions are not satisfied, these predictions do not necessarily hold.

Second, the increasing tendency for shareholder ESG engagement to have a limited impact on firms with high-ESG scores reduces ESG performance, but improves expected financial returns in firms with high-ESG scores and all the firms in the market portfolio. Furthermore, it causes a negative association between ESG scores and the EBITDA attained by firms with high-ESG scores and all the firms in the market portfolio.

Third, the lower ESG engagement cost of the S-fund (P-fund) improves ESG performance but reduces expected financial returns in firms with high-ESG scores and all the firms in the market portfolio (in any type of firm). The lower engagement costs of the S-fund (P-fund) also cause a negative association between ESG scores and the EBITDA

attained by firms with high-ESG scores and all the firms in the market portfolio (by any type of firm).

The remainder of the paper is organized as follows. Section 2 reviews the related literature, and Section 3 presents the basic model. Sections 4.1 and 4.2 examine fund managers' efforts and trading decisions, taking management fees and investment decisions by fund investors as given. Section 4.3 derives the asset management fees and the investment allocation decisions by fund investors. Section 4.4 characterizes the equilibrium and Section 4.5 discusses the comparative static results. Section 5 considers the empirical implications of our main results. The final section concludes the paper. Appendix A provides the proofs of all propositions. Appendix B discusses the robustness of our main results in the case of multiple S- and P-funds and in the presence of non-sustainable funds, and provides additional comparative static results regarding P-fund growth.

2. Related Literature

The analysis in this paper is related to the delegated asset management literature on the interaction between active and passive funds in general equilibrium (Gârleanu and Pedersen, 2018, and Corum, Malenko, and Malenko, 2021). In particular, by extending the model of Gârleanu and Pedersen (2018) with shareholder engagement, Corum, Malenko, and Malenko (2021) mainly examine how the fund managers' governance incentives to improve the expected profit of their portfolio firms are affected by passive fund growth evidenced by a decrease in fund investors' search costs for the P-fund.[8] By contrast, based on the model of Corum, Malenko, and Malenko (2021), we consider multiple task-setting by S- and P-fund managers who make engagement decisions to improve not only the expected profit but also the social performance (i.e., impact) of their portfolio firms when investors have an ESG preference. Our paper focuses on how these engagement decisions under the multitask setting are affected by growing interest in ESG, the increasing tendency for shareholder ESG engagement to have a limited impact on high-ESG firms, and the reduction in ESG engagement cost when investors have ESG concerns.

Our model is related to theoretical studies of sustainable investing and provides impli-

[8]Kakhbod, Loginova, Malenko, and Malenko (2023) discuss the effect of shareholder engagement; that is, shareholders communicating their views to management, under growing ownership by passively managed funds. However, they do not consider the agency relationship between fund investors and fund managers.

cations for the existence of socially responsible investors. Pástor, Stambaugh, and Taylor (2021b) derive an ESG factor in an equilibrium asset-pricing model when investors have an ESG preference. They show that sustainable investing brings about a positive social impact by making firms greener and by shifting real investment toward green firms. Goldstein, Kopytov, Shen, and Xiang (2022) develop a rational expectations equilibrium model with socially responsible and traditional for-profit investors, and suggest that an increase in the fraction of socially responsible investors and an improvement in the ESG information quality can reduce price informativeness about the financial payoff and raise the financial returns for investors.

Under the interaction between socially responsible investors and traditional for-profit investors when firms are subject to financing constraints, several papers consider the effect of socially responsible investors providing more capital to sustainable investment. Chowdhry, Davies, and Waters (2019) indicate that socially responsible investors must hold financial claims to counterbalance project owners' tendencies to overemphasize profits, if project owners cannot commit to social objectives when they finance capital from profit-motivated investors alone. Green and Roth (2021) examine the situation in which socially responsible and commercial investors compete to finance for-profit entrepreneurs, and characterize alternative strategies for socially responsible investors that result in higher social welfare and higher financial returns. Oehmke and Opp (2020) identify optimal investment choices for socially responsible investors who bargain with the entrepreneur with ESG preferences, and show that socially responsible and for-profit financial investors are complementary. Using the model in which entrepreneurs search for capital, Landier and Lovo (2022) indicate that a firm's incentive to reduce negative externalities increases with the size of socially responsible capital.

Heinkel, Kraus, and Zechner (2001) and Edmans, Levit, and Schneemeier (2022) derive conditions concerning whether holding stocks of a "brown" firm taking a corrective action dominates divestment of stocks of "brown" firms. Broccardo, Hart, and Zingales (2022) find that engagement (i.e., through voting rights) is more effective than divesting stocks to make firms internalize negative externalities. Inderst and Opp (2022) investigate a situation in which the social planner sets a minimum susceptibility standard that all investment and production must satisfy, and ask whether such labeling is socially optimal. Hartzmark and Shue (2022) discuss that the current sustainable investment strategy

mainly rewards green firms for trivial reductions in their already low levels of emissions.

By contrast, our paper is the first to consider how the expected negative externality and the expected profit of firms in the presence of the S- and P-funds vary with (i) investors' ESG preferences, (ii) the limited impact of shareholder ESG engagement in high-ESG firms, and (iii) the ESG engagement cost for each fund manager. In particular, these problems are examined not only when profit-motivated fund managers face a multitask agency situation where they exert engagement efforts to improve ESG and profit levels for socially responsible investors, but also when the impact of shareholder ESG engagement in high-ESG firms is limited. Although the direct effects of the key parameters in these problems have important effects, one of the significant factors in our paper is the interaction of the fund investors' reallocation of investments across assets and the fund managers' reallocation of engagement efforts across tasks, which may lead to S-fund growth failing to contribute to improving ESG performance.

3. The Basic Model

3.1. Firms, fund managers, and investors.—

The model considers a single period, from time 0 to time 1, in which there are three types of agents: fund managers, who invest in firms on behalf of fund investors but are purely interested in their monetary payoffs; fund investors, who indirectly invest in firms through the fund managers and consider both firm profit and ESG performances; and liquidity investors, who directly invest in firms for various reasons, and consider both firm profit and ESG performances. In Appendix B.2, we extend the basic model by incorporating non-socially responsible investors, who do not care about ESG performance. All agents are risk neutral.

There is a mass one of firms with observable high-ESG performance (which we refer to as G-firms), and a mass one of firms with observable low-ESG performance (B-firms). G-firms generate lower negative externalities (e.g., they are cleaner and pollute the environment less) than B-firms. We index G-firms (B-firms) by $G_j \in [0, 1]$ ($B_j \in [0, 1]$). Each firm's stock is in unit supply because the initial owners of the firm have sufficiently low valuations such that they are willing to sell their shares regardless of the price.

The observable profit of firm G_j is represented by

$$\widetilde{R}_{G_j} \equiv R_{G_j} + \epsilon_{RG_j} = R_0 + \sum_{i=1}^{M_{G_j}} e_{iG_j} + \epsilon_{RG_j}, \tag{1}$$

where R_0 is the base profit without shareholder engagement, M_{G_j} is the number of shareholders of firm G_j, e_{iG_j} is the amount of unobservable effort exerted by shareholder i to improve the profit of firm G_j, and ϵ_{RG_j} is unobservable noise that has a mean of zero.[9] Similarly, the observable profit of firm B_j is

$$\widetilde{R}_{B_j} \equiv R_{B_j} + \epsilon_{BG_j} = R_0 + \sum_{i=1}^{M_{B_j}} e_{iB_j} + \epsilon_{RB_j}, \tag{2}$$

where M_{B_j} is the number of shareholders of firm B_j, e_{iB_j} is the amount of unobservable effort exerted by shareholder i to improve the profit of firm B_j, and ϵ_{RB_j} is the unobservable noise that has mean zero. For simplicity, note that the base profit is the same for both G- and B-firms.

The observable negative externality released by firm G_j is given by

$$\widetilde{Z}_{G_j} \equiv Z_{G_j} + \epsilon_{ZG_j} = Z_{G0} - \lambda \sum_{i=1}^{M_{G_j}} a_{iG_j} + \epsilon_{ZG_j}, \tag{3}$$

where Z_{G0} is the negative externality of G-firms without shareholder engagement, $\lambda \in [0, 1)$ is a constant parameter, a_{iG_j} is the amount of unobservable effort exerted by shareholder i to improve the ESG performance of firm G_j, and ϵ_{ZG_j} is the unobservable noise that has mean zero. Similarly, the observable negative externality released by firm B_j is

$$\widetilde{Z}_{B_j} \equiv Z_{B_j} + \epsilon_{ZB_j} = Z_{B0} - \sum_{i=1}^{M_{B_j}} a_{iB_j} + \epsilon_{ZB_j}, \tag{4}$$

where Z_{B0} is the negative externality of B-firms without shareholder engagement, a_{iB_j} is the amount of unobservable effort exerted by shareholder i to improve the ESG performance of firm B_j, and ϵ_{ZB_j} is the unobservable noise that has mean zero.

[9] The noise terms ϵ_{RG_j} and ϵ_{RB_j} (ϵ_{ZG_j} and ϵ_{ZB_j}) prevent fund investors from stipulating e_{iG_j} and e_{iB_j} (a_{iG_j} and a_{iB_j}) for $i \in (S, P)$ for their fund managers directly by observing R_{G_j} and R_{B_j} (Z_{G_j} and Z_{B_j}).

It follows from (3) and (4) that in response to an increase in the effort of each shareholder, there is a marginal improvement in the ESG performance of G-firms that is smaller than that of B-firms. Thus, λ indicates the limited impact in G-firms relative to B-firms in response to each fund manager's ESG effort. This formulation reflects the observation that the shareholder effort would be more valuable for firms that lag behind in terms of ESG; that is, for B-firms (for empirical evidence, see Hartzmark and Shue, 2023).

We assume that ϵ_{RG_j}, ϵ_{RB_j}, ϵ_{ZG_j}, and ϵ_{ZB_j} are distributed independently. It follows from (1)–(4) that R_{G_j}, R_{B_j}, Z_{G_j}, and Z_{B_j} are the expected values of $\widetilde{R}_{G_j}$, $\widetilde{R}_{B_j}$, $\widetilde{Z}_{G_j}$, and $\widetilde{Z}_{B_j}$, respectively. As G-firms have better ESG performance than B-firms, we focus on the case of $Z_{G_j} > Z_{B_j}$, which implicitly assumes that Z_{B0} is sufficiently larger than Z_{G0}. In the subsequent analysis, we focus on the case of $(Z_{G_j}, Z_{B_j}) > 0$.

We assume that the stocks of firms can be accessed by fund investors only through two fund types: namely, S-funds and P-funds. For simplicity, there is one fund manager of each type of fund, although we can easily extend to any number of S-funds and P-funds, N_S and N_P.[10] The S-fund is restricted to holding stocks of firms with high-ESG performance, whereas the P-fund is restricted to holding a value-weighted portfolio of all stocks according to a mechanical rule. In our framework, the S-fund can be taken as either sustainable active funds or ESG-indexed funds. In Appendix B.2, we consider a non-sustainable fund (N-fund) that only invests in stocks of firms with low-ESG performance. The fund manager of each fund offers to invest the wealth of fund investors in stocks of firms in exchange for an asset management fee.

The fund manager of type $i \in (S, P)$ chooses the amount of unobservable efforts (e_{ih_j}, a_{ih_j}) to improve the profit and ESG performance of his portfolio firms h_j at time 0, where $h \in (G, B)$. If he exerts an effort regarding the firm profit e_{ih_j}, he incurs a private cost $c_{Ri}(e_{ih_j})$ for $i \in (S, P)$ and $h \in (G, B)$. However, if he exerts an effort regarding ESG performance a_{ih_j}, he incurs a private cost $c_{Zi}(a_{ih_j})$ for $i \in (S, P)$ and $h \in (G, B)$. We assume that $c_{ki}(0) = 0$, $c'_{ki}(\cdot) > 0$, $c''_{ki}(\cdot) > 0$, $c'_{ki}(0) = 0$, and $c'_{ki}(\infty) = \infty$ for $k \in (R, Z)$ and $i \in (S, P)$. These standard assumptions ensure an interior solution to (e_{ih_j}, a_{ih_j}) for $i \in (S, P)$ and $h \in (G, B)$.

[10] Although we extend our model to the case of multiple S- and P-funds, the only things that matter for fund managers' engagements with portfolio firms are the combined holdings of all S-funds and those of all P-funds. The individual fund's ownership stakes do not matter; therefore, our results continue to hold. See Appendix B.1 for further details.

The effort e_{ih_j} (a_{ih_j}) exerted by the fund manager i for $i \in (S, P)$ and $h \in (G, B)$ includes any actions, such as communicating with management, submitting shareholder proposals, nominating directors, and voting on proxy contests. Although large P-funds charge substantially smaller management fees than actively managed funds, the large amount of assets under their management and ownership stakes can compensate for their low management fees and strongly incentivize their fund managers to exert managerial effort (see Brav, Malenko, and Malenko, 2022, for a numerical discussion; and Kahn and Rock, 2020, and Lewellen and Lewellen, 2022, for empirical evidence regarding financial incentives of P-funds). In particular, recently, fund managers of large P-funds have been involved in engagement through voting and communications with management (see the literature review of Section 4.2 in Brav, Malenko, and Malenko, 2022, for the empirical evidence). Hence, greater ownership of P-funds has various effects on governance. In the subsequent analysis, we focus on the case of $(e_{SG_j}, a_{SG_j}) > 0$ and $(e_{Ph_j}, a_{Ph_j}) > 0$ for $h \in (G, B)$ and any j. Note that the S-fund does not hold stakes in B-firms.

There is a large mass of homogeneous fund investors, who have a certain amount of wealth to invest, ε.[11] We denote their aggregate wealth by W, which is given exogenously. Although fund investors want to receive more pecuniary investment returns, they also derive disutility from holding stocks of firms generating negative externalities. For simplicity, we assume that the amount of disutility incurred by fund investors per unit of their stock holdings is equal to $\eta \times$ (the negative externality generated by their holding firms per unit of their stock holdings), where η (> 0) is a scalar measuring the degree of investors' "ESG" preference.[12]

At time 0, each fund investor chooses whether to invest in the S-fund and/or the P-fund by delegating her wealth to the fund manager, and whether to invest in an alternative investment opportunity such as public bonds that generates a fixed return of 0. When each fund investor with wealth ε seeks an S-fund (a P-fund) manager, she must search for and vet fund managers by incurring a search cost $\psi_S \varepsilon$ ($\psi_P \varepsilon$). Fund investors are assumed

[11] Fund investors typically include pension funds, sovereign wealth funds, and wealthy retail investors who have invested in family offices in which hedge funds manage their covert operations.

[12] The utility of fund investors depends on the pecuniary returns that they receive and the social value created by firms they have financed through funds. Green and Roth (2021) refer to these investors as value-aligned social investors. The assumption that investors prefer socially responsible performance is supported by empirical studies in the mutual fund literature. For example, see Riedl and Smeets (2017) and Hartzmark and Sussman (2019).

to be homogeneous; therefore, they incur the same search cost $\psi_S\varepsilon$ ($\psi_P\varepsilon$) when they try to find an S-fund (a P-fund) manager. Thus, the proportional parameter ε can be interpreted as a normalization by adjusting the scale of ψ_S and ψ_P. These costs indicate that most fund investors must spend significant resources to find a fund manager whom they trust with their money, and to examine the funds' investment strategies and fee structures.[13] We assume that $\psi_S \geq \psi_P$. This assumption can be justified because it takes more time and effort to understand the investment strategy and fee structure of an S-fund than that of a P-fund.

After a fund investor finds a fund manager $i \in (S, P)$, they negotiate the fee f_i through generalized Nash bargaining at time 0.[14] The fund manager of the S-fund (P-fund) has bargaining power ω_S (ω_P) $\in$ (0, 1), whereas the fund investor has bargaining power $1 - \omega_S$ ($1- \omega_P$). We assume that the fee charged by the fund manager to the fund investor is a fraction of the sum of the realized values of the profit and the disutility of the negative externality of their portfolio firms, which is assumed to be observable. The pecuniary amount deducted from the fund manager's compensation as a result of the negative externality arises directly from bargaining between the fund manager and the fund investor.[15] However, it may be viewed as the fund manager's reward reduction being tied to ESG criteria and/or the fund manager's reputation loss from the nonaccomplishment of direct contract commitments on ESG goals or from public sentiment that the fund manager may impair improvement in firms' ESG performance.

Finally, there is a large mass of liquidity investors, who directly invest in firms at time 0 for various reasons, such as liquidity need, hedging demand, firms' issuance, repurchase of shares, or investor sentiment, although they also incur a disutility of amount as $\eta \times$ (the negative externality generated by their holding firms per unit of their holding stocks).[16] Liquidity investors apply rational expectations in predicting the value of each

[13] For more information, see Corum, Malenko, and Malenko (2021) and the references listed in footnote 9 in their text.

[14] This assumption is also made in Gârleanu and Pedersen (2018) and Corum, Malenko, and Malenko (2021).

[15] Note that the deduction amount, $f_i \times$ (the disutility of the negative externality), in turn, increases the pecuniary payoff of fund investors, while decreasing the pecuniary payoff of the fund manager. In addition, the fund manager's payoff is positive even though this amount is deducted because we impose the assumption, as discussed below, that the stock price is always positive. Adachi-Sato (2022) clarifies that a profit-oriented agent pursues improvement in ESG performance under the bargaining between a socially and environmentally aware principal and the agent.

[16] These traders include insurance companies and retail investors.

stock. However, their valuation is perturbed by an additional factor that captures the amount of liquidity need, hedging demand, firms' issuance, repurchase of shares, or investor sentiment. As a result, liquidity investors' expectation of the value of the stock of each firm is equal to the sum of the expected values of the profit and the disutility of the negative externality generated by the firm h_j, $R_{h_j} - \eta Z_{h_j}$, minus the additional component, $L_{h_j} > 0$; that is, $R_{h_j} - \eta Z_{h_j} - L_{h_j}$ for $h \in (G, B)$.[17]

3.2. Equilibrium.—

The equilibrium includes the search and investment allocation strategies of fund investors, management fees, each agent's trading strategy, each fund manager's engagement effort strategy, and the market clearing price, as follows.

At the beginning of time 0, fund investors make their search and investment allocation decisions with the aim of maximizing the sum of their expected profit and their expected disutility from negative externalities minus the search cost. After a fund investor finds a fund manager, they negotiate the management fee through generalized Nash bargaining. Then, each fund manager invests the delegated amount of fund investors' wealth in stocks according to the trading strategy of each fund, as described below. First, the S-fund is restricted to holding stocks of firms with high-ESG performance. Specifically, we assume that the S-fund manager invests only in G-firms. Second, the P-fund is restricted to holding a value-weighted portfolio of all stocks according to a mechanical rule.

However, liquidity investors trade according to their predictions about the stock price of each firm. Their predictions are made by anticipating the equilibrium effort of fund managers under rational expectations.

After trading, each fund manager selects his effort at time 0 to maximize his expected compensation minus his effort cost by improving the profit and ESG performance of his portfolio firms, given his management fee.

Finally, at time 1, the profit and negative externality generated by each firm is realized. Then, the payoffs of the fund manager and fund investors in each fund are determined according to the management fee.

The stock price of each firm is set to clear the market at time 0. Short sales are ruled out. We restrict our analysis to the case in which liquidity investors hold at least some

[17] All of our results continue to hold even when $L_{G_j} = L_{B_j}$.

shares of each type of stock.[18] The assessment of both the S-fund and the P-fund of each stock $h \in (G, B)$ reflect the fund investors' valuation of the stock h, which is higher than that of the liquidity investors; therefore, the market clearing price of stock $h \in (G, B)$ may be determined by the liquidity investors' assessment of stock h.[19]

Figure 1 illustrates the model timing.

4. The Analysis

We solve this model by backward induction. First, we determine the effort decisions of fund managers and examine the trading decisions of liquidity investors and fund managers. Then, we clarify the investment allocation decisions of fund investors and the determination of asset management fees. Finally, the equilibrium is defined as a set of these decisions and market clearing conditions.

We drop the subscript j from each variable in the subsequent discussions because G-firms (B-firms) are all homogeneous and because the S-fund finds it optimal to diversify equally across all G-firms.[20]

4.1. Fund managers' effort decisions.—

Suppose that the S-fund manager charges the management fee f_S, holds x_{SG} shares, and exerts the efforts (e_{SG}, a_{SG}). Then, the S-fund manager's expected payoff is given by

$$f_S x_{SG}(R_G - \eta Z_G) - c_{RS}(e_{SG}) - c_{ZS}(a_{SG}). \tag{5}$$

Note that the S-fund holds only the stock of the G-firm, and that the sum of the expected profit and the expected disutility from the negative externality of the G-firm is $R_G - \eta Z_G$. As discussed in Section 3.1, note that the fund manager's compensation includes the pecuniary amount deducted as a result of the negative externality.

Next, suppose that the P-fund manager charges the management fee f_P, holds x_{Ph} shares, and exerts the efforts (e_{Ph}, a_{Ph}) for $h \in (G, B)$. Then, the P-fund manager's

[18] Proposition 1 provides a sufficient condition for this to hold.

[19] For an alternative justification, we can assume that the S- and P-funds submit a market order, whereas liquidity investors submit a limit order reflecting their valuation of each stock.

[20] We provide a sufficient condition for this in Proposition 1.

expected payoff from firm h is given by

$$f_P x_{Ph}(R_h - \eta Z_h) - c_{RP}(e_{Ph}) - c_{ZP}(a_{Ph}), \qquad \text{for } h \in (G, B). \tag{6}$$

Note that the P-fund holds stocks of both the G-firm and the B-firm, and that the sum of the expected profit and the expected disutility from the negative externality of firm h is $R_h - \eta Z_h$ for $h \in (G, B)$.

For simplicity, we assume that $c_{Ri}(e_{ih})$ and $c_{Zi}(a_{ih})$ are quadratic; that is,

$$c_{Ri}(e) = \frac{c_{Ri}}{2}e^2 \text{ and } c_{Zi}(a) = \frac{c_{Zi}}{2}a^2, \qquad \text{for } i \in (S, P), \tag{7}$$

where $c_{Ri} > 0$ and $c_{Zi} > 0$ for $i \in (S, P)$. Then, it follows from (1)–(4) that maximizing (5) and (6) yields the following first-order conditions; that is, the optimal effort decisions of the S- and P-fund managers satisfy

$$e_{SG} = \frac{f_S x_{SG}}{c_{RS}} \text{ and } a_{SG} = \frac{\eta \lambda f_S x_{SG}}{c_{ZS}}, \tag{8}$$

$$e_{Ph} = \frac{f_P x_{Ph}}{c_{RP}} \text{ and } a_{Ph} = \frac{\eta \lambda_h f_P x_{Ph}}{c_{ZP}}, \qquad \text{for } h \in (G, B), \tag{9}$$

where $\lambda_G = \lambda$ and $\lambda_B = 1$. Next, (8) and (9) imply the following: (i) each fund manager exerts more effort regarding both firm profit and ESG performance in all firms if he holds more shares of his portfolio firms (i.e., higher x_{ih}) and/or if his management fee is higher (i.e., higher f_i); (ii) each fund manager exerts more effort regarding ESG performance in all firms if the degree of investors' ESG preference is larger (i.e., larger η); and (iii) each fund manager exerts more effort regarding ESG performance in G-firms if his effort is more valuable in G-firms (i.e., higher λ).

4.2. Trading decisions.—

In making their trading decisions, liquidity investors and fund managers rationally anticipate the fund managers' effort decisions given by (8) and (9).

Under rational expectations, if liquidity investors expect the S- and P-funds to hold x_{SG} and x_{PG} shares in G-firms, it follows from (1), (3), (8), and (9) that the liquidity

investors' assessment of the stock of G-firms is

$$R_G - \eta Z_G - L_G = R_0 + \frac{f_S x_{SG}}{c_{RS}} + \frac{f_P x_{PG}}{c_{RP}} - \eta \left(Z_{G0} - \lambda \frac{\eta \lambda f_S x_{SG}}{c_{ZS}} - \lambda \frac{\eta \lambda f_P x_{PG}}{c_{ZP}} \right) - L_G. \quad (10)$$

Similarly, using (2), (4), and (9), liquidity investors' assessment of the stock of B-firms is

$$R_B - \eta Z_B - L_B = R_0 + \frac{f_P x_{PB}}{c_{RP}} - \eta \left(Z_{B0} - \frac{\eta f_P x_{PB}}{c_{ZP}} \right) - L_B. \quad (11)$$

Note that the S-fund holds only the stock of G-firms.

Each liquidity investor purchases stock $h \in (G, B)$ if his valuation exceeds the price; that is, $R_h - \eta Z_h - L_h \geq P_h$ for $h \in (G, B)$. We focus on the case in which liquidity investors hold at least some shares of stocks in each type of firm; that is, G- and B-firms. As mentioned at the end of Section 3.2, this implies that the market clearing price of stock $h \in (G, B)$ is determined by the liquidity investors' assessment of stock h:

$$P_h = R_h - \eta Z_h - L_h, \qquad \text{for } h \in (G, B), \quad (12)$$

where $R_h - \eta Z_h - L_h$ for $h \in (G, B)$ is given by (10) and (11). Here, we assume that $R_0 > \max(\eta Z_{G0} + L_G, \eta Z_{B0} + L_B)$, which is also provided in Proposition 1. Given (10) and (11), this assumption ensures that the price of each stock is always positive.

To characterize the trading decisions of the S- and P-funds, let W_S and W_P denote the sizes of the S- and P-funds, respectively, which are endogenously determined in equilibrium. The S- and P-fund managers use all of W_S and W_P delegated to them as long as liquidity investors hold at least positive shares of stocks of each firm.[21]

The S-fund invests only in G-firms. As mentioned, the S-fund finds it optimal to diversify equally across all G-firms. Given that the S-fund can use all W_S to purchase x_{SG} units of the stock of G-firms, we have

$$x_{SG} = \frac{W_S}{P_G}. \quad (13)$$

[21] Note that these fund managers evaluate each stock more highly than do liquidity investors or submit a market order.

Because of (12), note that

$$P_G = R_G - \eta Z_G - L_G. \tag{14}$$

The P-fund is restricted to holding a value-weighted portfolio of all stocks, with this market portfolio denoted by index M. As there is a mass one of G-firms and a mass one of B-firms, the price of the market portfolio is $P_M = \int_0^1 P_G dj + \int_0^1 P_B dj = P_G + P_B$. The P-fund purchases x_{Ph} units of stock h according to the market portfolio rule, under which the proportion of the amount invested in stock h in the fund, $\frac{x_{Ph}P_h}{W_P}$, equals the weight of this stock in the market portfolio, $\frac{P_h}{P_M}$. This implies that x_{Ph} is the same for any $h \in (G, B)$ and is equal to

$$x_P = \frac{W_P}{P_M}. \tag{15}$$

Furthermore, let $R_M = R_G + R_B$, $Z_M = Z_G + Z_B$, and $L_M = L_G + L_B$. Then, it follows from (10)–(12) with $x_{Ph} = x_P$ for any $h \in (G, B)$ that

$$P_M = R_M - \eta Z_M - L_M, \tag{16}$$

where

$$\begin{aligned} R_M - \eta Z_M - L_M = {} & R_0 + \frac{f_S x_{SG}}{c_{RS}} + \frac{f_P x_P}{c_{RP}} - \eta \left(Z_{G0} - \lambda \frac{\eta \lambda f_S x_{SG}}{c_{ZS}} - \lambda \frac{\eta \lambda f_P x_P}{c_{ZP}} \right) \\ & + R_0 + \frac{f_P x_P}{c_{RP}} - \eta \left(Z_{B0} - \frac{\eta f_P x_P}{c_{ZP}} \right) - L_M. \end{aligned} \tag{17}$$

Note that from (9) and (15), e_{Ph} is the same for any $h \in (G, B)$. Thus, (9) is rewritten so that

$$e_P = \frac{f_P x_P}{c_{RP}} \text{ and } a_P = \frac{\eta \lambda_h f_P x_P}{c_{ZP}}, \qquad \text{for } h \in (G, B), \tag{9$'$}$$

where $\lambda_G = \lambda$ and $\lambda_B = 1$.

4.3. Investment allocation decisions and asset management fees.—

Now, we discuss the investment allocation decision by infinitesimal fund investors, who choose between investing in the S-fund and/or the P-fund and investing in an alternative investment opportunity, such as public bonds, that generates the fixed return 0. To this end, we begin by examining fund investors' indifference conditions regarding the

investment allocation. Consider a fund investor with wealth ε. If the fund investor invests with the S-fund, the fund manager buys $\frac{\varepsilon}{P_G}$ stocks. Then, the fund investor's expected payoff is $(R_G - \eta Z_G)\frac{\varepsilon}{P_G} - f_S(R_G - \eta Z_G)\frac{\varepsilon}{P_G} - \psi_S\varepsilon = (1 - f_S)(R_G - \eta Z_G)\frac{\varepsilon}{P_G} - \psi_S\varepsilon$ because she incurs a search cost $\psi_S\varepsilon$ and pays the fee f_S. Similarly, the fund investor's expected payoff with the P-fund is $(1 - f_P)(R_M - \eta Z_M)\frac{\varepsilon}{P_M} - \psi_P\varepsilon$.

Under the condition of Proposition 1 derived below, we can ensure that $W_S + W_P < W$ if the aggregate wealth of fund investors such as pension funds is sufficiently large that they purchase public bonds. Then, fund investors make a positive investment in public funds with the fixed return of 0. This implies that fund investors earn the same rate of expected net return regardless of whether they invest with S- or P-funds, and this expected net return is equal to 1.[22] Specifically, the fund investors' indifference conditions are

$$(1 - f_S)\frac{R_G - \eta Z_G}{P_G} - \psi_S = (1 - f_P)\frac{R_M - \eta Z_M}{P_M} - \psi_P = 1. \tag{18}$$

Next, we deal with bargaining in the S-fund. After a fund investor with wealth ε incurs the cost $\psi_S\varepsilon$ and finds an appropriate S-fund, she bargains with the S-fund manager over the fee $\widehat{f}_S$. The outcome of the bargaining depends on each player's expected payoff in the event of agreement and no agreement. If the fund investor and the fund manager agree on the fee $\widehat{f}_S$, the fund investor's expected payoff is $(1 - \widehat{f}_S)(R_G - \eta Z_G)\frac{\varepsilon}{P_G}$. If no agreement is reached, the fund investor can either find the P-fund by incurring the cost $\psi_P\varepsilon$ and invest with the P-fund or invest in the alternative investment opportunity. Under (18), the P-fund yields the same rate of net return 1 for the fund investor as the alternative investment opportunity so that her expected payoff is ε when no agreement is reached.

To specify the fund manager's expected payoff, we must provide his additional expected payoff from agreeing on the fee $\widehat{f}_S$ and obtaining the additional funds ε. The additional expected payoff is represented by $\widehat{f}_S(R_G - \eta Z_G)\frac{\varepsilon}{P_G}$.[23] However, the fund manager's gain

[22] This assumption forces us to neglect the case where the rates of net return from investing with the S- and P-funds are larger than 1, which is analyzed by Corum, Malenko, and Malenko (2021). However, the assumption enables us to focus on the effects that occur through the effort decisions of fund managers on multiple tasks under the negative externality released by their portfolio firms.

[23] By adding ε to the fund with x_{SG}, it follows from (1), (3), and (9′) that the expected payoff of the S-fund manager is $\max_{e,a}\{f_S[R_{G0} + e + \frac{f_P x_P}{c_{RP}} - \eta(Z_{G0} - \lambda a - \lambda\frac{\eta\lambda f_P x_P}{c_{ZP}})]x_{SG} + \widehat{f}_S[R_{G0} + e + \frac{f_P x_P}{c_{RP}} - \eta(Z_{G0} - \lambda a - \lambda\frac{\eta\lambda f_P x_P}{c_{ZP}})]\frac{\varepsilon}{P_G} - c_{RS}(e) - c_{ZS}(a)\}$. Using the envelope theorem, the derivative with respect

from no agreement is zero.

Given the fund manager's (investor's) bargaining power ω_S $(1-\omega_S)$, the bargaining outcome maximizes the product of the expected payoff gains from agreement with respect to $\widehat{f}_S$:

$$\max_{\widehat{f}_S} \left[(1-\widehat{f}_S)(R_G-\eta Z_G)\frac{\varepsilon}{P_G}-\varepsilon\right]^{1-\omega_S}\left[\widehat{f}_S(R_G-\eta Z_G)\frac{\varepsilon}{P_G}\right]^{\omega_S}.$$

The solution must satisfy

$$\widehat{f}_S(R_G-\eta Z_G)\frac{\varepsilon}{P_G}=\omega_S\left[(R_G-\eta Z_G)\frac{\varepsilon}{P_G}-\varepsilon\right].$$

As the S-fund fee is the same for all fund investors, we have $\widehat{f}_S = f_S$. Thus,

$$f_S=\omega_S\left(1-\frac{P_G}{R_G-\eta Z_G}\right). \tag{19}$$

Similarly, the P-fund fee is the same for all investors, and is given by

$$f_P=\omega_P\left(1-\frac{P_M}{R_M-\eta Z_M}\right). \tag{20}$$

4.4. Characterization of equilibrium.—

The equilibrium is defined as a solution to the following system of equations: (i) the fund managers' effort decisions (8) and (9′); market clearing conditions (10) and (13)–(17); fund investors' capital allocation conditions (18); and fee bargaining conditions (19) and (20). These equations determine the following endogenous variables: the fund managers' effort decisions, $(e_{SG}, a_{SG}, e_P, a_{PG}, a_{PB})$; the asset management fees, (f_S, f_P); the trading decisions and investment asset allocations, (x_{SG}, x_P, W_S, W_P); the total expected payoffs, $(R_G-\eta Z_G, R_M-\eta Z_M)$; and the asset prices, (P_G, P_M).

Now, we obtain the following proposition that characterizes the equilibrium.

Proposition 1: *Suppose that* $R_0 > \max(\eta Z_{B0}+L_B, \eta Z_{G0}+L_G)$ *and* $R_0-\eta Z_{G0}-L_G > W \geq \underline{W}$, *where* $\underline{W}$ *is given by (A9) in Appendix A. Then, we have the following.*
(i) The asset management fees are $f_S=\frac{\omega_S\psi_S}{\psi_S+1-\omega_S}$ *and* $f_P=\frac{\omega_P\psi_P}{\psi_P+1-\omega_P}$, and $f_S \geq f_P$ if $\omega_S \geq \omega_P$.

to ε at $\varepsilon=0$ yields $\widehat{f}_S[R_{G0}+e+\frac{f_P x_P}{c_{RP}}-\eta(Z_{G0}-\lambda a-\lambda^{\frac{\eta\lambda f_P x_P}{c_{ZP}}})]\frac{1}{P_G}=\widehat{f}_S\frac{(R_G-\eta Z_G)}{P_G}$.

(ii) The expected profit of G-stocks and the market portfolio are $R_G = \frac{\psi_S+1-\omega_S}{\psi_S}L_G + \eta Z_G$ and $R_M = \frac{\psi_P+1-\omega_P}{\psi_P}L_M + \eta Z_M$.
(iii) The expected negative externalities generated by B-firms, G-firms, and the firms included in the market portfolio satisfy the following equations:

$$Z_B + Z_G = Z_M, \tag{21}$$

$$Z_G = Z_{G0} - \eta\lambda^2\frac{c_{RS}}{c_{ZS}}(2R_G - R_M) - \eta\lambda^2\frac{c_{RP}}{c_{ZP}}(R_M - R_G - R_0), \tag{22}$$

$$Z_M = Z_{G0} + Z_{B0} - \eta\lambda^2\frac{c_{RS}}{c_{ZS}}(2R_G - R_M) - \eta\lambda^2\frac{c_{RP}}{c_{ZP}}(R_M - R_G - R_0) - \eta\frac{c_{RP}}{c_{ZP}}(R_M - R_G - R_0), \tag{23}$$

where R_G *and* R_M *are given above.*
(iv) *The prices of G-stocks and the market portfolio are* $P_G = \frac{1-\omega_S}{\psi_S}L_G$ and $P_M = \frac{1-\omega_P}{\psi_P}L_M$.

The restrictions $R_0 > \max(\eta Z_{B0} + L_B, \eta Z_{G0} + L_G)$, $R_0 - \eta Z_{G0} - L_G > W$, and $W \geq \underline{W}$ ensure that the liquidity investors' holding ratio in each stock is positive, that is, $x_{SG} + x_P < 1$. The restriction $R_0 > \eta Z_{G0} + L_G$ guarantees that the S-fund finds it optimal to diversify equally across all G-firms. Finally, the restriction $W \geq \underline{W}$ further ensures that fund investors make a positive investment in an alternative investment opportunity such as public bonds; that is, $W_S + W_P < W$.

As $W_S + W_P < W$, fund investors' aggregate wealth is relatively large. Then, their outside options in negotiations are eventually limited by an alternative investment opportunity such as public bonds with the fixed return 0.[24] In addition, given $\psi_S \geq \psi_P$, the fee charged by the S-fund is higher than that charged by the P-fund if the bargaining power of the S-fund manager is equal to or exceeds that of the P-fund manager.

Some recent studies indicate the limited or even counterproductive impact of S-funds on ESG because high-ESG firms have little scope for further improvement in their impact, whereas low-ESG firms, which face an increase in financing costs, must produce large negative externalities (e.g., see Hartzmark and Shue, 2023). In the present model, the limited impact of the ESG performance in G-firms in response to each fund manager's effort is captured by $\lambda \in [0, 1)$. Indeed, if $\lambda = 0$, it follows from (21)–(23) that the following

[24] To be consistent with the assumption of $R_0 - \eta Z_{G0} - L_G > W$ that ensures $x_{SG} + x_P < 1$, we need to suppose the situation where R_0 is also sufficiently large. Hence, our analysis may be less applicable to the case where the economy faces a financial crisis such that R_0 is not sufficiently large.

corollary is derived.

Corollary to Proposition 1: If $\lambda = 0$, shareholder engagement does not affect the expected negative externality generated by G-firms, but it does affect the expected negative externality generated by B-firms and the firms included in the market portfolio.

Intuitively, even if $\lambda = 0$, the P-fund manager's ESG engagement effort is still effective such that it affects the expected negative externalities generated by B-firms and the firms included in the market portfolio.

In the subsequent analysis, we focus on the case of $\lambda \in (0, 1)$

4.5. Comparative statics.—

We examine the effects of the key parameters of the model on the expected negative externalities, the expected profits, and the asset management fees. The key parameters are the intensity of investors' ESG preference, η, the improvement of the ESG performance in high-ESG firms relative to that in low-ESG firms in response to each fund manager's effort, λ, and the effort cost parameter of each fund manager in ESG, c_{ZS} and c_{ZP}.

We first consider how growing interest in ESG affects the ESG and pecuniary performances of firms. Then, we obtain the following proposition.

Proposition 2: *Suppose that investors' ESG preferences are strengthened (i.e., η increases).*
(i) The expected negative externality released by G-firms, Z_G, decreases if η is not large or if η is large and $\frac{c_{RP}}{c_{RS}} > \frac{c_{ZP}}{c_{ZS}}$. The expected profit of G-firms, R_G, increases if η is not large.
(ii) The expected negative externality released by B-firms, Z_B, decreases, whereas the expected profit of B-firms, R_B, increases.
(iii) The expected negative externality released by all the firms in the market portfolio, Z_M, decreases if η is not large or if η is large and $\frac{c_{RP}}{c_{RS}} > \frac{c_{ZP}}{c_{ZS}}$, whereas the expected profit for the market portfolio, R_M, increases if η is not large.
(iv) The asset management fees of both funds are unaffected.

$\frac{c_{RP}}{c_{RS}}$ is equal to the effort cost ratio of the P-fund to the S-fund for improving the profit of firms, whereas $\frac{c_{ZP}}{c_{ZS}}$ is this effort cost ratio for improving the negative externality. A larger $\frac{c_{RP}}{c_{RS}}$ ($\frac{c_{ZP}}{c_{ZS}}$) implies that increasing profits (decreasing the negative externalities) of

the portfolio firms is relatively less costly for the S-fund than for the P-fund. Thus, the larger $\frac{c_{RP}}{c_{RS}}$ ($\frac{c_{ZP}}{c_{ZS}}$) can be interpreted such that the S-fund has a greater cost advantage in improving profit (ESG performance) than the P-fund.

Considering this interpretation, Propositions 2(i) and 2(iii) show that when η increases, Z_G and Z_M decrease if η is not large, or if compared with the P-fund, the S-fund has a greater comparative advantage in improving profit performance over ESG performance (i.e., if $\frac{c_{RP}}{c_{RS}}$ is larger than $\frac{c_{ZP}}{c_{ZS}}$). Propositions 2(i) and 2(iii) indicate that when η increases, R_G and R_M increase if η is not large. Proposition 2(ii) also suggests that an increase in η always decreases Z_B and increases R_B. Proposition 2(iv) states that an increase in η does not affect either the fees of either the P-fund or the S-fund.

The intuition behind Proposition 2 is as follows. For convenience, we begin by considering the effect of an increase in η on the expected negative externality and the expected profit by taking the management fee of each fund as given. Later, we clarify the effect of an increase in η in considering its effect on the asset management fees. Now, the effort incentive for each fund manager to reduce the negative externality in a firm not only depends on η directly, but also on the fund ownership stakes in the firm, as indicated in (8) and (9′). The direct effect of an increase in η on the effort incentive increases the engagement efforts for the S- and P-fund managers a_{SG} and a_P to reduce the negative externality, thus decreasing Z_G, Z_B, and Z_M.

However, an increase in η changes the fund ownership stakes in each firm, i.e., the fund ownership effect exists. Suppose that η is not large. Then, an increase in η increases the expected disutilities of fund investors, ηZ, because $\eta\frac{dZ}{d\eta}$ is not large. The larger ηZ_G and ηZ_M increase fund investors' rate of expected gross return from each fund (note that $\partial(\frac{R-\eta Z}{P})/\partial(\eta Z) > 0$, where $P = R - \eta Z - L$). However, in equilibrium, fund investors must be indifferent between investing in each fund and the alternative investment opportunity (see (18)). In fact, the larger R_G and R_M decrease fund investors' rate of expected gross return from each fund (note that $\partial(\frac{R-\eta Z}{P})/\partial R < 0$, where $P = R - \eta Z - L$). Thus, to restore (18), R_G and R_M need to increase in response to increases in ηZ_G and ηZ_M.

To this end, note that R_G and R_M increase with the fund managers' efforts e_{SG} and e_P. Because e_{SG} and e_P are determined by (8) and (9′), each fund needs to increase its ownership stakes in each firm, x_{SG} and x_P, until the fund investors' rate of expected

gross return from the fund decreases so that their rate of expected net return goes back to 1. This implies that fund investors increase their investment in the S-fund (P-fund) and enable the S-fund (P-fund) to take increasingly large ownership stakes x_{SG} (x_P) in G-firms (all the firms in the market portfolio). Thus, the increases in x_{SG} and x_P reduce the ownership stakes held by liquidity investors; that is, $1 - x_{SG} - x_P$ in G-firms and $1 - x_P$ in the market portfolio.

The effect of the decrease in $1 - x_{SG} - x_P$ reduces Z_G and raises R_G. The reason is that if the S- and P-funds replace the liquidity investors' ownership in G-firms, the overall efforts to reduce Z_G and raise R_G increase because liquidity investors do not make any engagement efforts. Similarly, the effect of the decrease in $1 - x_P$ reduces Z_G and Z_M and raises R_G and R_M. Given that B-firms are bought only by the P-fund and liquidity investors, such changes in the fund ownership stakes also reduce Z_B and raise R_B. Because the direct effect of an increase in η derived above decreases Z_G, Z_B, and Z_M, both the direct effect and the ownership structure effect are consistent with each other in this case.

By contrast, suppose that η is large. Then, an increase in η may reduce the expected disutilities of fund investors, ηZ, because $\eta \frac{dZ}{d\eta}$ is large. Then, we can show that the fund ownership effect from the change in x_G increases Z_G and Z_M but decreases R_G and R_M, although the fund ownership effect from the change in x_P still decreases Z_B and increases R_B. However, as mentioned above, the direct effect of an increase in η on the effort incentive reduces the expected negative externality of each firm. Thus, combining these two effects, we find that the effect of an increase in η can be ambiguous in G-firms and market portfolio firms in this case. However, if $\frac{c_{RP}}{c_{RS}} > \frac{c_{ZP}}{c_{ZS}}$, the fund ownership effect of increasing Z_G and Z_M from the change in x_G is smaller than that of decreasing Z_G and Z_M from the change in x_P. Then, an increase in η reduces both Z_G and Z_M. Furthermore, for B-firms, the fund ownership effect works only through the changes in the ownership of the P-fund and liquidity investors. Consequently, an increase in η always decreases Z_B and increases R_B.

We return to examining the effect of an increase in η on the asset management fee of each fund. An increase in η changes the expected gross return earned by fund investors. The reason is that an increase in η changes the expected disutilities of fund investors, ηZ, as discussed above. However, given (14), (16), (19), and (20), note that fund investors' rate of expected gross return, $(1 - f)\frac{R - \eta Z}{P}$, depends on the expected profit of portfolio

firms of the fund, R, minus the expected disutility of the negative externality released by the firms, ηZ. When η increases, the effect of the increase in η on the expected disutility is canceled out by its effect on the expected profit to restore fund investors' capital allocation conditions (18). This implies that the change in η has no effect on the fund investors' rate of expected gross return, and thus has no effect on the management fee of either fund when fund investors' bargaining power is fixed.[25]

Now, we proceed to discuss the comparative statics of λ, which is taken as the limited impact on G-firms in response to each fund manager's ESG effort. Then, we have the following proposition.

Proposition 3: *Suppose that the improvement of the ESG performance of G-firms relative to that of B-firms in response to each fund manager's ESG effort is further limited (i.e., λ decreases).*
(i) The expected negative externality and the expected profit of G-firms, Z_G and R_G, increase.
(ii) The expected negative externality and the expected profit of B-firms, Z_B and R_B, are unaffected.
(iii) The expected negative externality and the expected profit of all the firms in the market portfolio, Z_M and R_M, increase.
(iv) The asset management fees of both funds are unaffected.

Proposition 3 indicates that when λ decreases, the ESG performances on G-firms and of all the firms in the market portfolio are negatively affected, whereas the profit performances of these firms are improved. However, neither ESG performance nor profit performance in B-firms is affected. In addition, the asset management fees of both funds are unaffected.

The intuition for Proposition 3 is as follows. Again, suppose that the management fee is taken as given. Then, the lower λ directly decreases both the S-fund manager's ESG effort in G-firms (see $a_{SG} = \frac{\eta\lambda f_S x_{SG}}{c_{ZS}}$) and the P-fund manager's ESG effort in G-firms (see $a_{PG} = \frac{\eta\lambda f_P x_P}{c_{ZP}}$), thereby increasing both Z_G and Z_M directly. However, as discussed in the case of an increase in η, we also need to consider the effect of a change in the fund

[25] Under fund investors' capital allocation conditions (18), the S-fund (P-fund) investors' rate of expected gross return $(1 - f_S)\frac{R_G - \eta Z_G}{P_G}$ ($(1 - f_P)\frac{R_M - \eta Z_M}{P_M}$) must remain constant for a fixed ψ_S (ψ_P). Combining this with (19) ((20)), we can show that both the fund fee f_S (f_P) and the rate of expected gross return $\frac{R_G - \eta Z_G}{P_G}$ ($\frac{R_M - \eta Z_M}{P_M}$) must remain unaffected by the change in η.

ownership stakes. Because the larger Z_G and Z_M increase fund investors' rate of expected gross returns from both the S- and P-funds (see $\partial[(1-f)\frac{R-\eta Z}{P}]/\partial Z > 0$, where $P = R - \eta Z - L$), fund investors would increase their investment in the S- and P-funds. Such an investment increase would force the S-fund (P-fund) manager to buy a larger number of the shares of G-firms (all the firms in the market portfolio), thus increasing x_{SG} (x_P). However, the effect of the larger x_{SG} and x_P also raise the fund managers' efforts regarding firm profit (see $e_{SG} = \frac{f_S x_{SG}}{c_{RS}}$ and $e_P = \frac{f_p x_p}{c_{Rp}}$). Hence, R_G and R_M increase.

In fact, note that fund investors' rate of expected gross return, $(1-f)\frac{R-\eta Z}{P}$, depends on the expected profit of the portfolio firms of the fund, R, minus the expected disutility of the negative externality released by the firms, ηZ. When λ is lower, under fund investors' capital allocation conditions (18), its negative effect on the reduction of the expected disutility, ηZ, cancels out its positive effect on the expected profit, R. This implies that the change in λ has no effect on fund investors' rate of expected gross return, although it continues to have the initial direct effect on a_{SG} and a_{PG}, and the fund ownership effect through a change in x_{SG} so that Z_G, R_G, Z_M, and R_M increase. Thus, given (18), the change in λ has no effect on the management fee of either fund.[26] By contrast, as these effects do not operate in B-firms, neither Z_B nor R_B is affected as long as the management fee is taken as given.

Recently, various institutions and organizations have attempted to clarify and develop ESG definitions and scores. Furthermore, they have reported how firms' activities are evaluated from the viewpoint of the ESG definitions and scores. As a result, it has been easier for fund managers to intervene in the management of their portfolio firms from the perspective of ESG performance. In the context of our model, we can consider these changes as decreasing c_{ZS} and c_{ZP}.

Proposition 4: *Suppose that the S-fund manager's effort cost parameter for reducing the negative externality is lower (i.e., c_{ZS} is lower).*

(i) The expected negative externality and the expected profit of G-firms, Z_G and R_G, both decrease.

(ii) The expected negative externality and the expected profit of B-firms, Z_B and R_B, respectively, are unaffected.

(iii) The expected negative externality and the expected profit from all the firms in the

[26] A remark similar to that of footnote 25 also holds in this case.

market portfolio, Z_M and R_M, respectively, decrease.
(iv) The asset management fees of both funds are unaffected.

Proposition 5: *Suppose that the P-fund manager's effort cost parameter of reducing the negative externality is lower (i.e., c_{ZP} is lower). Then, the statements of (i), (ii), and (iv) in Proposition 4 hold, whereas the expected negative externality and the expected profit of B-firms both decrease.*

Propositions 4 and 5 show that the lower c_{ZS} and the lower c_{ZP} both improve ESG performance in G-firms and in all the firms in the market portfolio, but reduce profit performance in G-firms and in all the firms in the market portfolio. However, these propositions indicate that only the lower c_{ZP} improves ESG performance but harms profit performance in B-firms; and neither the lower c_{ZS} nor the lower c_{ZP} affects the asset management fees of either funds.

Intuitively, the mechanism by which the lower c_{ZS} works is similar to that by which the lower λ works except that the lower c_{ZS} directly increases *only* the S-fund manager's ESG effort. Thus, the lower c_{ZS} decreases Z_G, R_G, Z_M, and R_M, but does not affect Z_B, R_B, or the asset management fees of either funds. For the effect of the lower c_{ZP}, we can apply a similar logic, except that the P-fund manager's effort in the market portfolio firms reduces Z_B and R_B. Thus, the lower c_{ZP} also reduces Z_B and R_B.

Several remarks regarding Propositions 2–5 are in order. First, because the strong ESG preference creates S-fund growth, Proposition 2 can be interpreted in the light of this growth. In our model, S-fund growth changes the fund ownership stakes. Specifically, whether S-fund growth crowds out fund investors' allocations to the other fund or brings new investor capital into the fund industry is related to whether S-fund growth replaces the P-fund or liquidity investors. Accordingly, Proposition 2 shows the following: (i) S-fund growth decreases the expected negative externality released in G-firms and in all the firms in the market portfolio if the ESG preference of investors is not strong and/or if the S-fund has a comparative advantage over the P-fund in improving profit performance relative to ESG performance; and (ii) S-fund growth always reduces the expected negative externality released by B-firms. Conversely, if the above condition in (i) is not satisfied, Proposition 2 indicates that S-fund growth may increase the expected negative externality released by G-firms or all the firms in the market portfolio. As some recent studies suggest, albeit for

different reasons than the limited or counterproductive impact of the S-fund, the latter result theoretically suggests the possibility of S-fund growth preventing the reduction of the expected negative externality if investors have a strong preference for ESG and if the S-fund does not have a comparative advantage over the P-fund in improving profit performance relative to ESG performance.

Second, Proposition 3 shows that when shareholders' ESG engagement becomes less valuable for high-ESG firms, the ESG performance of the high-ESG firms and all the firms in the market portfolio worsens, whereas their profit performances are improved. Although this change affects fund managers' ESG efforts toward G-firms in both the S- and P-funds, the ESG and profit performances in B-firms are unaffected because neither the direct effect nor the fund ownership effect works in B-firms.

Third, it is empirically supported that the change in the fund ownership structure behind the mechanism working in Proposition 2 has first-order effects. Even though S-fund is taken as ESG-indexed funds, there is growing evidence that passive fund growth may affect information production and the information content of asset prices (see Israeli, Lee, Sridharam, 2017; Glosten, Nallareddy, and Zou, 2021; and Coles, Health, and Ringgenberg, 2022). These changes may have first-order effects on shareholders' willingness to make costly engagements in their portfolio firms.

Fourth, Goldstein, Kopytov, Shen, and Xiang (2022) suggest that an increase in the green investor share leads to an increase (a decrease) in the cost of capital and the expected asset returns when most investors are traditional (green) investors. Their results depend on changes in the composition of the investor base and in the price informativeness. Pástor, Stambaugh, and Taylor (2021b) indicate that higher ESG appetite leads green firms to become greener but reduces the expected returns of green firms. Their results depend on the shift of real investment from brown to green firms. By contrast, our results of growing interest in ESG are mainly derived from changes in the fund managers' governance efforts caused by both the direct effect of the strengthened ESG preferences and the change in the fund ownership stakes. Accordingly, our results depend on the strength of investors' ESG taste and the comparative advantage of each fund manager in improving ESG performance relative to firm profit. Furthermore, our results suggest that growing interest in ESG does not necessarily improve ESG performance in G-firms or in all the firms in the market portfolio if investors have a strong preference for ESG, which

is different from the results of Pástor, Stambaugh, and Taylor (2021b).

Fifth, Corum, Malenko, and Malenko (2021) report that passive fund growth improves the firm's governance and increases the returns of firms if it replaces liquidity investors with institutional investors, whereas its effects on governance are subtler and depend on the active and passive funds' ownership stakes if the passive fund growth primarily affects the composition of active versus passive funds. Our results of growing interest in ESG depend on the S- and P-funds' ownership stakes. However, our model includes investors' ESG preferences and the costly engagement of each fund manager in reducing the negative externality in addition to the costly engagement of each fund manager to improve firm profit. Hence, our results depend on the degree of investors' ESG preferences and the comparative advantage of improving ESG performance relative to firm profit for each fund manager.

Sixth, Propositions 4 and 5 show that an improvement in the engagement cost in ESG for the S-fund manager enhances ESG performance in both G-firms and all the firms in the market portfolio, but does not affect ESG performance in B-firms. By contrast, an improvement in the engagement cost in ESG for the P-fund manager enhances ESG performance even in B-firms. Regarding these results, one might think it is obvious that the lower engagement cost in ESG for each fund manager reduces the expected negative externalities. However, the present model has an indirect channel through fund investors' capital allocation that might block the reduction of the expected negative externalities. In this sense, the comparative static results for c_{ZS} and c_{ZP} are not straightforward because we need to examine the indirect channel.

Seventh, an interesting point is that under the multitask situation for fund managers, the lower c_{ZS} (c_{ZP}) increases a_{SG} (a_P) but decreases e_{SG} (e_P), even though the costs of these efforts are additive. This implies that if the ESG effort cost parameter of each fund manager is lower, his effort in increasing the firm profit substitutes for his effort in reducing the negative externality, although the costs of these efforts are additive. This result is different from that of Holmström and Milgrom (1991). They formalize a multitask principal–agent model in which complementarity or substitutability between tasks plays an important role in deriving their key results. However, the mechanism behind our model is different from theirs because it depends on the adjustment of fund investors' capital allocation conditions.

5. Discussions and Empirical Implications

Propositions 2–5 provide several empirical predictions regarding the shareholder engagement effects of growing interest in ESG, the limited impact of shareholder ESG engagement in G-firms, and a decrease in each fund manager's cost of engagement in ESG on the expected negative externality and the expected financial return. To test the predictions of our model empirically, although ESG performance includes various aspects, one could rely on several proxies capturing different ESG aspects that are proposed by the empirical literature (e.g., see Pedersen, Fitzgibbons, and Pomorski, 2021).

To derive the empirical implications, using (12) and (16), we start by observing that the expected financial returns of G-stocks, B-stocks, and the market portfolio for investors, $R_G - P_G$, $R_B - P_B$, and $R_M - P_M$, are defined by

$$R_h - P_h = L_h + \eta Z_h, \qquad \text{for } h \in (G, B, M). \tag{24}$$

$R_G - P_G$, $R_B - P_B$, and $R_M - P_M$ capture the expected financial returns (cost of capital) of G-stocks, B-stocks, and the market portfolio, respectively.

We assume that Z_{B0} is sufficiently larger than Z_{G0} and the S-fund holds only G-firms. Therefore, it follows from (3), (4), and (24) that if L_G is not so different from L_B and if the ESG engagement effort of the P-fund manager in B-firms is not very large, the expected financial returns of stocks with low-ESG proxies outperform those with high-ESG proxies. Many empirical studies provide predictions about the relation between ESG aspects and financial returns of firms' operations, but document mixed results. For example, Hong and Kacperczyk (2009), El Ghoul, Guedhami, Kwok, and Mishra (2011), Chava (2014), Zerbib (2019), Bolton and Kacperczyk (2021), and Barber, Morse, and Yasuda (2021) report a negative relation between ESG performance and financial returns. However, Derwall, Guenster, Bauer, and Koedijk (2005), Kempf and Osthoff (2007), and Pastor, Stambaugh, and Taylor (2021a) report a higher financial return of stocks with better environmental prospects. Green and Roth (2021) suggest that measurement issues are a significant obstacle to resolving the problem of whether firms with good ESG performance face lower financial returns. In addition, the opposite findings can be explained by the weak return predictability of the overall ESG rating (Pedersen, Fitzgibbons, and Pomorski, 2021) and

the presence of uncertainty about the ESG profile (Avramov, Cheng, Lioui, and Tarelli, 2022). Indeed, until recently, the construction of ESG ratings has not been regulated or unified. As a result, the methodology of ESG ratings is opaque and proprietary.[27]

Next, we examine the effect of growing interest in ESG because many practitioners and researchers wonder how growing interest in ESG really affects ESG performance and financial returns. As mentioned in Section 3.1, the engagement effort e_{ih} (a_{ih}) exerted by the fund manager i for $i \in (S, P)$ and $h \in (G, B)$ includes any actions such as communicating with management, submitting shareholder proposals, nominating directors, and voting on proxy contests.

Suppose that the S-fund is a sustainable active fund. In their review of the literature, Brav, Malenko, and Malenko (2022) conclude that because actively managed funds and passive funds have different types of costs, and hence are likely to specialize in different types of engagement, passive funds may be in a better position to have an impact by setting broad, market-wide governance standards, instead of focusing on firm-specific operational improvements.[28] Given the difference in the engagement strategies, the P-fund has a comparative advantage over the S-fund in improving ESG performance relative to profit performance if improving ESG performance can be achieved to a certain extent by setting broad, market-wide standards for ESG. This is because, in this situation, improving the profit performance of each firm needs more firm-specific operational engagements than improving ESG performance. In addition, the engagement effort regarding ESG is more valuable for firms that lag behind in terms of ESG, although the S-fund invests only in G-firms. This feature may be reflected in the comparative advantage argument, even though the parameter λ may mainly capture this feature in our model. Then, $\frac{c_{ZP}}{c_{ZS}}$ becomes lower because setting, broad, market-wide standards for ESG is less costly, whereas $\frac{c_{RP}}{c_{RS}}$ becomes higher because improving the profit performance of each firm reduces more firm-specific operational engagements. Accordingly, we can assume that $\frac{c_{RP}}{c_{RS}} > \frac{c_{ZP}}{c_{ZS}}$ if improving ESG performance can be achieved to a certain extent by setting broad,

[27] Avramov, Cheng, Lioui, and Tarelli (2022) report that there are substantial variations across different rating providers; that is, the average rating correlation is 0.48.

[28] Kahn and Rock (2020) and Fish, Hamdani, and Solomon (2019) indicate that actively managed funds may have an advantage over index funds in identifying firm-specific operational or financial issues because they can specialize in collecting or acquiring such information as a byproduct of their investment activities. They also argue that large passive funds are in a good position to enjoy economics of scale in collecting information on broad, market-wide issues and setting market-wide standards.

market-wide standards for ESG.

On the other hand, suppose that the S-fund is an ESG-indexed fund. If the engagement effort regarding ESG is more valuable for firms with low-ESG proxies and if this feature is also captured by the fund manager's ESG engagement cost in G-firms relative to that in B-firms in addition to a lower λ, then $\frac{c_{ZP}}{c_{ZS}}$ is sufficiently low because the S-fund invests only in G-firms. Hence, again, we may assume that $\frac{c_{RP}}{c_{RS}} > \frac{c_{ZP}}{c_{ZS}}$.

Now, given that the strengthened ESG taste affects both η and Z_i ($i = G, B, M$) in (24), Propositions 2(i)–2(iii) along with (24) provide the following predictions (for the proof, see Appendix A):

Prediction 1A: Suppose that investors do not have a strong preference for ESG. Then, growing interest in ESG is likely to **reduce** the expected negative externalities released by any type of firm. It is also likely to **raise** the expected financial returns of any type of firm.

Prediction 1B: Suppose that investors have a strong preference for ESG. If improving ESG performance can be achieved to a certain degree by setting broad, market-wide standards of ESG, growing interest in ESG is likely to **reduce** the expected negative externalities released by firms with high ESG proxies and by all the firms in the market portfolio. However, growing interest in ESG always **reduces** the expected negative externality by firms with low-ESG proxies and **raises** their expected financial returns.

If investors have a strong preference for ESG and if improving ESG performance cannot be achieved to a certain degree by setting broad, market-wide standards for ESG, Prediction 1 does not necessarily suggest that growing interest in ESG is likely to improve ESG performance in firms with high-ESG proxies and in all the firms in the market portfolio, or that growing interests in ESG is likely to raise expected financial returns in these firms. By contrast, Prediction 1 suggests that growing interest in ESG always improves ESG performance and the expected financial returns of firms with low-ESG proxies.

Now, we consider the effect of the limited impact of shareholder ESG engagement in G-firms. Because the increasing tendency for shareholder ESG engagement to have a limited impact on high-ESG firms is captured by a decrease in λ, it easily follows from Propositions 3(i)–3(iii) along with (24) that the following predictions are obtained.

Prediction 2: When the impact of shareholder ESG engagement in G-firms is more

limited, not only the expected negative externalities but also the expected financial returns are **increased** for firms with high-ESG proxies and all the firms in the market portfolio, but are unaffected in firms with low-ESG proxies.

Prediction 2 particularly suggests that when the impact of shareholder ESG engagement in G-firms relative to that in B-firms is limited and decreases, both ESG performance and financial returns in firms with high-ESG scores and market portfolio firms increase, but those in firms with low-ESG proxies are unaffected.

We proceed to discuss the effect of an improvement in the ESG effort cost for each fund manager. As argued, sustainable active funds are more likely to focus on firm-specific operational improvements, whereas ESG-indexed funds and P-funds are more likely to have an impact by setting broad, market-wide governance standards. Thus, c_{ZS} is lower when exerting firm-specific operational efforts in improving ESG performance is less costly for sustainable active funds or when setting broad, market-wide ESG governance standards is less costly for ESG-indexed funds, whereas c_{ZP} is lower when setting broad, market-wide ESG governance standards is less costly for P-funds. Hence, Propositions 4 and 5 with (24) immediately yield the following predictions:

Prediction 3A: Suppose that focusing on firm-specific operational improvements in ESG is less costly for sustainable active funds and/or that setting broad, market-wide ESG governance standards is less costly for ESG-indexed funds. Then, the expected negative externalities released by firms with high-ESG proxies and by all the firms in the market portfolio are **reduced**. The expected financial returns of firms with high-ESG proxies and those of the market portfolio are also **reduced**.

Prediction 3B: Suppose that setting broad, market-wide ESG governance standards is less costly for P-funds. Then, the expected negative externalities released by any type of firm are **reduced**. The expected financial returns of any type of firm are also **reduced**.

Now, the profit of each firm in Propositions 2–5 can be interpreted as the operating profits—that is, the EBITDA—of each firm. As a lower expected negative externality implies higher ESG scores, Propositions 2–5 also provide empirical implications regarding the association between ESG scores and the EBITDA achieved by each firm.

First, Propositions 2 and 3 imply the following predictions.

Prediction 4: Growing interest in ESG leads to a positive association between ESG

scores and the EBITDA attained by any type of firm if investors do not have a strong preference for ESG. Even if investors are strongly ESG conscious, growing interest in ESG leads to a positive association between ESG scores and the EBITDA attained in firms with low-ESG proxies.

Prediction 5: The increasing tendency for shareholder ESG engagement to have a limited effect in firms with high-ESG proxies causes a negative association between ESG scores and the EBITDA attained in firms with high-ESG proxies and in all the firms in the market portfolio.

If the ESG preference of investors is strong, Prediction 4 does not necessarily suggest that S-fund growth creates a positive association between ESG scores and the EBITDA attained by any type of firm.

Second, Propositions 4 and 5 imply the following predictions.

Prediction 6: The lower cost for sustainable active funds to exert firm-specific operational efforts to improve ESG performance and/or the lower cost of ESG-indexed funds in setting broad, market-wide ESG standards causes a negative association between ESG scores and the EBITDA attained by firms with high-ESG proxies and by all the firms in the market portfolio.

Prediction 7: The lower cost of P-funds setting broad, market-wide ESG standards causes a negative association between ESG scores and the EBITDA attained by any type of firm.

To the best of our knowledge, Predictions 1–6 have not yet been tested. As for Predictions 1A, 1B, and 4, many empirical studies report the expected financial returns of assets, but they focus on cross-sectional analysis. In contrast with these cross-sectional studies, Predictions 1A, 1B, and 4 provide time-series predictions created by the effect of growing interest in ESG. Conversely, the other predictions need to be tested using cross-sectional and panel data analyses. To test Predictions 2 and 5, we need to identify the impact of shareholder ESG engagement in each firm, which may be estimated using the method of Hartzmark and Shue (2022). To test Predictions 3A, 3B, 6A, and 6B, differences in the accessibility and plausibility of ESG data in different industries and/or the growing accessibility and variety of ESG proxies may be used to identify the cross-sectional differences and the time-series changes in ESG engagement costs.

6. Conclusion

This paper considers how profit-motivated managers of S- and P-funds govern their portfolio firms when these funds must attract capital from socially responsible investors and when the impact of shareholder ESG engagement in high-ESG firms is limited. We examine a multitask situation in which the manager of each fund must choose the fund's costly engagement effort levels for mitigating negative externalities and increasing pecuniary returns in his portfolio firms.

Using the search model framework for fund managers and investors, we derive the following implications:

(i) If investors are generally not very interested in ESG, a growing interest in ESG is likely to improve ESG performance and the expected financial returns of any type of firm. Even when the investors have strong ESG preferences in general, growing interest in ESG is likely to improve ESG performance in firms with high-ESG proxies and in all the firms in the market portfolio if the S-fund has a comparative advantage in improving profit performance over ESG performance when compared with the P-fund, whereas it always improves ESG performance and expected financial returns in firms with low-ESG proxies. However, in the latter case, growing interest in ESG does not generally contribute to the reduction of the expected negative externality in all types of firms.

(ii) The increasing tendency for shareholder ESG engagement to have a limited impact in firms with high-ESG proxies reduces ESG performance but improves expected financial returns of firms with high-ESG proxies and all the firms in the market portfolio, but does not affect the ESG performance or expected financial returns of firms with low-ESG proxies.

(iii) The lower ESG engagement cost of the S-fund (P-fund) improves ESG performance, but reduces the expected financial returns of firms with high-ESG proxies and all the firms in the market portfolio (in any type of firm).

In this paper, we focused on the fund manager's multitask incentive problem in engaging in the ownership of his portfolio firms, and fund investors' investment allocation problems. To shed light on these problems, we abstract from the tax and interest payments of the portfolio firms. Thus, in our model, the EBITDA and net income are indistinguishable. However, in conducting empirical research, net income may be a more adequate measure

of the profit of the portfolio firms for the fund manager. Hence, the tax and interest payment considerations would be an interesting extension of the empirical analysis in future research.

Appendix A

Proof of Proposition 1: We first derive statements (i), (ii), and (iv). Substituting P_G from (14) and f_S from (19) into (18), we obtain

$$(1+\psi_S-\omega_S)L_G=\psi_S(R_G-\eta Z_G),$$

which means $R_G=\frac{\psi_S+1-\omega_S}{\psi_S}L_G+\eta Z_G$. Then, (14) yields $P_G=\frac{1-\omega_S}{\psi_S}L_G$. Thus, it follows from (19) that $f_S=\frac{\omega_S\psi_S}{\psi_S+1-\omega_S}$. Similarly, using (16), (18), and (20), we can derive the solution: $f_P=\frac{\omega_P\psi_P}{\psi_P+1-\omega_P}$, $R_M=\frac{\psi_P+1-\omega_P}{\psi_P}L_M+\eta Z_M$, and $P_M=\frac{1-\omega_P}{\psi_P}L_M$. In addition, if $\omega_S\geq\omega_P$, then $\psi_S\geq\psi_P$ implies that $f_S\geq f_P$.

Next, we verify statement (iii). As the S-fund holds only the stock of G-firms, it follows from (1) and (2) with $R_M=R_G+R_B$, $e_{PG}=e_{PB}=e_P$, $E\widetilde{R}_G=R_G$, and $E\widetilde{R}_B=R_B$ that

$$R_M-R_G=R_0+e_P, \tag{A1}$$

and

$$2R_G-R_M=e_{SG}. \tag{A2}$$

It is also found from (3) and (4) with $Z_M=Z_G+Z_B$, $E\widetilde{Z}_G=Z_G$, and $E\widetilde{Z}_B=Z_B$ that

$$Z_G=Z_{G0}-\lambda a_{SG}-\lambda a_{PG}, \tag{A3}$$

and

$$Z_M=Z_{G0}+Z_{B0}-\lambda a_{SG}-\lambda a_{PG}-a_{PB}. \tag{A4}$$

Substituting a_{SG} and e_{SG} from (8) and a_P and e_P from (9′) into (A3) and (A4) and rearranging them with (8), (9′), (A1) and (A2), we obtain (22) and (23).

In the remaining part, we show that under the conditions of this proposition, (a) liquidity investors hold at least some shares in each type of stock, that is, $x_{SG}+x_P<1$, (b) fund investors make a positive investment in an alternative investment opportunity such as public bonds, that is, $W_S+W_P<W$, and (c) the S-fund finds it optimal to diversify equally across all G-firms.

We first prove (a). Given that the S-fund holds only the stock of G-firms, it follows

from (1)–(4) and (13)–(16) with $R_M = R_G + R_B$ and $e_{PG} = e_{PB} = e_P$ that

$$x_{SG} + x_P = \frac{W_S}{P_G} + \frac{W_P}{P_M}. \tag{A5}$$

Note that

$$P_G = R_0 + e_{SG} + e_P - \eta Z_G - L_G \geq R_0 - \eta Z_{G0} - L_G > 0,$$

$$P_M = 2R_0 + e_{SG} + 2e_P - \eta Z_M - L_M \geq R_0 - \eta Z_{G0} - L_G > 0,$$

because we focus on the cases of $(e_{SG}, a_{SG}) > 0$ and $(e_P, a_{PG}, a_{PB}) > 0$ and because $R_0 > \max(\eta Z_{B0} + L_B, \eta Z_{G0} + L_G) > 0$. Given $W_S + W_P < W$ derived below, (A5) leads to

$$x_{SG} + x_P \leq \frac{W_S + W_P}{R_0 - \eta Z_{G0} - L_G} < \frac{W}{R_0 - \eta Z_{G0} - L_G}.$$

It follows from the condition $W < R_0 - \eta Z_{G0} - L_G$ that $x_{SG} + x_P < 1$.

We next proceed to prove (b). Rearranging (8) and (9′) with (A1) and (A2), we have

$$x_{SG} = \frac{c_{RS}}{f_S}(2R_G - R_M), \tag{A6}$$

$$x_P = \frac{c_{RP}}{f_P}(R_M - R_G - R_0). \tag{A7}$$

It is found from (13), (15), (A6), and (A7) with $R_G = \frac{\psi_S + 1 - \omega_S}{\psi_S} L_G + \eta Z_G$, $R_M = \frac{\psi_P + 1 - \omega_P}{\psi_P} L_M + \eta Z_M$, (A3), and (A4) that

$$\begin{aligned}
&W_S + W_P \\
&= P_G x_{SG} + P_M x_P = \frac{P_G c_{RS}}{f_S}(2R_G - R_M) + \frac{P_M c_{RP}}{f_P}(R_M - R_G - R_0) \\
&= \frac{P_G c_{RS}}{f_S}\left(2\frac{\psi_S + 1 - \omega_S}{\psi_S} L_G - \frac{\psi_P + 1 - \omega_P}{\psi_P} L_M + \eta Z_{G0} - \eta\lambda a_{SG} - \eta\lambda a_{PG} - \eta Z_{B0} + \eta a_{PB}\right) \\
&+ \frac{P_M c_{RP}}{f_P}\left(\frac{\psi_P + 1 - \omega_P}{\psi_P} L_M - \frac{\psi_S + 1 - \omega_S}{\psi_S} L_G - R_0 + \eta Z_{B0} - \eta a_{PB}\right).
\end{aligned} \tag{A8}$$

Define

$$\underline{W} \equiv \frac{1 - \omega_S}{\psi_S} \frac{\psi_S + 1 - \omega_S}{\omega_S \psi_S} L_G c_{RS} \left[2\frac{\psi_S + 1 - \omega_S}{\psi_S} L_G - \frac{\psi_P + 1 - \omega_P}{\psi_P} L_M + \eta Z_{G0}\right]$$

$$+\frac{1-\omega_P}{\psi_P}\frac{\psi_P+1-\omega_P}{\omega_P\psi_P}L_M c_{RP}\left(\frac{\psi_P+1-\omega_P}{\psi_P}L_M-\frac{\psi_S+1-\omega_S}{\psi_S}L_G-R_0+\eta Z_{B0}\right). \tag{A9}$$

Then, given $P_G=\frac{1-\omega_S}{\psi_S}L_G$, $P_M=\frac{1-\omega_P}{\psi_P}L_M$, $f_S=\frac{\omega_S\psi_S}{\psi_S+1-\omega_S}$, and $f_P=\frac{\omega_P\psi_P}{\psi_P+1-\omega_P}$ with the assumption of $Z_{B0}>a_{PB}$, comparing (A8) with (A9) verifies that $W_S+W_P<W$ if $W\geq\underline{W}$.

Finally, we prove (c). Indeed, applying a procedure similar to the proof of Lemma 2 in Online Appendix of Corum, Malenko, and Malenko (2021) under the condition $R_0>\eta Z_{G0}+L_G$ and the assumption of a quadratic cost function, we can show that the S-fund finds it optimal to diversify equally across all G-firms. ‖

Proof of Propositions 2–5: Substituting $R_G=\frac{\psi_S+1-\omega_S}{\psi_S}L_G+\eta Z_G$ and $R_M=\frac{\psi_P+1-\omega_P}{\psi_P}L_M+\eta Z_M$ into (22) and (23) of Proposition 1(iii), we show that Z_G, Z_B, and Z_M are determined by solving the following simultaneous equations

$$Z_B+Z_G=Z_M, \tag{A10}$$

$$Z_G=Z_{G0}-\Gamma_1-\Gamma_2, \tag{A11}$$

$$Z_M=Z_{G0}+Z_{B0}-\Gamma_1-\Gamma_2-\Gamma_3, \tag{A12}$$

where

$$\Gamma_1\equiv\eta\lambda^2\frac{c_{RS}}{c_{ZS}}\left(2\frac{\psi_S+1-\omega_S}{\psi_S}L_G+2\eta Z_G-\frac{\psi_P+1-\omega_P}{\psi_P}L_M-\eta Z_M\right),$$

$$\Gamma_2\equiv\eta\lambda^2\frac{c_{RP}}{c_{ZP}}\left(\frac{\psi_P+1-\omega_P}{\psi_P}L_M+\eta Z_M-\frac{\psi_S+1-\omega_S}{\psi_S}L_G-\eta Z_G-R_0\right),$$

$$\Gamma_3\equiv\eta\frac{c_{RP}}{c_{ZP}}\left(\frac{\psi_P+1-\omega_P}{\psi_P}L_M+\eta Z_M-\frac{\psi_S+1-\omega_S}{\psi_S}L_G-\eta Z_G-R_0\right).$$

Totally differentiating (A10)–(A12) with respect to Z_B, Z_G, Z_M, η, λ, c_{ZS}, c_{ZP}, and ψ_P

yields

$$\begin{bmatrix} 1 & 1 & -1 \\ 0 & 1+\frac{\partial\Gamma_1}{\partial Z_G}+\frac{\partial\Gamma_2}{\partial Z_G} & \frac{\partial\Gamma_1}{\partial Z_M}+\frac{\partial\Gamma_2}{\partial Z_M} \\ 0 & \frac{\partial\Gamma_1}{\partial Z_G}+\frac{\partial\Gamma_2}{\partial Z_G}+\frac{\partial\Gamma_3}{\partial Z_G} & 1+\frac{\partial\Gamma_1}{\partial Z_M}+\frac{\partial\Gamma_2}{\partial Z_M}+\frac{\partial\Gamma_3}{\partial Z_M} \end{bmatrix} \begin{bmatrix} dZ_B \\ dZ_G \\ dZ_M \end{bmatrix}$$

$$= \begin{bmatrix} 0 \\ -\frac{\partial\Gamma_1}{\partial\eta}-\frac{\partial\Gamma_2}{\partial\eta} \\ -\frac{\partial\Gamma_1}{\partial\eta}-\frac{\partial\Gamma_2}{\partial\eta}-\frac{\partial\Gamma_3}{\partial\eta} \end{bmatrix} d\eta + \begin{bmatrix} 0 \\ -\frac{2\Gamma_1}{\lambda}-\frac{2\Gamma_2}{\lambda} \\ -\frac{2\Gamma_1}{\lambda}-\frac{2\Gamma_2}{\lambda} \end{bmatrix} d\lambda + \begin{bmatrix} 0 \\ \frac{\Gamma_1}{c_{ZS}} \\ \frac{\Gamma_1}{c_{ZS}} \end{bmatrix} dc_{ZS}$$
$$+ \begin{bmatrix} 0 \\ \frac{\Gamma_2}{c_{ZP}} \\ \frac{2\Gamma_2}{c_{ZP}} \end{bmatrix} dc_{ZP} + \begin{bmatrix} 0 \\ -\frac{\partial\Gamma_1}{\partial\psi_P}-\frac{\partial\Gamma_2}{\partial\psi_P} \\ -\frac{\partial\Gamma_1}{\partial\psi_P}-\frac{\partial\Gamma_2}{\partial\psi_P}-\frac{\partial\Gamma_3}{\partial\psi_P} \end{bmatrix} d\psi_P. \tag{A13}$$

Given (A6) and (A7) with $R_G = \frac{\psi_S+1-\omega_S}{\psi_S}L_G + \eta Z_G$ and $R_M = \frac{\psi_P+1-\omega_P}{\psi_P}L_M + \eta Z_M$, note that $\Gamma_1 = \eta\lambda^2\frac{c_{RS}}{c_{ZS}}(2R_G - R_M) = \frac{\eta\lambda^2 f_S x_{SG}}{c_{ZS}}$, $\Gamma_2 = \eta\lambda^2\frac{c_{RP}}{c_{ZP}}(R_M - R_G - R_0) = \frac{\eta\lambda^2 f_P x_P}{c_{ZP}}$, and $\Gamma_3 = \eta\frac{c_{RP}}{c_{ZP}}(R_M - R_G - R_0) = \frac{\eta f_P x_P}{c_{ZP}}$. It follows from (8) and (9′) that the assumption $(e_{SG}, a_{SG}) > 0$ and $(e_P, a_{PG}, a_{PB}) > 0$ means that $\Gamma_1 > 0$, $\Gamma_2 > 0$, and $\Gamma_3 > 0$.

Now, solving (A13), we show

$$\frac{dZ_B}{d\eta} = -\frac{1}{\Delta}\left(\eta Z_B\frac{c_{RP}}{c_{ZP}} + \frac{\Gamma_3}{\eta}\right)\left(1+\eta^2\lambda^2\frac{c_{RS}}{c_{ZS}}\right) < 0, \tag{A14}$$

$$\begin{aligned}\frac{dZ_G}{d\eta} &= -\frac{\eta\lambda^2 Z_G}{\Delta}\frac{c_{RS}}{c_{ZS}}\left(1+\eta^2\frac{c_{RP}}{c_{ZP}}\right) - \frac{\eta\lambda^2 Z_B}{\Delta}\frac{c_{RS}}{c_{ZP}}\left(\frac{c_{RP}}{c_{RS}} - \frac{c_{ZP}}{c_{ZS}}\right) \\ &\quad - \frac{\Gamma_1}{\eta\Delta}\left(1+\eta^2\frac{c_{RP}}{c_{ZP}}\right) - \frac{\Gamma_2}{\eta\Delta}\left(1+\eta^2\frac{c_{RS}}{c_{ZS}}\right) \\ &< 0, \quad \text{if } \eta \text{ is not large or if } \eta \text{ is large and } \frac{c_{RP}}{c_{RS}} - \frac{c_{ZP}}{c_{ZS}} > 0,\end{aligned} \tag{A15}$$

$$\begin{aligned}\frac{dZ_M}{d\eta} &= -\frac{\eta\lambda^2 Z_G}{\Delta}\frac{c_{RS}}{c_{ZS}}\left(\eta^2\frac{c_{RP}}{c_{ZP}}+1\right) - \frac{\eta Z_B}{\Delta}\left[\eta^2\lambda^2\frac{c_{RP}}{c_{ZP}}\frac{c_{RS}}{c_{ZS}} + \lambda^2\left(\frac{c_{RP}}{c_{ZP}} - \frac{c_{RS}}{c_{ZS}}\right) + \frac{c_{RP}}{c_{ZP}}\right] \\ &\quad - \frac{\Gamma_1}{\eta\Delta}\left(\eta^2\frac{c_{RP}}{c_{ZP}}+1\right) - \frac{\Gamma_3}{\eta\Delta}\left(2\eta^2\lambda^2\frac{c_{RS}}{c_{ZS}} + 1 + \lambda^2\right) < 0,\end{aligned}$$

$$\text{if } \eta \text{ is not large or if } \eta \text{ is large and } \frac{c_{RP}}{c_{RS}} > \frac{c_{ZP}}{c_{ZS}}, \tag{A16}$$

$$\frac{dZ_B}{d\lambda} = 0, \qquad \frac{dZ_h}{d\lambda} = -\frac{2(\Gamma_1+\Gamma_2)}{\lambda\Delta}\left(1+\eta^2\frac{c_{RP}}{c_{ZP}}\right) < 0, \qquad h = G, M, \tag{A17}$$

$$\frac{dZ_B}{dc_{ZS}} = 0; \qquad \frac{dZ_h}{dc_{ZS}} = \frac{\Gamma_1}{c_{ZS}\Delta}(1+\eta^2\frac{c_{RP}}{c_{ZP}}) > 0, \qquad h = G, M, \tag{A18}$$

$$\begin{aligned}&\frac{dZ_B}{dc_{ZP}} = \frac{\Gamma_3}{c_{ZP}\Delta}(1+\eta^2\lambda^2\frac{c_{RS}}{c_{ZS}}) > 0, \qquad \frac{dZ_G}{dc_{ZP}} = \frac{\Gamma_2}{c_{ZP}\Delta}(1+\eta^2\frac{c_{RS}}{c_{ZS}}) > 0,\\ &\frac{dZ_M}{dc_{ZP}} = \frac{\Gamma_3}{c_{ZP}\Delta}(1+\lambda^2+2\eta^2\lambda^2\frac{c_{RS}}{c_{ZS}}) > 0,\end{aligned} \tag{A19}$$

$$\frac{dZ_B}{d\psi_P} = \frac{(1-\omega_P)\eta L_M}{(\psi_P)^2\Delta}\left(\frac{c_{RP}}{c_{ZP}} + \eta^2\lambda^2\frac{c_{RP}}{c_{ZP}}\frac{c_{RS}}{c_{ZS}}\right) > 0, \tag{A20}$$

$$\frac{dZ_G}{d\psi_P} = \frac{(1-\omega_P)\eta\lambda^2 L_M}{(\psi_P)^2\Delta}\frac{c_{RS}}{c_{ZP}}\left(\frac{c_{RP}}{c_{RS}} - \frac{c_{ZP}}{c_{ZS}}\right) \gtreqless 0, \qquad \text{if and only if } \frac{c_{RP}}{c_{RS}} \gtreqless \frac{c_{ZP}}{c_{ZS}}, \tag{A21}$$

$$\begin{aligned}&\frac{dZ_M}{d\psi_P} = \frac{(1-\omega_P)\eta L_M}{(\psi_P)^2\Delta}\frac{c_{RS}}{c_{ZP}}\left[(1+\lambda^2)\frac{c_{RP}}{c_{RS}} + \eta^2\lambda^2\frac{c_{RP}}{c_{ZS}} - \lambda^2\frac{c_{ZP}}{c_{ZS}}\right] > 0,\\ &\text{if and only if } \frac{c_{RP}}{c_{RS}} > \frac{\lambda^2}{1+\lambda^2+\eta^2\lambda^2\frac{c_{RS}}{c_{ZS}}}\frac{c_{ZP}}{c_{ZS}},\end{aligned} \tag{A22}$$

where $\Delta = 1 + \eta^2\left(\lambda^2\frac{c_{RS}}{c_{ZS}} + \frac{c_{RP}}{c_{ZP}} + \eta^2\lambda^2\frac{c_{RS}}{c_{ZS}}\frac{c_{RP}}{c_{ZP}}\right) > 0$. It follows from (A14)–(A19) that the results of the expected negative externalities in Propositions 2–5 are obtained.

Given Proposition 1(ii), we have

$$\frac{dR_h}{d\eta} = Z_h + \eta\frac{dZ_h}{d\eta}, \qquad h = G, M, \tag{A23}$$

$$\frac{dR_h}{d\lambda} = \eta\frac{dZ_h}{d\lambda}, \qquad h = G, M, \tag{A24}$$

$$\frac{dR_h}{dc_{Zi}} = \eta\frac{dZ_h}{dc_{Zi}}, \qquad h = G, M, \text{ and } i = S, P. \tag{A25}$$

$$\frac{dR_G}{d\psi_P} = \eta\frac{dZ_G}{d\psi_P}; \qquad \frac{dR_M}{d\psi_P} = -\frac{(1-\omega_P)L_M}{(\psi_P)^2} + \eta\frac{dZ_M}{d\psi_P}, \tag{A26}$$

In addition,

$$\frac{dR_B}{d\chi} = \frac{dR_M}{d\chi} - \frac{dR_G}{d\chi}, \qquad \chi = \eta, \lambda, c_{ZS}, c_{ZP}, \psi_P. \tag{A27}$$

Inspecting (A23)–(A25) and (A27) with (A14)–(A19), we prove the results of the expected profits in Propositions 2–5.

Finally, it follows from Proposition 1(i) that

$$\frac{df_i}{d\eta} = \frac{df_i}{d\lambda} = \frac{df_i}{dc_{Zj}} = 0, \qquad i = S, P;\ j = S, P, \tag{A28}$$

$$\frac{df_S}{d\psi_P} = 0; \qquad \frac{df_P}{d\psi_P} = \frac{\omega_P(1-\omega_P)}{(\psi_P + 1 - \omega_P)^2} > 0. \tag{A29}$$

It follows from (A28) that the results of the asset management fees in Propositions 2–5 are verified. ‖

Proof of Predictions 1A and 1B: Comparing Proposition 1(ii) with (24), we show that $\frac{d(R_i - P_i)}{d\eta} = \frac{dR_i}{d\eta}$ for $i = G, B, M$. Hence, it follows from Propositions 2(i)–2(iii) that the statements of Predictions 1A and 1B are obtained. ‖

Appendix B

B.1. Multiple S- and P-funds.—

Our basic model can be extended to the case of multiple funds in which there are N_S S-funds and N_P P-funds. All N_S S-funds only invest in and diversify the stocks of G-firms, whereas all N_P P-funds invest in the market portfolio. As we focus on symmetric equilibria, the same type funds choose the same effort and bargaining strategies and the same fund size. Then, under a quadratic cost function of efforts, we can show that all of our propositions continue to hold by applying the discussion of Corum, Malenko, and Malenko (2021).

B.2. Non-sustainable funds and non-socially responsible investors.—

We can consider a third type of fund as a non-sustainable fund (N-fund), which invests only in B-firms. The fund manager of the N-fund invests in B-firms on behalf of investors and is interested purely in his monetary payoffs. There is also a large mass of non-socially responsible investors, who have no ESG preference and are purely interested in their monetary payoffs. Then, we can discuss whether our results are robust to these changes. For convenience, fund investors and liquidity investors in the basic model are denoted as socially responsible investors.

For simplicity, we assume that because socially responsible investors have ESG preferences, they dislike the N-fund such that they do not want to invest in the N-fund. By contrast, we assume that non-socially responsible investors have a certain amount of wealth to invest, ε, and only determine whether they invest in the N-fund or the alternative investment opportunity such as public bonds.[29] We denote their aggregate wealth by W^+, which is given exogenously. Each non-socially responsible investor with wealth ε must search for and vet the N-fund manager by incurring a search cost $\psi_N \varepsilon$. After she finds the N-fund manager, she negotiates the fee f_N through generalized Nash bargaining.

Under these assumptions, we begin with the case in which the fund manager of the N-fund has no governance role in his portfolio firms because the N-fund is practically set up to seek higher financial returns by arbitrage trading. Then, the basic model is modified as follows. As shown in Section 4.4, in the basic model, the endogenous variables consisting of the effort decisions, $(e_{SG}, a_{SG}, e_P, a_{PG}, a_{PB})$, the asset management fees, (f_S, f_P), the trading decisions and investment asset allocations, (x_{SG}, x_P, W_S, W_P), the total expected payoffs of the S- and P-funds, $(R_G - \eta Z_G, R_M - \eta Z_M)$, and the asset prices, (P_G, P_M), are determined by (8), (9′), (10), and (13)–(20). In this extended model, we additionally need to determine the asset management fee of the N-fund, f_N, the holding shares of the N-fund in B-firms, x_{NB}, the investment amount of the N-fund in B-firms, W_N, and the price of B-firms, P_B.

First, P_B is given by (12). Second, for W_N and fixed W^+, x_{NB} satisfy

$$x_{NB} = \frac{W_N}{P_B} \leq \frac{W^+}{P_B}. \tag{B1}$$

Third, the N-fund fee f_N is determined by generalized Nash bargaining between the N-fund manager and non-socially responsible investors. Because both agents are purely interested in their pecuniary returns, their concern is to distribute $R_B \frac{\varepsilon}{P_B}$ in this case.

[29] As non-socially responsible investors have no ESG preference and are purely interested in their monetary payoffs, they can invest in assets that yield the highest rate of expected net return among the S-fund, the N-fund, the P-fund, and the alternative investment opportunity such as public funds. However, for simplicity, we focus on the case in which non-socially responsible investors invest only in the N-fund, that is, the N-fund yields the highest rate of expected net return.

Hence, it follows from the discussion at the end of Section 4.3 that

$$f_N = \omega_N \left(1 - \frac{P_B}{R_B}\right), \tag{B2}$$

where ω_N is the bargaining power of the N-fund manager and R_B is given by (2) for e_P determined from the above-mentioned equation system of the basic model.

The remaining problem is to show how W_N is chosen by non-socially responsible investors. As non-socially responsible investors decide whether they invest in the N-fund or the alternative investment opportunity such as public bonds, we need to specify the expected payoff of non-socially responsible investors attained by investing in the N-fund. This expected payoff is represented by

$$(1 - f_N)\frac{R_B}{P_B} - \psi_N. \tag{B3}$$

Because R_B and P_B are given by (2) and (12) for e_P and a_{PB} determined from the above-mentioned equation system of the basic model, it follows from (B2) that the value of (B3) may not be generically equal to 1; thus, it may be smaller than 1 or larger than 1. Hence, if (B3) is larger than 1, non-socially responsible investors invest their entire wealth in the N-fund, that is, $W_N = W^+$. Otherwise, they do not invest in the N-fund, that is, $W_N = 0$.

In either case, even in this extended model, the endogenous variables in the basic model are still determined in the exactly same way as in the main text. Consequently, none of our main results are affected because Proposition 1 still holds in this extended model.

We next examine the case in which the fund manager of the N-fund exerts governance effort e_{NB} to increase the profit of B-firms by incurring a private engagement cost $c_{RN}(e_{NB})$, where $c_{RN}(e) = \frac{c_{RN}}{2}e^2$. Then, as the negative externality released by each firm is affected by a fund ownership effect because of a change in e_{NB}, we cannot derive our main results generally. However, if socially responsible investors' ESG preference, η, is not large, R_B and P_B are almost taken as exogenous because R_B and P_B are almost unaffected by Z_B. Thus, the effect of a change in e_{NB} is not large. Similarly, if the bargaining power of the N-fund manager, ω_N, is not large, and/or if the wealth of non-socially responsible investors, W^+, is not large, the effect of a change in e_{NB} is not large because e_{NB} is not

large in this case. Then, our main results are almost certainly true in these cases.

B.3. Effect of P-fund growth.—

It has been discussed frequently that ESG investing is harmed by P-fund growth because P-funds automatically invest their money in firms with lower ESG scores unlike S-funds. However, as has been argued in this paper, P-funds have an ability to monitor their portfolio firms and force the management of the firms to improve their ESG performance. Hence, to investigate the above problem, we must analyze P-fund growth by incorporating the P-fund manager's engagement with their portfolio firms. A decrease in ψ_P can be thought of as indicating easy access to the P-fund over time and bring about P-fund growth because it reflects more investor awareness about the fund and improved disclosure about the investment strategy and the fee structure of the fund.[30]

We then have the following proposition.

Proposition 6: *Suppose that access to the P-fund becomes easier (i.e., ψ_P is lower).*
(i) The expected negative externality released by G-firms, Z_G, decreases if $\frac{c_{RP}}{c_{RS}} > \frac{c_{ZP}}{c_{ZS}}$ but increases otherwise. The expected profit of G-firms, R_G, decreases if $\frac{c_{RP}}{c_{RS}} > \frac{c_{ZP}}{c_{ZS}}$ but increases otherwise.
(ii) The expected negative externality released by B-firms, Z_B, decreases, whereas the expected profit of B-firms, R_B, increases.
(iii) The expected negative externality released by all the firms in the market portfolio, Z_M, decreases if $\frac{c_{RP}}{c_{RS}} > \frac{1}{1+\lambda^2+\eta^2\lambda^2\frac{c_{RS}}{c_{ZS}}}\frac{c_{ZP}}{c_{ZS}}$ but increases otherwise. The expected profit of the market portfolio, R_M, increases if investors do not have a strong preference for ESG (i.e., η is not large).
(iv) The asset management fee of the S-fund, f_S, is unaffected, whereas that of the P-fund, f_P, decreases.

The intuition behind Proposition 6 is divided into two effects: the fund fee effect and the fund ownership effect. For convenience, we begin by discussing the effect of the lower ψ_P on the asset management fee of each fund, f_S and f_P. The effect of the lower ψ_P on f_P follows from an effect of the decrease in the rate of expected gross return earned by the P-fund. The reason is that the lower ψ_P increases fund investors' rate of expected net

[30] Corum, Malenko, and Malenko (2021) provide the same interpretation of a decrease in the search cost.

return of the P-fund from which ψ_P is deducted. In equilibrium, however, fund investors are indifferent between investing in the P-fund and the alternative investment opportunity (see (18)). To restore (18), fund investors increase their investment in the P-fund until fund investors' rate of expected gross return from the P-fund decreases so that their rate of expected net return returns to 1. A decrease in fund investors' rate of expected gross return from the P-fund then leads to a lower f_P because the P-fund manager's bargaining power ω_P is assumed to be fixed. Indeed, in the expression for the fund fee in Proposition 1(i), this effect is featured as a dependence of f_P on ψ_P. However, the lower ψ_P has no effect on the S-fund fee because it does not affect fund investors' expected net return from the S-fund exclusive of the search cost ψ_S.

To examine the effect of the lower ψ_P on the expected negative externality, we need to consider both the fund fee effect and the fund ownership effect: note that the effort incentive for each fund manager to reduce the negative externality depends on the fund fee and the fund ownership stakes for fixed η, λ, c_{ZS} and c_{ZP}, as indicated in (8) and (9′). For the effect through the fund fee, a decrease in ψ_P reduces the P-fund fee f_P, but does not affect the S-fund fee f_S, as discussed above. This weakens the effort incentive for the P-fund manager to reduce the negative externality in all the firms in the market portfolio and thus increases Z_G and Z_M. However, it has no effect on the effort incentive for the S-fund manager to reduce the negative externality in G-firms.

A decrease in ψ_P also changes the fund ownership stakes in firms. If ψ_P decreases, fund investors increase their investment in the P-fund, W_P, because fund investors' expected net return from the P-fund increases, as argued above. This enables the P-fund manager to take increasingly large stakes x_P in all the firms in the market portfolio. The increase in x_P reduces the stakes held by the S-fund, x_{SG}, and those held by liquidity investors, $1 - x_{SG} - x_P$, in G-firms, while it also reduces the stakes held by liquidity investors, $1 - x_P$, in the market portfolio. Note that the S-fund does not buy the market portfolio. The effect of the decrease in x_{SG} of the S-fund in G-firms reduces the engagement effort of the S-fund manager in G-firms and thus increases Z_G and Z_M. However, the effect of the decrease in $1 - x_{SG} - x_P$ $(1-x_P)$ of liquidity investors in G-firms (in the market portfolio) reduces Z_G (both Z_G and Z_M). The reason is that if the P-fund replaces liquidity investors in G-firms' ownership (in the market portfolio ownership), this effect decreases Z_G (both Z_G and Z_M) because liquidity investors do not make any engagement efforts.

In evaluating the effects of the lower ψ_P on Z_G (Z_M), note that the total effects through changes in the fund fees and the fund ownership stakes depend on the difference in $\frac{c_{RP}}{c_{RS}}$ and $\frac{c_{ZP}}{c_{ZS}}$ ($\frac{1}{1+\lambda^2+\eta^2\lambda^2\frac{c_{RS}}{c_{ZS}}}\frac{c_{ZP}}{c_{ZS}}$). Accordingly, the lower ψ_P reduces Z_G (Z_M) as long as $\frac{c_{RP}}{c_{RS}}$ is larger than $\frac{c_{ZP}}{c_{ZS}}$ ($\frac{1}{1+\lambda^2+\eta^2\lambda^2\frac{c_{RS}}{c_{ZS}}}\frac{c_{ZP}}{c_{ZS}}$). However, for Z_B, the total effects of the lower ψ_P do not include any effect through a change in the fund ownership stakes in G-firms. As the effect of replacing liquidity investors is dominant, the lower ψ_P always reduces Z_B.

To investigate the effect of the lower ψ_P on the expected profit, note that the expected profit is positively associated with the expected negative externality in G-firms and in market portfolio firms (see Proposition 1(ii)). Then, for R_G, we show that the lower ψ_P decreases R_G as long as $\frac{c_{RP}}{c_{RS}}$ is larger than $\frac{c_{ZP}}{c_{ZS}}$. However, for R_M, there exists an additional direct effect of the lower ψ_P through the P-fund fee on the effort incentive for the P-fund manager to increase the profit, which increases R_M. Hence, we only suggest that the lower ψ_P increases R_M if η is not large. For R_B, as the effect of replacing liquidity investors is dominant, the lower ψ_P always increases R_B.

The theoretical implication of Proposition 6 is that because P-fund growth affects fund investors' capital allocation and then changes the fund ownership stakes, the effect of P-fund growth on the expected negative externality strongly depends on the comparative advantage between each fund in improving ESG or profit performance, like the effect of growing interests in ESG. Accordingly, despite the recent argument about the P-fund not contributing to ESG, P-fund growth does not necessarily avoid the reduction in the expected negative externality.

Given the argument in Section 5, it easily follows from Propositions 6(i)–6(iii) along with (24) that the following predictions are obtained:[31]

Prediction 7A: Suppose that improving ESG performance can be achieved to a certain degree by setting broad, market-wide standards of ESG. Then, the growth in P-funds is likely to **reduce** the expected negative externalities released by firms with high-ESG proxies and by all the firms in the market portfolio. It is also likely to **reduce** the expected financial returns of firms with high-ESG proxies, whereas it is likely to **raise** the expected financial returns for the market portfolio if investors' ESG preference is not strong.

Prediction 7B: The growth in P-funds **reduces** the expected negative externalities

[31] Note that $\frac{c_{RP}}{c_{RS}} > \frac{c_{ZP}}{c_{ZS}}$ implies $\frac{c_{RP}}{c_{RS}} > \frac{1}{1+\lambda^2+\eta^2\lambda^2\frac{c_{RS}}{c_{ZS}}}\frac{c_{ZP}}{c_{ZS}}$.

released by firms with low-ESG proxies and **raises** the expected financial returns of firms with low-ESG proxies.

Predictions 7A and 7B show that if improved ESG performance can be achieved to a certain degree by setting broad, market-wide standards of ESG, P-fund growth is likely to improve ESG governance in any type of firm. However, its effect on expected financial returns in each type of firm is more complicated. This prediction suggests that P-fund growth does not necessarily hinder the improvement in ESG performance, unlike the argument of environmental activists.

Using the argument in Section 5, we also indicate

Prediction 8: P-fund growth causes a negative association between ESG scores and EBITDA attained in firms with high-ESG proxies. However, it brings about a positive association between ESG scores and EBITDA attained in firms with low-ESG proxies (in all the firms in the market portfolio if the ESG taste of investors is not strong).

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Time 0				Time 1
Fund investors allocate their wealth between a S-fund, a P-fund, and outside investment opportunities. Fund investors search for fund managers.	Fund investors and fund managers negotiate a management fee.	Fund managers invest the delegated amount of fund investors' wealth. Liquidity investors trade.	Fund managers exert their efforts regarding ESG and monetary performances.	Payoffs are realized.

Figure 1. Timing of the model