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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 they construct using the capital collected from socially responsible investors. The fund managers endogenously choose their level of engagement with these firms to increase their profit while reducing any negative externalities. Using the search model framework between fund managers and investors, we derive several theoretical and empirical implications with regard to the effects of passive fund growth, sustainable fund growth, and improvement in environmental, social, and governance (ESG) engagement cost upon ESG and monetary performances generated by portfolio firms.

JEL Classification: D83, G23, G32, M14.

Keywords: delegated asset investment, ESG, passive fund, social impact, socially responsible investing, sustainable fund.

1. Introduction

In recent decades, it has been observed that a rapid expansion in socially responsible or sustainable investment has occurred.[1] Although recent macroeconomic headwinds (including inflationary pressures, rising interest rates, global energy crisis, and a looming global recession) have caused a slump of net new money into socially responsible or sustainable investment, the preference for environmental, social, and governance (ESG) investments among investors who derive non-pecuniary benefits from these investments, is growing. However, a large proportion of sustainable investments are made by institutional investment funds, such as sustainable funds (S-funds), that buy only the stocks of firms with high ESG performance. These funds are often managed by asset managers that may pursue their own pecuniary profits. Therefore, it is of utmost importance to motivate fund managers to engage in management of their portfolio firms not only to enhance pecuniary returns but also to improve the ESG performance.

However, passive fund (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 also at risk of seeing their efforts undermined by P-fund growth.[2] However, the empirical evidence about the governance role of P-funds is mixed.[3] In recent years, P-fund growth has been significant. The proportion of P-funds grew to just under 40% of the US fund market at the end of 2019 (Investment Company Institute 2020 Factbook), indicating that the governance role of the P-fund managers is becoming

[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] 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).

[3] See the literature cited in Corum, Malenco, and Malenco (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) also report that large institutional investors with a longer time horizon and less concern about stock liquidity intervene more intensively with management through private engagements.

increasingly important.

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

In this setting, we address the following questions. Firstly, how does the growth in the size of P-funds affect the portfolio firms' negative externalities and the pecuniary returns through a change in the P-fund and/or S-fund managers' governance engagement efforts toward their portfolio firms. P-fund growth is captured in the model in the form of a reduction in the search cost for the market portfolio as observed in the real world in recent decades. Secondly, we address the same questions when S-fund growth is observed. In actuality, we capture S-fund growth in the form of investors' growing interests in ESG. It is our understanding that this paper is the first theoretical paper to examine fund managers' engagement efforts toward the portfolio firms to reduce the negative externalities of their firms and to increase the pecuniary returns of their portfolio firms under the growth of S-funds & P-funds. Lastly, we also examine how the governance engagement efforts are affected when the costs of governance engagement effort decrease.

To address these questions, we build an asset management market model in which ESG-conscious fund investors allocate their wealth between a S-fund, a P-fund, and outside investment opportunities. These fund investors can invest their wealth in firms only via funds.[4] However, these funds are managed by for-profit fund managers who may not be so keen on ESG. If fund investors decide to invest in the S-fund, P-fund, or both, they must search for these funds, which incurs a search cost. After matching, fund investors and a fund manager bargain over an asset management fee. Then the fund manager invests in firms that differ in the sustainability of their activities; the S-fund buys only the stocks of firms with high ESG performance and the P-fund invests all of its money

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

in the value-weighted market portfolio.[5] After investing, each fund manager chooses his costly governance engagement effort levels to mitigate the negative externalities and to increase the profits of his portfolio firms.

Our main findings are as follows. When the P-fund grows, the following four results are obtained:

• The expected negative externality decreases as does the expected profit for the high-ESG firms (so-called G-firms) with the following condition: when P-fund managers have a comparative advantage over S-fund managers in making engagement efforts to reduce negative externalities relative to increasing profits.

• The expected negative externality decreases but the expected profit increases for the low-ESG firms (so-called B-firms).

• The expected negative externality for the market portfolio decreases with the same condition as the above-mentioned G-firm case. The expected profit for the market portfolio increases only if the P-fund growth occurs when the investors are not so ESG conscious.

• Regarding the asset management fee, only that of the P-fund managers is reduced. There is no influence on the S-fund managers.

The intuition of the above results is broken into two effects: the fund fee effect and the fund ownership effect. With regard to the fund fee effect, given that the P-fund growth in this paper is caused by a lower search cost for fund investors, this in turn increases fund investors' expected net return for the P-fund. Expected net return is defined as expected gross return less search cost. Hence, fund investors increase their investment in the P-fund. However, this investment increase in the P-fund eventually results in a lower expected gross return for the P-fund, which results in a drop in the P-fund fee determined by a bargaining in equilibrium. Note that the drop in the search cost for the P-fund has no effect on the S-fund's fee because it has no effect on fund investors' expected net return from the S-fund.

The fund ownership effect is more complicated, as it involves both engagement effort levels for the S-fund manager as well as for the P-fund manager. First, the fund manager's governance efforts are determined at the point where his expected marginal return equals his marginal cost of effort.[6] As the effort cost parameters are exogenous when considering

[5] 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.

[6] This holds for the effort to reduce the negative externality and the effort to increase pecuniary returns.

the fund growth, these are fixed. On the other hand, the fund manager's incentives are determined by the expected marginal return, which is equal to the fund fee multiplied by the fund ownership stake. The decrease in the P-fund fee in response to the P-fund growth, as discussed above, directly weakens the P-fund manager's governance effort level. However, fund investors' allocation of their wealth to the P-fund increases when the P-fund fee drops, enabling the P-fund ownership stake to increase in each firm. This reduces the ownership of the S-fund as well as the ownership of liquidity investors. Recall that the S-fund only buys G-firms, whereas the liquidity investors buy any type of firm. The reduction in the ownership of the S-fund weakens the S-fund manager's engagement effort levels toward G-firms. However, the reduction in the ownership of liquidity investors motivates both S-fund and P-fund managers to exert more engagement efforts toward their portfolio firms. This is because their ownership increases, although the increase in the S-fund ownership does not offset the decrease in the S-fund caused by the reduction in the S-fund ownership itself. Note that the liquidity investors do not make engagement efforts.

In short, the fund fee effects lower the P-fund manager's engagement efforts. The fund ownership effects lower the S-fund manager's engagement efforts, while increasing those of the P-fund manager. We later show that the effect of the fund ownership is always larger than the effect of the fund fee for the P-fund manager. Therefore, these changes in the fund managers' governance efforts determine the actual firm's negative externality level and the pecuniary return levels through a comparative advantage between the P-fund manager and the S-fund manager in conducting an effort to reduce the negative externality and enhance the pecuniary returns.

Our second main results concern S-fund growth. When the S-fund grows, the expected negative externality decreases but the expected profit increases for the G-firms, B-firms, and in-market-portfolio firms. This only takes place when the S-fund growth occurs at the level where the investors are not so ESG conscious. The expected negative externality can decrease for G-firms even when the S-fund growth occurs at the level where the investors are already highly ESG active. This occurs only where the P-fund managers have a comparative advantage in conducting efforts for reducing negative externalities to the S-fund managers. S-fund growth has no effect on management fees for either the S-fund or P-fund.

To understand the intuition, recall that S-fund growth is brought about by the investors becoming increasingly keen on ESG. The crucial difference between the mechanisms of the effects of P-fund growth and S-fund growth is that the stronger ESG preference of investors directly raises fund managers' ESG effort incentive, although it does not affect the asset management fee of either fund. However, because the direct effect of the strengthened ESG preference increases the ESG engagement effort of each fund manager, it also intensifies the capital allocation effect through a change in fund ownership stakes. In fact, if the ESG preference of investors is not large, the former direct effect is dominant so that the expected negative externalities released by any type of firm decrease. On the other hand, as the strengthened ESG preference increases the expected disutility of the negative externalities released by any type of firm, the expected profits generated by such a firm eventually increase because fund investors' rate of expected net return must be equal to that attained by the outside option.

Our third main result considers what happens when the ESG engagement cost changes; that is, when ESG engagement cost becomes low for the S-fund managers and the P-fund managers, respectively. For G-firms, either for the S-fund or P-fund, the reduction in the ESG engagement cost reduces both the expected negative externality and the expected profit. The above result holds true for the market portfolio firms. As for B-firms, the reduction in the ESG engagement cost for the S-fund managers does not affect the expected negative externality or the expected profit. However, 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 ESG effort incentive, whereas it does not affect the ESG effort incentive for the other fund manager or the asset management fee of either fund. Although a capital allocation effect on the ESG effort incentive through a change in fund ownership stakes exists, it is dominated by the direct effect stated above. However, because the ESG engagement cost does not directly affect the profit effort incentive for either fund manager, the capital allocation effect reduces the incentive for each fund manager to improve profit performance. Furthermore, as the S-fund does not buy B-firms, only the lower ESG engagement cost of the P-fund manager affects B-firms.

Our first and second results above show that because S-fund or 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 depends strongly on the comparative advantage between each fund in improving ESG or profit performance, whereas the effect of S-fund growth depends strongly on how keen the investors are on ESG. In summary, despite the recent argument about the P-fund not contributing to ESG, growth in the P-fund does not necessarily avoid the reduction in the expected negative externality. However, growth in the S-fund does not necessarily reduce the expected negative externality if investors already have a strong ESG preference.

Our results also have several empirical implications by imposing restrictions on the model parameters that cause S-funds & 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 of ESG, instead of focusing on firm-specific operational improvements. Then, as will be discussed in Section 5, the P-fund has a more costly disadvantageous position to improve profit performance than ESG performance when compared with the S-fund.

Under this environment, P-fund growth is likely to improve ESG performance in any type of firm. However, it is likely to aggravate (improve) expected financial returns in firms with high (low) ESG. It is also likely to improve expected financial returns for the market portfolio if investors' ESG preference is not strong. It also causes a negative (positive) association between ESG scores and EBITDA attained by firms with high (low) ESG, where EBITDA stands for earnings before interest, taxes, depreciation, and amortization. However, it brings about a positive relation between ESG scores and EBITDA attained by all the firms in the market portfolio if investors' ESG preference is not strong.

Under the same environment, S-fund growth is likely to improve ESG performance and expected financial returns in any type of firm if investors' ESG preference is not strong. Even if investors' ESG preference is strong, S-fund growth is likely to improve ESG performance in firms with high ESG scores. In addition, it creates a positive association between ESG scores and EBITDA attained by any type of firm if investors are not so ESG conscious.

Thirdly, the lower ESG engagement cost of the S-fund (P-fund) improves ESG performance but aggravates expected financial returns in firms with high ESG scores and all

the firms in the market portfolio (in any type of firm). Such a lower cost of the S-fund (P-fund) also 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 (by any type of firm).

The rest of the paper is organized as follows. Section 2 reviews the related literature, while 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, while Appendix B discusses the robustness of our main results in the case of multiple S-funds & P-funds and in the presence of non-sustainable funds.

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) build a model in which both active and passive fund managers make governance decisions to improve the expected profit of their portfolio firms, and examine how the fund managers' governance incentives in equilibrium are affected by passive fund growth.[7] By contrast, based on the model of Corum, Malenko, and Malenko (2021), we consider a multiple task setting of S- and P-fund managers who make governance 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 governance decisions under the multitask setting are determined in equilibrium endogenously and are affected by P-fund growth, S-fund growth, and the reduction in

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

ESG engagement cost when investors have ESG concerns.

Our model is also related to theoretical studies of sustainable investing and provides implications 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 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 that bargain with the entrepreneur with ESG taste, and show that socially responsible and for-profit financial investors are complementary: that is, total surplus is generally highest in an economy in which there is a balance between socially responsible and for-profit financial capital. Using the model in which entrepreneurs search for capital, Landier and Lovo (2022) analyze how the size, emission threshold, and investment policies of socially responsible funds vary with investors' preferences, production technologies, and capital market frictions. In addition, they indicate that a firm's incentive to reduce negative externalities increases with the size of socially responsible capital.

Regarding divestment, Heinkel, Kraus, and Zechner (2001) and Edmans, Levit, and Schneemeier (2022) derive conditions as to whether holding stocks of a "brown" firm tak-

ing 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.

By contrast, different from the above-mentioned papers, our paper is the first to consider how the expected negative externality and the expected profit of firms vary with (i) S- or P-fund growth and (ii) the lower ESG engagement cost for each fund manager, when the profit-motivated managers of both funds must attract socially responsible investors and face a multitask agency situation where they must exert governance efforts to improve ESG and profit levels for socially responsible investors. In particular, we show that a fund manager's incentives to reduce the negative externality and to increase pecuniary returns in response to P-fund (S-fund) growth depend on the comparative advantage of each fund in improving ESG and profit levels (strength of investors' ESG preference). The driving force behind this result is the investment reallocation of fund investors from an alternative investment opportunity to each fund and across different fund types. This investment reallocation of fund investors affects the ESG and monetary performances of firms through the comparative efficiency of increasing ESG relative to monetary performance for each fund; therefore, we must delineate the combined effects in equilibrium.

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 agent types: 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, although they also 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 (so-called G-firms), and a mass one of firms with observable low ESG performance (so-called 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 valuations low enough 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 mean zero. 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 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

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

where Z_{G0} is the negative externality of G-firms without shareholder engagement, 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 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 unobservable noise that has mean zero.

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 $\widetilde{Z}_{B_j}$. As we assume that 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}.

We assume that 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, although we can easily extend to any number of S-funds and P-funds, N_S and N_P.[8] 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 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 $h \in (G, B)$.

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, their large amount of assets under management and ownership stakes can compensate for their low

[8] 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.

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, fund managers of large P-funds have been recently 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.[9] 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 $\eta \times$ (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.[10]

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 that generates a fixed return of 0. When each fund investor with wealth ε tries to find a S-fund (P-fund) manager, she must search for and vet a fund manager by incurring a search cost $\psi_S\varepsilon$ $(\psi_P\varepsilon)$. Fund investors are assumed to be homogeneous; therefore, they incur the same search cost $\psi_S\varepsilon$ $(\psi_P\varepsilon)$ when they try to find a S-fund (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 on finding a fund manager whom they trust with their money, and examine the funds' investment strategies and fee structures.[11] We

[9] 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.

[10] The utility of fund investors depends on the pecuniary returns they receive and the social value created by firms they have financed through funds. Green and Roth (2021) call these investors 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).

[11] For more information, see Corum, Malenco, and Malenco (2021) and the references listed in footnote

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.[12] 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 $-$ ω_S (1 $-$ ω_P). We also 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.[13] 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 the amount of disutility as $\eta \times$ (negative externality generated by their holding firms per unit of their holding stocks).[14] Liquidity investors apply rational expectations in predicting the value of each 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

9 in their text.

[12]This assumption is also used in Gârleanu and Pedersen (2018) and Corum, Malenco, and Malenco (2021).

[13]Note that the deduction amount, $f_i \times$ (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 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.

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

component, $L_{h_j} > 0$, that is, $R_{h_j} - \eta Z_{h_j} - L_{h_j}$ for $h \in (G, B)$.

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 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 by their prediction about the stock price of each firm. Their prediction is 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 shares of each type of stock.[15] Both the S-fund's and P-fund's assessments 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 liquidity investors' assessment of stock h.[16]

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

[16] For 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.

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.[17]

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 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 the 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 $h \in (G, B)$.

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

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

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

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

(8) and (9) imply that each fund manager exerts more effort 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).

4.2. Trading decisions.—

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

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

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

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

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

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 firm, G- and B-firms. As has been mentioned at the end of Section 3.2, this implies that the market clearing price of stock

$h \in (G, B)$ is determined by liquidity investors' assessment of stock h:

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

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 (1)–(4), 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.[18]

The S-fund invests only in G-firms. As has been mentioned, the S-fund also 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

$$x_{SG} = \frac{W_S}{P_G}. \tag{13}$$

Because of (12), note that

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

where $R_G - \eta Z_G - L_G$ is given by (10).

The P-fund is restricted to holding a value-weighted portfolio of all stocks. Denote the market portfolio 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 rule in 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

[18] Note that these fund managers evaluate each stock higher than liquidity investors or submit a market order.

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

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

Note that from (9) and (15), e_{Ph} and a_{Ph} are the same for any $h \in (G, B)$ and are equal to

$$e_P = \frac{f_P x_P}{c_{RP}} \text{ and } a_P = \frac{\eta f_P x_P}{c_{ZP}}. \tag{9'}$$

4.3. Investment allocation decisions and asset management fees.—

We now 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 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 $W_S + W_P < W$. Then, fund investors make a positive investment in an alternative investment opportunity with the fixed return 0. This implies that fund investors earn the same rate of expected net return regardless of whether they invest with the S- and P-funds, which is equal to

1.[19] Specifically, fund investors' indifference conditions are

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

We next deal with bargaining in the S-fund. After a fund investor with wealth ε incurs the cost $\psi_S\varepsilon$ and finds the S-fund, she bargains with the S-fund manager over the fee $\widehat{f_S}$. The outcome of bargaining then 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 $\widehat{f_S}(R_G-\eta Z_G)\frac{\varepsilon}{P_G}$.[20] However, the fund manager's gain 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

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

[19] Unlike Corum, Malenko, and Malenko (2021), 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. However, this assumption also enables us to focus on the effects through the effort decisions of fund managers in multiple tasks under the negative externality released by their portfolio firms.

[20] 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 $\max_{e,a}\{f_S[R_{G0}+e+\frac{f_Px_P}{c_{RP}}-\eta(Z_{G0}-a-\frac{\eta f_Px_P}{c_{ZP}})]x_{SG}+\widehat{f_S}[R_{G0}+e+\frac{f_Px_P}{c_{RP}}-\eta(Z_{G0}-a-\frac{\eta f_Px_P}{c_{ZP}})]\frac{\varepsilon}{P_G}-c_{RS}(e)-c_{ZS}(a)\}$. Using the envelope theorem, the derivative with respect to ε at $\varepsilon=0$ yields $\widehat{f_S}[R_{G0}+e+\frac{f_Px_P}{c_{RP}}-\eta(Z_{G0}-a-\frac{\eta f_Px_P}{c_{ZP}})]\frac{1}{P_G}=\widehat{f_S}\frac{(R_G-\eta Z_G)}{P_G}$.

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, $(e_{SG}, a_{SG}, e_P, a_P)$; 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,*
(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 $\omega_S \geq \omega_P$.
(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:

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

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

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

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 $R_0 > \max(\eta Z_{B0} + L_B, \eta Z_{G0} + L_G)$ and $R_0 - \eta Z_{G0} - L_G > W$ ensure that liquidity investors' holding ratio in each stock is positive, that is, $x_{SG} + x_P < 1$. The restriction $R_0 > \eta Z_{G0} + L_G$ also guarantees that the S-fund finds it optimal to diversify equally across all G-firms. Finally, the restriction $W \geq \underline{W}$ ensures that fund investors make a positive investment in an alternative investment opportunity, 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 with the fixed return 0. 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 not smaller than that of the P-fund manager.

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 fund investors' search costs for the P-fund, ψ_P, the intensity of investors' ESG preference, η, and the effort cost parameter of each fund manager in ESG, c_{ZS} and c_{ZP}.

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, 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.[21]

We then have the following proposition.

Proposition 2: *Suppose that access to the P-fund becomes easier (i.e.,* ψ_P *is lower).*

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

(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 $\frac{c_{RP}}{c_{RS}} > \frac{1}{2+\eta^2\frac{c_{RS}}{c_{ZS}}}\frac{c_{ZP}}{c_{ZS}}$ but increases otherwise. The expected profit of the market portfolio, R_M, increases if investors in the market 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.

$\frac{c_{RP}}{c_{RS}}$ 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 that 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 more costly for the P-fund than the S-fund. Thus, the larger $\frac{c_{RP}}{c_{RS}}$ ($\frac{c_{ZP}}{c_{ZS}}$) can be interpreted such that the P-fund has much less advantage in the cost efficiency of improving profit (ESG) performance than the S-fund.

Considering this interpretation, Proposition 2(i) claims that as access to the P-fund becomes easier (i.e., ψ_P is lower), Z_G and R_G decrease as long as the P-fund has a smaller advantage in improving profit performance than ESG performance when compared with the S-fund (i.e., $\frac{c_{RP}}{c_{RS}}$ is larger than $\frac{c_{ZP}}{c_{ZS}}$). However, Proposition 2(ii) indicates that when ψ_P is lower, Z_B decreases, whereas R_B increases. Proposition 2(iii) states that the lower ψ_P decreases Z_M as long as $\frac{c_{RP}}{c_{RS}}$ is larger than $\frac{1}{2+\eta^2\frac{c_{RS}}{c_{ZS}}}\frac{c_{ZP}}{c_{ZS}}$, but increases R_M if investors in the market are not so keen on ESG in general (i.e., η is not large). Proposition 2(iv) indicates that the lower ψ_P decreases the P-fund fee, although it does not affect the S-fund fee.

The intuition behind Proposition 2 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 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, 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 $\frac{c_{ZP}}{c_{ZS}}$ ($\frac{1}{2+\eta^2\frac{c_{RS}}{c_{ZS}}}\frac{c_{ZP}}{c_{ZS}}$). Accordingly, the lower ψ_P reduces Z_G (Z_M) as long as $\frac{c_{RP}}{c_{RS}}$ is larger than $\frac{c_{ZP}}{c_{ZS}}$ ($\frac{1}{2+\eta^2\frac{c_{RS}}{c_{ZS}}}\frac{c_{ZP}}{c_{ZS}}$). However, for Z_B, the total effects of the lower ψ_P do not include the 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 (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 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 P-fund fee effect is dominant, the lower ψ_P always increases R_B.

We now proceed to consider the comparative statics of η. It has been discussed often that ESG investing is promoted by S-fund growth. To capture this tendency of S-fund growth, we consider the situation in which investors in general have become more ESG conscious (i.e., η increases). We then obtain the following proposition.

Proposition 3: *Suppose that investors' ESG preference is 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) If η is not large, the expected negative externality released by B-firms, Z_B, decreases, whereas the expected profit of B-firms, R_B, increases.
(iii) If η is not large, the expected negative externality released by all the firms in the market portfolio, Z_M, decreases, whereas the expected profit for the market portfolio, R_M, increases.
(iii) The asset management fees of both funds are unaffected.

Proposition 3(i) shows that when investors become more concerned with ESG (i.e., when η increases), Z_G decreases if η is not large, or if compared with the S-fund, the P-fund has a less advantageous position to improve profit performance over ESG performance (i.e., if $\frac{c_{RP}}{c_{RS}}$ is larger than $\frac{c_{ZP}}{c_{ZS}}$). Proposition 3(i) indicates that when η increases, R_G increases if η is not large. Propositions 3(ii) and 3(iii) also suggest that if η is not large, an increase

in η decreases Z_B and Z_M, and increases R_B and R_M. Proposition 3(iv) states that an increase in η does not affect either the P-fund or the S-fund fee.

The intuition behind Proposition 3 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 for fixed c_{ZS} and c_{ZP}, 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-fund 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 also changes the fund ownership stakes in each firm. 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 $P = R - \eta Z - L$). In equilibrium, however, fund investors are indifferent between investing in each fund and the alternative investment opportunity (see (18)). 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 then needs to increase its ownership stakes in each firm, x_{SG} and x_P, until fund investors' rate of expected gross return from the fund increases so that their rate of expected net return returns 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-fund replaces liquidity investors in G-firms' ownership, 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 decrease the expected disutilities of fund investors, ηZ, because $\eta \frac{dZ}{d\eta}$ is then large. Applying the above argument on the fund ownership effect, we show that this effect increases Z_G, Z_B, and Z_M but decreases R_G, R_B, and R_M. 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 is ambiguous in this case. However, if $\frac{c_{RP}}{c_{RS}} > \frac{c_{ZP}}{c_{ZS}}$, the fund ownership effect of increasing Z_G from the change in x_G is smaller than that from the change in x_P. Then, an increase in η reduces Z_G.

We now 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 fund investors' rate of expected gross return, thus having no effect on the management fee of either fund.[22]

Several remarks regarding Propositions 2 and 3 are in order. First, because the lower search cost ψ_P brings about P-fund growth, while the strong ESG preference creates S-fund growth, Propositions 2 and 3 can be interpreted in the light of fund growth. Proposition 2 implies that P-fund growth leads to the lower fund fee of only the P-fund, whereas S-fund growth does not affect the fund fee of any funds. However, in our model, even though one fund growth leads to the lower fund fee or does not affect either fund fee, it can also change the fund ownership stakes. Specifically, whether one fund growth crowds out fund investors' allocations to the other fund or brings new investor

[22] Under fund investors' capital allocation conditions (18), 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.

capital into the fund industry is related to whether one fund growth replaces the other fund or liquidity investors. Accordingly, Proposition 2 shows that P-fund growth reduces the expected negative externality released in G-firms and all the firms in the market portfolio if the P-fund has a comparative advantage over the S-fund in improving ESG performance relative to profit performance,[23] and always reduces the expected negative externality released in B-firms. Proposition 3 indicates that S-fund growth also decreases the expected negative externality released in G-firms under the same condition as that of P-fund growth; however, it does not necessarily decrease the expected negative externality released in B-firms or all the firms in the market portfolio if the ESG preference of investors is strong. These results suggest theoretically that the P-fund growth may not necessarily hinder the reduction of the expected negative externality, whereas the S-fund growth may not necessarily contribute to the reduction of the expected negative externality if the investors in the market have a strong preference for ESG.

Second, it is empirically supported that the change in the fund ownership structure has first-order effects because 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 engagement in their portfolio firms.

Third, 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 taste leads green firms to become greener but reduce 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 S-fund growth are mainly derived from changes in the fund managers' governance efforts because of changes in the fund fee and the fund ownership stakes. Accordingly, our results depend on the comparative advantage of each fund manager in improving ESG performance relative to firm profit and the strength of investors' ESG taste.

Finally, Corum, Malenco, and Malenco (2021) report that passive fund growth improves

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

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

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 ESG performance perspective. In the context of our model, we can think of these changes as decreasing c_{ZS} and c_{ZP}.

Proposition 4: *Suppose that the S-fund manager's effort cost parameter of reducing the negative externality is decreasing (i.e., c_{ZS} is lower).*
(i) The expected negative externality and the expected profit of G-firms, Z_G and R_G, decrease.
(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 from all the firms in the market portfolio, Z_M and R_M, 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 decreasing (i.e., c_{ZP} is lower). Then, the statements of (i), (ii), and (iv) in Proposition 4 still hold, whereas the expected negative externality and the expected profit of B-firms decrease.*

Propositions 4(i) and 4(iii) show that the lower ESG effort cost parameter of the S-fund manager (i.e., the lower c_{ZS}) decreases Z_G, R_G, Z_M, and R_M. However, Propositions 4(ii) and 4(iv) indicate that the lower c_{ZS} does not affect Z_B, R_B, or the asset management fee of either fund. Proposition 5 implies that the lower ESG effort cost parameter of the

P-fund (i.e., the lower c_{ZP}) has effects similar to those of the lower c_{ZS}, except that Z_B and R_B decrease. Thus, the lower c_{ZS} and c_{ZP} both improve ESG governance in G-firms and in all the firms in the market portfolio, but aggravate profit governance in G-firms and in all the firms in the market portfolio. However, only the lower c_{ZP} improves ESG governance, but it aggravates profit governance in B-firms.

Intuitively, first, suppose that the management fee is taken as given. Then, the lower c_{ZS} increases the S-fund manager's ESG effort in G-firms (see $a_{SG} = \frac{\eta f_S x_{SG}}{c_{ZS}}$), thereby decreasing Z_G 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 ownership stakes. Because the lower Z_G decreases fund investors' rate of expected gross return from the S-fund (see $\partial(\frac{R-\eta Z}{P})/\partial Z > 0$, where $P = R - \eta Z - L$), fund investors reduce their investment in the S-fund, which forces the S-fund manager to buy a smaller number of the shares of G-firms, thus decreasing x_{SG}. However, this effect of the lower x_{SG} on a_{SG} does not offset the initial direct effect of the lower c_{ZS} on a_{SG}. Thus, Z_G ultimately decreases. The effect of the lower x_{SG} also reduces his effort regarding firm profit (see $e_{SG} = \frac{f_S x_{SG}}{c_{RS}}$). Hence, R_G decreases. By contrast, the lower c_{ZS} does not affect the P-fund manager's effort directly. Thus, as long as the management fee is taken as given, neither Z_B nor R_B is affected. Nevertheless, as the market portfolio includes G-firms, both Z_M and R_M decrease, such as Z_G and R_G.

Regarding the management fee, note that fund investors' rate of expected gross return depends on the expected profit of portfolio firms of the fund minus the expected disutility of the negative externality released by the firms. When c_{ZS} is lower, under fund investors' capital allocation conditions (18), its positive effect on the reduction of the expected disutility cancels out its negative effect on the expected profit. This implies that the change in c_{ZS} has no effect on fund investors' rate of expected gross return, thus having no effect on the management fee of either fund.[24]

For the effect of the lower c_{ZP}, we can apply 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} reduces Z_B and R_B

Several remarks about Propositions 4 and 5 are in order. First, these discussions show that an improvement in the engagement cost in ESG for the S-fund manager enhances

[24] A remark similar to that of footnote 22 also holds in this case.

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.

Second, even though one might think it is obvious that the lower engagement cost in ESG for each fund manager reduces the expected negative externalities, the present model has an indirect channel through fund investors' capital allocation that blocks the reduction of the expected negative externalities. In this sense, the comparative static results for c_{ZS} and c_{ZP} are not straightforward.

Third, 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 of increasing the firm profit is substituted for his effort of reducing the negative externality, although the costs of these efforts are additive. This result is different from that of Hölmstrom 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 change in the fund ownership structure, that is, the change in x_{SG} and x_P.

5. Discussions and Empirical Implications

Propositions 2–5 provide several empirical predictions regarding the shareholder engagement effects of P-fund growth, S-fund growth, and an improvement in each fund manager's engagement cost 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

$$R_G - P_G = L_G + \eta Z_G, \tag{24}$$

$$R_B - P_B = L_B + \eta Z_B, \tag{25}$$

$$R_M - P_M = L_M + \eta Z_M. \tag{26}$$

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

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), (24), and (25) that if L_G is not so different from L_B, the expected financial returns of stocks with low-ESG proxies outperform those with high-ESG proxies. Many existing 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 environment 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 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.[25]

We next examine the governance effect of S- and P-fund growth because many practitioners and researchers wonder how S- or P-fund growth 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 action such as communicating with management, submitting shareholder proposals, nominating directors, and voting on proxy contests. In their review literature, Brav, Malenco, and Malenco (2022) conclude that because passive funds and actively managed funds have different

[25] 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.

types of cost and hence are likely to specialize in different types of engagement, passive funds may be in a better position to have impact by setting broad, market-wide governance standards, instead of focusing on firm-specific operational improvements.[26] Given the difference in the engagement strategies, the passive 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 of ESG. This is because, in this situation, improving the profit performance of each firm needs more firm-specific operational engagements than improving ESG performance. Then, c_{ZP} is relatively lower than c_{ZS} because setting, broad, market-wide standards of ESG is less costly, whereas c_{RP} is relatively higher than c_{RS}, because improving the profit performance of each firm needs more firm-specific operational engagements. Accordingly, we can assume $\frac{c_{RP}}{c_{RS}} > \frac{c_{ZP}}{c_{ZS}}$ if improving ESG performance can be achieved to a certain extent by setting broad, market-wide standards of ESG.

As discussed in the preceding section, the easier access to the P-fund produces the growth in the P-fund. Hence, given the above argument, it easily follows from Propositions 2(i)–2(iii) along with (24)–(26) that the following predictions are obtained:[27]

Prediction 1A: 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 1B: The growth in P-funds **reduces** the expected negative externalities released by firms with low-ESG proxies and **raises** the expected financial returns of firms with low-ESG proxies.

Predictions 1A and 1B 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

[26] 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.

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

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.

However, strengthened ESG taste brings about S-fund growth. Indeed, the strengthened ESG taste affects both η and Z_i ($i = G, B, M$) in (24)–(26). Given this, Propositions 3(i)–3(iii) along with (24)–(26) provide the following predictions (for the proof, see Appendix A):

Prediction 2A: Suppose that improving ESG performance can be achieved to a certain degree by setting broad, market-wide standards of ESG. Then, the S-fund growth is likely to **reduce** the expected negative externality released by firms with high-ESG proxies.

Prediction 2B: Suppose that investors' ESG preference is not strong. Then, the S-fund growth 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 2A shows that if improving ESG performance can be achieved to a certain degree by setting broad, market-wide standards of ESG, S-fund growth is likely to improve ESG performance in firms with high-ESG proxies. If the ESG preference of investors is not strong, Prediction 2B indicates that S-fund growth is likely to improve both ESG governance and expected financial returns in any type of firm. However, if the ESG preference of investors is strong, Prediction 2B with Prediction 2A does not necessarily suggest that S-fund growth is likely to improve ESG performance in all the firms in the market portfolio or in firms with low-ESG proxies, or that S-fund growth is likely to raise expected financial returns in all types of firms.

Many empirical studies report the expected financial returns of assets, but they focus on cross-sectional analysis. Different from these cross-sectional studies, Predictions 1A–2B of our analysis provide time-series predictions created by the effects of S- and P-fund growth.

We now discuss the governance effect of an improvement in the ESG effort cost for each fund manager. As has been argued, S-funds are more likely to focus on firm-specific operational improvements, whereas P-funds are more likely to have 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 S-funds, whereas c_{ZP} is lower when setting broad, market-wide ESG governance standards is less costly for P-funds. Hence, Propositions 4(i)–(iii) and 5 with (24)–(26) immediately yield the following predictions:

Prediction 3A: Suppose that focusing on firm-specific operational improvements in ESG is less costly for S-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**.

Prediction 3B in particular suggests that the lower cost of P-funds setting broad, market-wide ESG governance standards improves ESG performance but aggravates financial returns in any type of firm.

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

First, Propositions 2 and 3 imply the following predictions.

Prediction 4: 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).

Prediction 5: S-fund growth causes a positive association between ESG scores and EBITDA attained by any type of firm when the investors do not have a strong preference for ESG.

If the ESG preference of investors is not strong, Predictions 4 and 5 suggest that P-fund growth creates a negative (positive) association between ESG scores and EBITDA attained by firms with high-ESG proxies (by firms with low-ESG proxies and by all the

firms in the market portfolio); and S-fund growth brings about a positive association between ESG scores and EBITDA attained by any type of firm. However, if the ESG preference of investors is strong, these predictions also suggest that P-fund (S-fund) growth does not necessarily create a positive association between ESG scores and EBITDA attained by all the firms in the market portfolio (by any type of firm).

Second, Propositions 4 and 5 imply the following predictions.

Prediction 6: The lower cost of S-funds exerting firm-specific operational efforts for improving ESG performance causes a negative association between ESG scores and 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 EBITDA attained by any type of firm.

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. We examine a multitask situation in which the manager of each fund must choose the costly engagement effort levels of 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 the P-fund has a comparative advantage in improving ESG performance relative to profit performance when compared with the S-fund, P-fund growth is likely to improve ESG performance in any type of firm, and is not necessarily likely to aggravate expected financial returns in all types of firms. Thus, P-fund growth does not necessarily hinder improvement in ESG performance.

(ii) If investors in the market are generally not so keen on ESG, S-fund growth is likely to improve ESG performance and expected financial returns in any type of firm. Even when the investors generally have a strong ESG preference, under the same condition stated in (i), S-fund growth is likely to improve ESG performance in firms with high-ESG proxies.

However, when investors have a strong ESG preference, S-fund growth does not generally contribute to the reduction of the expected negative externality in all types of firms.
(iii) The lower ESG engagement cost of the S-fund (P-fund) improves ESG performance but aggravates the expected financial returns in 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 the governance engagement in his portfolio firms, and fund investors' investment allocation problems. In order to shed light on these two problems, we abstract from the tax and interest payments of the portfolio firms. Thus, in our model, EBITDA and net income are indistinguishable. In conducting empirical research, however, 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 for the empirical analysis.

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 $Z_M=Z_G+Z_B$, $a_{PG}=a_{PB}=a_P$, $E\widetilde{Z}_G=Z_G$, and $E\widetilde{Z}_B=Z_B$ that

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

and

$$Z_M=Z_{G0}+Z_{B0}-a_{SG}-2a_P. \tag{A4}$$

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, 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 $(e_P, a_P) > 0$ and because $R_0 > \max(\eta Z_{B0} + L_B, \eta Z_{G0} + L_G) > 0$. Hence, it is found from (A5) that

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

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

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

Define

$$\underline{W} \equiv \frac{1 - \omega_S}{\psi_S} \frac{\psi_S + 1 - \omega_S}{\omega_S \psi_S} L_G c_{RS} \left(2\frac{\psi_S + 1 - \omega_S}{\psi_S} L_G - \frac{\psi_P + 1 - \omega_P}{\psi_P} L_M + \eta Z_{G0} - \eta Z_{B0}\right)$$

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

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 $f_P=\frac{\omega_P\psi_P}{\psi_P+1-\omega_P}$, 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, Malenco, and Malenco (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

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

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

$$Z_M=Z_{G0}+Z_{B0}-\Gamma_1-2\Gamma_2, \tag{A12}$$

where

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

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

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

$$\begin{bmatrix} 1 & 1 & -1 \\ 0 & 1+\frac{\partial\Gamma_1}{\partial Z_G}+\frac{\partial\Gamma_2}{\partial Z_G} & \frac{\partial\Gamma_1}{\partial Z_M}+\frac{\partial\Gamma_2}{\partial Z_M} \\ 0 & \frac{\partial\Gamma_1}{\partial Z_G}+2\frac{\partial\Gamma_2}{\partial Z_G} & 1+\frac{\partial\Gamma_1}{\partial Z_M}+2\frac{\partial\Gamma_2}{\partial Z_M} \end{bmatrix}\begin{bmatrix} dZ_B \\ dZ_G \\ dZ_M \end{bmatrix}$$

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

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 $\Gamma_1 = \eta \frac{c_{RS}}{c_{ZS}} (2R_G - R_M) = \frac{\eta f_S x_{SG}}{c_{ZS}}$ and $\Gamma_2 = \eta \frac{c_{RP}}{c_{ZP}} (R_M - R_G - R_0) = \frac{\eta f_P x_P}{c_{ZP}}$. It follows from (8) and (9′) that the assumption $(e_{SG}, a_{SG}) > 0$ and $(e_P, a_P) > 0$ means $f_S x_{SG} > 0$ and $f_P x_P > 0$. Thus, this ensures that $\Gamma_1 > 0$ and $\Gamma_2 > 0$.

Now, solving (A13), we show

$$\frac{dZ_B}{d\psi_P} = \frac{(1-\omega_P)\eta L_M}{(\psi_P)^2 \Delta} \left(\frac{c_{RP}}{c_{ZP}} + \eta^2 \frac{c_{RP}}{c_{ZP}} \frac{c_{RS}}{c_{ZS}} \right) > 0, \tag{A14}$$

$$\frac{dZ_G}{d\psi_P} = \frac{(1-\omega_P)\eta L_M}{(\psi_P)^2 \Delta} \frac{c_{RS}}{c_{ZP}} \left(\frac{c_{RP}}{c_{RS}} - \frac{c_{ZP}}{c_{ZS}} \right) \gtreqless 0, \qquad \text{if and only if } \frac{c_{RP}}{c_{RS}} \gtreqless \frac{c_{ZP}}{c_{ZS}}, \tag{A15}$$

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

$$\text{if and only if } \frac{c_{RP}}{c_{RS}} > \frac{1}{2 + \eta^2 \frac{c_{RS}}{c_{ZS}}} \frac{c_{ZP}}{c_{ZS}}, \tag{A16}$$

$$\begin{aligned} \frac{dZ_B}{d\eta} &= \frac{\eta^3 Z_G}{\Delta} \frac{c_{RS}}{c_{ZS}} \left(2\frac{c_{RS}}{c_{ZS}} + \frac{c_{RP}}{c_{ZP}} \right) + \frac{\eta Z_B}{\Delta} \left[\eta^2 \left(\frac{c_{RP}}{c_{ZP}} \right)^2 - \frac{c_{RP}}{c_{ZP}} - 2\eta^2 \left(\frac{c_{RS}}{c_{ZS}} \right)^2 \right] \\ &\quad + \frac{\eta \Gamma_1}{\Delta} \left(2\frac{c_{RS}}{c_{ZS}} + \frac{c_{RP}}{c_{ZP}} \right) + \frac{\Gamma_2}{\eta \Delta} \left(\eta^2 \frac{c_{RP}}{c_{ZP}} + \eta^2 \frac{c_{RS}}{c_{ZS}} - 1 \right) \\ &< 0, \quad \text{if } \eta \text{ is not large,} \end{aligned} \tag{A17}$$

$$\begin{aligned} \frac{dZ_G}{d\eta} &= -\frac{\eta Z_G}{\Delta} \frac{c_{RS}}{c_{ZS}} \left(1 + \eta^2 \frac{c_{RP}}{c_{ZP}} \right) - \frac{\eta Z_B}{\Delta} \frac{c_{RS}}{c_{ZP}} \left(\frac{c_{RP}}{c_{RS}} - \frac{c_{ZP}}{c_{ZS}} \right) \\ &\quad - \frac{\Gamma_1}{\eta \Delta} \left(1 + \eta^2 \frac{c_{RP}}{c_{ZP}} \right) - \frac{\Gamma_2}{\eta \Delta} \left(1 + \eta^2 \frac{c_{RS}}{c_{ZS}} \right) \\ &< 0, \quad \text{if } \eta \text{ is not large, or if } \eta \text{ is large and } \frac{c_{RP}}{c_{RS}} - \frac{c_{ZP}}{c_{ZS}} > 0, \end{aligned} \tag{A18}$$

$$\frac{dZ_M}{d\eta} = \frac{\eta Z_G}{\Delta}\frac{c_{RS}}{c_{ZS}}\left(2\eta^2\frac{c_{RS}}{c_{ZS}} - 1\right) + \frac{\eta Z_B}{\Delta}\left[\eta^2\left(\frac{c_{RP}}{c_{ZP}}\right)^2 - 2\frac{c_{RP}}{c_{ZP}} + \frac{c_{RS}}{c_{ZS}} - 2\eta^2\left(\frac{c_{RS}}{c_{ZS}}\right)^2\right]$$
$$+ \frac{\Gamma_1}{\eta\Delta}\left(2\eta^2\frac{c_{RS}}{c_{ZS}} - 1\right) - \frac{\Gamma_2}{\eta\Delta}\left(2 - \frac{c_{RP}}{c_{ZP}}\eta^2\right)$$
$$< 0, \quad \text{if } \eta \text{ is not large,} \tag{A19}$$

$$\frac{dZ_B}{dc_{ZS}} = 0; \qquad \frac{dZ_h}{dc_{ZS}} = \frac{\Gamma_1}{c_{ZS}\Delta}(1 + \eta^2\frac{c_{RP}}{c_{ZP}}) > 0, \qquad h = G, M, \tag{A20}$$

$$\frac{dZ_h}{dc_{ZP}} = \frac{\Gamma_2}{c_{ZP}\Delta}(1+\eta^2\frac{c_{RS}}{c_{ZS}}) > 0, \qquad h = B, G; \qquad \frac{dZ_M}{dc_{ZP}} = \frac{2\Gamma_2}{c_{ZP}\Delta}(1+\eta^2\frac{c_{RS}}{c_{ZS}}) > 0, \tag{A21}$$

where $\Delta = 1 + \eta^2\left(\frac{c_{RS}}{c_{ZS}} + \frac{c_{RP}}{c_{ZP}} + \eta^2\frac{c_{RS}}{c_{ZS}}\frac{c_{RP}}{c_{ZP}}\right) > 0$. It follows from (A14)–(A21) that the results of the expected negative externalities in Propositions 2–5 are obtained.

Given Proposition 1(ii), we have

$$\frac{dR_G}{d\psi_P} = \eta\frac{dZ_G}{d\psi_P}; \qquad \frac{dR_M}{d\psi_P} = -\frac{(1-\omega_P)L_M}{(\psi_P)^2} + \eta\frac{dZ_M}{d\psi_P}, \tag{A22}$$

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

$$\frac{dR_h}{dc_{Zi}} = \eta\frac{dZ_G}{dc_{Zi}}, \qquad h = G, M, \text{ and } i = S, P. \tag{A22}$$

In addition,

$$\frac{dR_B}{d\chi} = \frac{dR_M}{d\chi} - \frac{dR_G}{d\chi}, \qquad \chi = \psi_P, \eta, c_{ZS}, c_{ZP}. \tag{A25}$$

Inspecting (A22)–(A25) with (A14)–(A21), we prove the results of the expected profits in Propositions 2–5.

Finally, it follows from Proposition 1(i) that

$$\frac{df_S}{d\psi_P} = 0; \qquad \frac{df_P}{d\psi_P} = \frac{\omega_P(1-\omega_P)}{(\psi_P + 1 - \omega_P)^2} > 0. \tag{A26}$$

$$\frac{df_i}{d\eta} = 0; \qquad i = S, P, \tag{A27}$$

$$\frac{df_S}{dc_{Zi}} = 0, \qquad i = S, P; \qquad \frac{df_P}{dc_{Zi}} = 0, \qquad i = S, P, \tag{A28}$$

It follows from (A26)–(A28) that the results of the asset management fees in Propositions 2–5 are verified. ‖

Proof of Predictions 2A and 2B: Comparing Proposition 1(ii) with (24)–(26), 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 3(i)–3(iii) that the statements of Predictions 2A and 2B 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, Malenco, and Malenco (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. 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, $(e_{SG}, a_{SG}, e_P, a_P)$, 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 each fund, $(R_G - Z_G, R_M - Z_M)$, 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. 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, 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), (4), and (12) for e_P and a_P 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 exact 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, the effect of a change in e_{NB} through a change in f_N and x_{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.

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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