# Corporate governance in the presence of active and passive delegated investment*

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July 2021

**Abstract**

We examine the governance role of delegated portfolio managers. In our model, investors allocate their wealth between passive funds, active funds, and private savings, and fund fees are endogenously determined. Funds' ownership stakes and fees determine funds' incentives to engage in governance. Whether passive fund growth improves governance depends on whether it crowds out private savings or active funds. In the former case, it improves governance even though it is accompanied by lower fees, whereas in the latter case it can harm governance. Overall, passive fund growth improves governance only if it does not increase fund investors' returns too much.

**Keywords**: corporate governance, delegated asset management, passive funds, index funds, competition, investment stewardship, engagement

**JEL classifications**: G11, G23, G34, K22

*We are grateful to Alon Brav, Andrea Buffa, Jonathan Cohn, Shaun Davies, Alex Edmans, Todd Gormley, Emil Lakkis, David Ng, Uday Rajan, Sergey Stepanov, Martin Szydlowski, Luke Taylor, and Yao Zeng, participants of the 2021 American Finance Association, the 2021 Financial Intermediation Research Society (FIRS), the 2020 Northern Finance Association, Minnesota Corporate Finance Conference, the 2021 RCFS Winter Conference, the 9th International Moscow Financial Conference, and seminar participants at the Virtual Finance Theory Seminar, the Chinese University of Hong Kong, Copenhagen Business School, Cornell University, the Harvard University workshop on law, economics, and organization, Hong Kong University of Science and Technology, London School of Economics, Suffolk University, University Adolfo Ibañez, Universidad Carlos III de Madrid, University of Michigan, University of Texas at Dallas, University of Virginia, and Yeshiva University for helpful comments and suggestions.

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# 1 Introduction

Institutional ownership has grown tremendously over the last decades, rising to more than 70% of US public firms. The composition of institutional ownership has also changed, with a remarkable growth in index fund ownership. The fraction of equity mutual fund assets held by passive funds is now greater than 30%, and the Big Three index fund managers (BlackRock, Vanguard, and State Street) alone cast around 25% of votes in S&P 500 firms (Appel et al., 2016; Bebchuk and Hirst, 2019a). How active and passive asset managers monitor and engage with their portfolio companies has thus become of utmost importance for the governance and performance of public firms. In 2018, the SEC chairman Jay Clayton encouraged the SEC Investor Advisory Committee to examine "how passive funds should approach engagement with companies," and during the 2018 SEC Roundtable on the Proxy Process, Senator Gramm noted that "what desperately needs to be discussed [in the context of index fund growth] ... is corporate governance."[1]

There is considerable debate in the literature about the governance role of asset managers and the different incentives faced by active vs. passive funds. Some argue that index funds "have incentives to underinvest in stewardship" (Bebchuk and Hirst, 2019b) and even propose that "lawmakers consider restricting passive funds from voting at shareholder meetings" (Lund, 2018). Others disagree and counter that passive investors have "significant incentives ... to play their current roles in corporate governance responsibly" (Kahan and Rock, 2020) and that "existing critiques of passive investors are unfounded" (Fisch et al., 2019). The empirical evidence is also mixed. On the one hand, Appel, Gormley, and Keim (2016, 2019) find that passive ownership is associated with more independent directors, fewer antitakeover defenses, and greater success of activist investors, and Filali Adib (2019) concludes that it promotes the passage of value-increasing proposals. On the other hand, Boone et al. (2020), Brav et al. (2021), and Heath et al. (2021) show that index funds vote against management more rarely than active mutual funds, and Schmidt and Fahlenbrach (2017) and Heath et al. (2021) find that passive ownership is associated with more CEO power, less board independence, and worse pay-performance sensitivity.

Motivated by these ongoing academic and policy discussions, our goal in this paper is to provide a theoretical framework to analyze the governance role of active and passive asset

[1] See the SEC chairman's statement at https://www.sec.gov/news/public-statement/statement-clayton-iac-091318 and the 2018 SEC roundtable transcript at https://www.sec.gov/files/proxy-round-table-transcript-111518.pdf.

managers. We are particularly interested in the following questions. How does competition between funds affect their assets under management and fees and, in turn, fund managers' incentives to engage in governance? What are the effects of passive fund growth? And what are the expected effects of policy changes that have been made or put forward to improve the governance role of asset managers?

In our model, fund investors decide how to allocate their capital by choosing between three options: they can either save privately or invest with either an active or a passive (index) fund manager by incurring a search cost. If an investor decides to invest with a fund manager, they negotiate an asset management fee, which is a certain fraction of the realized value of the fund's assets under management (AUM). Next, trading takes place. Passive funds invest all of their AUM in the value-weighted market portfolio. Active funds invest strategically, exploiting trading opportunities due to liquidity investors' demand: they buy stocks with low liquidity demand, i.e., those that are "undervalued," and do not invest in "overvalued" stocks with high liquidity demand. After investments are made, fund managers decide how much costly effort to exert to increase the value of their portfolio firms. Effort captures multiple actions that a shareholder can take to add value: interacting and engaging with the firm's management, ongoing monitoring activities, submitting shareholder proposals, or nominating directors. Another important example of institutional activism is voting, which requires investing resources to vote informatively, and at a potential cost of alienating the management. For example, proxy contests have become an integral part of the U.S. corporate governance system and, as discussed in Brav et al. (2021) and evidenced by the recent high-profile proxy battle at Exxon, the votes of large asset managers often play a pivotal role in determining contest outcomes.[2] We refer to all of these actions as engaging in governance or monitoring and discuss them in more detail in Section 5.1.

The key determinants of a fund manager's incentives to engage in governance are the fund's stake in the firm and the fees charged to the fund's investors: the higher the fund's stake, the more its AUM increase in value due to monitoring; and the higher the fees, the more is captured by the fund manager from this increase in value.[3] (Lewellen and Lewellen provide

[2] In the Exxon battle, "the key to victory, according to two people with knowledge of Engine No. 1's strategy ... was winning over big mutual-fund investors" ("How Exxon Lost a Board Battle With a Small Hedge Fund," *The New York Times*, May 28, 2021).

[3] These properties are consistent with the empirical evidence. For example, Heath et al. (2021) document that index funds with high expense ratios are more likely to vote against management than those with low expense ratios, whereas Iliev and Lowry (2015) and Iliev, Kalodimos, and Lowry (2020) show that funds with higher equity stakes are more likely to conduct governance research and to vote "actively" instead of relying

(2021) empirical estimates of fund managers' incentives to engage based on the analysis of their portfolios and fees.[4]) The equilibrium ownership stake and fees, in turn, depend on the fund's AUM and the fees of other funds in the market. All of these characteristics are determined endogenously; they are affected by the returns fund managers realize by trading in financial markets and by the competition between funds.

Jointly analyzing these aspects and their combined effect on governance is critical, because focusing only on one aspect (e.g., fund fees) can miss other important effects. For example, it is frequently argued that the growth in passive funds is detrimental to governance due to the low fees they charge investors which, in turn, can lead to lower incentives to be engaged shareholders. However, this argument does not take into account that fees do not change in isolation, and a decrease in fees is accompanied by other changes relevant for governance, such as the reallocation of investor funds from private savings to asset managers and across different types of asset managers, as well as changes in funds' ownership stakes. While our model captures all of these general equilibrium effects, it is very tractable, allowing us to analyze the combined effects on governance, firm valuations, and investors' payoffs.

In particular, one implication of our analysis is that the relation between fund fees and governance is far from obvious: easier access to passive funds (which we model as a reduction in search costs) could simultaneously decrease passive fund fees but increase their engagement efforts and improve overall governance. Intuitively, when passive funds are more easily available and charge lower fees, their aggregate AUM increase, which increases their ownership stakes and strengthens their incentives to engage. Moreover, if passive funds primarily crowd out fund investors' private savings, rather than their allocation to active funds, then passive fund growth does not significantly affect active fund fees. Hence, active funds continue to engage, and the dominant effect of passive fund growth is to replace retail shareholders (who have neither ability nor incentives to monitor) in firms' ownership structures. As a result, the overall level of investor engagement increases, so passive fund growth improves aggregate governance despite the decrease in fund fees.

However, if passive fund growth crowds out investors' allocations to active funds, rather

on proxy advisors' recommendations. Relatedly, Lakkis (2021) finds evidence consistent with the hypothesis that an increase in a fund family's combined (across all of its funds) equity stake leads the family to oppose management more often and increase family-level coordination in voting.

[4]For example, Lewellen and Lewellen (2021) estimate that for the top five index fund managers (BlackRock, State Street, Vanguard, Dimensional, and Schwab), a 1% increase in the value of their typical stockholding leads to an extra \$133,000 in their annual management fees. This number is comparable to the corresponding estimate of \$520,400 for activist investors, i.e., those who file Schedule 13D.

than their private savings, then it can be detrimental to governance. In this case, passive funds primarily replace active funds, rather than retail shareholders, in firms' ownership structures. Since passive funds charge lower fees than active funds, they have lower incentives to engage, so the overall level of investor engagement can decrease. The accompanying decline in both active and passive fund fees further reduces funds' combined incentives to engage.

An implication of these results is that there can be a trade-off between governance and fund investors' well-being: if passive fund growth substantially increases fund investors' equilibrium returns, then it is detrimental to governance, and vice versa. Intuitively, passive fund growth is especially beneficial to fund investors if it creates strong competition between funds and substantially decreases active and passive fund fees. But lower fees decrease funds' incentives to engage and hence are detrimental to governance. Put differently, effective fund manager engagement requires that funds earn sufficient rents from managing investors' assets, which comes at the expense of fund investors.

Besides passive fund growth, another important development in the U.S. governance system has been the strengthening of shareholder rights. Examples include the move towards annual director elections, proxy access bylaws, and mandatory say-on-pay votes, among others. In the context of our model, such changes can be thought of as reducing funds' monitoring costs, and our analysis shows that their effects are generally subtle. On the one hand, lower monitoring costs induce fund managers to engage more, which increases the value of their portfolio firms. This improvement in governance benefits fund investors on their existing investments through the funds. However, there is also a negative effect: traders in financial markets rationally anticipate the benefits of increased engagement and bid up the prices, which lowers funds' ability to realize gains from trade and hurts fund investors on their future investments. Moreover, the resulting decline in fund returns also affects the sizes of the active and passive fund sectors. More generally, our analysis suggests that governance regulations have both a direct effect by affecting shareholder engagement, and also an indirect effect by changing investors' capital allocation decisions and thereby funds' AUM and ownership stakes.

**Related literature.** Our paper is related to the literature on shareholder activism and the interaction between shareholders' trading and monitoring decisions.[5] Our key contribution

[5]E.g., Admati, Pfleiderer, and Zechner (1994), Kahn and Winton (1998), and Maug (1998), among many others. Edmans and Holderness (2016) provide an in-depth survey of this literature.

to this literature is to study the activism by delegated asset managers and to examine how the simultaneous presence of active and passive funds affects funds' fees, AUM, and investment decisions, and the effect of these factors on funds' monitoring. Given our interest in these questions, we abstract from more specific details of the activism process, such as the role of the board (Cohn and Rajan, 2013), negotiations with management (Corum, 2020), communication (Levit, 2019), pushing for the sale of the firm (Corum and Levit, 2019; Burkart and Lee, 2021), and the interaction between shareholders (e.g., Edmans and Manso, 2011; Brav, Dasgupta, and Mathews, 2019).

Our paper is more closely related to studies of the governance role of asset managers (see Dasgupta, Fos, and Sautner (2021) for a comprehensive survey). Dasgupta and Piacentino (2015), Song (2017), Burkart and Dasgupta (2021), and Cvijanovic, Dasgupta, and Zachariadis (2021) focus on asset managers' reputational incentives due to concerns about flows, and examine whether they strengthen or weaken governance via exit and voice. Cocoma and Zhang (2021) analyze how investors' decisions to become active or passive, defined by whether they become informed or remain uninformed, interact with their decisions on activism. Edmans, Levit, and Reilly (2019) and Levit, Malenko, and Maug (2021) study index funds in extensions of their models and focus, respectively, on the interaction between voice and exit, and on index funds' role in voting. Differently from all these papers, our focus is on how fund investors' decisions to delegate their capital affect funds' AUM, fees, and ownership stakes, and how these variables jointly affect funds' incentives to engage. Two other papers study, like ours, the interaction between active and passive funds in general equilibrium, but focus on different mechanisms. In Baker, Chapman, and Gallmeyer (2020), passive funds do not engage in governance, so a reduction in passive fund fees is detrimental to governance but increases households' diversification opportunities. In contrast, in our paper, both active and passive funds engage in governance, which can make passive fund growth beneficial for governance. Friedman and Mahieux (2021) examine whether passive and active fund monitoring choices are complements or substitutes. In their setting, funds commit to their monitoring levels in advance, so their monitoring efforts do not depend on their fees or AUM. In contrast, our paper focuses on how funds' monitoring incentives are affected by the equilibrium fees, AUM, and ownership stakes.

Our paper also speaks to empirical studies of index reconstitutions, which examine how the resulting changes in firms' ownership structures affect corporate governance.[6] Our ana-

[6] They include Appel, Gormley, and Keim (2016, 2019), Bennett, Stulz, and Wang (2020), Boone and

lysis implies that the governance effects of endogenous changes in passive fund growth (which is the focus of our paper and corresponds to what is observed in the time-series) can be quite different from the effects of exogenous changes in the fraction of a firm owned by passive funds (e.g., due to index reconstitutions). First, the time-series effects reflect not only the changes in firms' ownership structures, but also the simultaneous changes in fund fees and AUM, which are factors that stay constant in the index reconstitution setting. Second, the types of investors that passive funds replace in the time-series could differ from those they replace upon index reconstitutions. For these two reasons, it is possible that passive fund growth in the time-series improves (harms) governance, while an increase in passive funds' ownership stakes caused by index reconstitutions has the opposite effect.

Finally, our paper is related to studies in the delegated asset management literature that analyze the equilibrium levels of active and passive investing and their implications for price efficiency and welfare (e.g., Stambaugh, 2014; Brown and Davies, 2017; Bond and Garcia, 2020; Garleanu and Pedersen, 2020; Lee, 2020; Malikov, 2020). Among these papers, the closest is Garleanu and Pedersen (2020), as we build on Garleanu and Pedersen (2018, 2020) in modeling the asset management industry with endogenously determined fees.[7] But differently from all these papers, our focus is on the corporate governance role of delegated asset management. In particular, while the asset payoffs in the above papers are exogenous, the asset payoffs in our paper are determined endogenously by fund managers' monitoring decisions. Buss and Sundaresan (2020) and Kashyap et al. (2020) also study the effects of delegated asset management on corporate outcomes, but through non-governance channels.

The paper proceeds as follows. Section 2 describes the setup, and Section 3 derives the equilibrium. Section 4 presents the implications for governance. Section 5 discusses the assumptions of the model, and Section 6 presents several extensions. Section 7 concludes.

# 2 Model setup

There are three types of agents: (1) fund investors, who decide how to allocate their capital; (2) fund managers, who make investment and governance decisions; and (3) liquidity investors (noise traders). All agents are risk-neutral.

White (2015), Crane, Michenaud, and Weston (2016), Heath et al. (2021), Schmidt and Fahlenbrach (2017), and others.

[7] Cuoco and Kaniel (2011), Basak and Pavlova (2013), and Buffa, Vayanos, and Woolley (2019) study the asset pricing implications of benchmarking and asset management contracts in general.

The timeline is illustrated in Figure 1. At $t = 1$, fund investors decide whether to pay a (search) cost to invest their capital with a fund manager or to invest it outside the financial market, which we refer to as private savings. At $t = 2$, fund investors negotiate with fund managers over the asset management fees. At $t = 3$, fund managers decide how to invest their assets under management, and trading takes place. At $t = 4$, each fund manager decides on the amount of effort to exert for each firm in his portfolio. Finally, at $t = 5$, all firms pay off, and the payoffs are split between fund managers and their investors according to the asset management fees decided upon at $t = 2$.

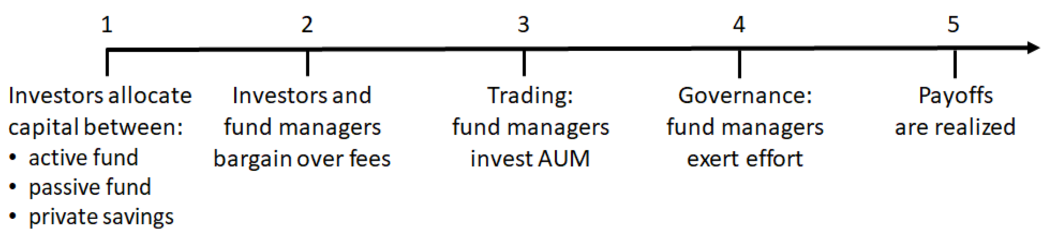


**Figure 1.** Timeline of the model.

We next describe the three types of agents and each of these stages in more detail.

### Fund managers and fund investors

We follow Garleanu and Pedersen (2018, 2020) in modeling investors' search for fund managers and their bargaining over asset management fees. There are two types of risk-neutral fund managers: active and passive (index). In our basic model, there is one fund manager of each type, but the model can be extended to any numbers of active and passive funds, $N_A$ and $N_P$ (see Section 6.3). While the active fund manager optimally chooses his investment portfolio, the passive fund manager is restricted to holding a value-weighted index of stocks.

Assets in financial markets can be accessed by fund investors only through the funds. Each fund manager offers to invest the capital of investors in exchange for an asset management fee. To focus on the effects of the contractual arrangements that are observed in the mutual fund industry, we follow Pastor and Stambaugh (2012) and assume that the fee charged to fund investors is a fraction of the fund's realized value of AUM at date 5 (this assumption is relaxed in Section 6.4). In particular, let $f_A$ and $f_P$ denote the fee as the percentage of AUM charged by the active and passive fund, respectively (we conjecture and later verify that each fund charges the same fee to all its investors). These fees are determined by bargaining between investors and fund managers, as described below. Then, if the realized value of fund manager $i$'s portfolio at date 5 is $\tilde{Y}_i$, he keeps $f_i \tilde{Y}_i$ and distributes $(1 - f_i)\tilde{Y}_i$ among fund investors in proportion to their original investments to the fund.

There is a mass of risk-neutral investors, who have combined capital (wealth) $W$. Each investor has an infinitesimal amount of capital. At $t = 1$, each investor decides whether to invest in the financial market by delegating his capital to one of the fund managers, or whether to invest outside the financial market (private savings). The latter can be interpreted as immediate consumption, savings at a bank, or simply keeping money under the mattress. We normalize the (gross) return from private savings to one.

If an investor decides to invest with a fund, he needs to incur a search cost. Specifically, if an investor with wealth $\varepsilon$ incurs a cost $\psi_A \varepsilon$ ($\psi_P \varepsilon$), he finds an active (passive) fund manager and can invest with him.[8] These costs can be interpreted as the costs of searching for relevant information, such as the fund's portfolio characteristics, investment process, and fee structure, and spending the time to understand it. For passive fund investors, the key component of these costs is finding out the fund's fee structure; these costs are likely to be larger for less financially sophisticated investors.[9] Consistent with this, Hortaçsu and Syverson (2004) conclude that investors' search frictions contribute to explaining the sizable dispersion in fees across different S&P 500 index funds despite their financial homogeneity, and Choi, Laibson, and Madrian (2010) show, in an experimental setting, that search costs for fees play an important role in decisions to invest across similar S&P 500 index funds. Some sources of growth in index funds over time (e.g., Coates, 2018) have been the move of 401(k) plans into index funds, as well as improved information: increased investor awareness about what index funds do and how their after-fee returns compare to those of active funds; the increased ability to find fund information on the Internet; improved disclosures; and the increased availability of financial advisors. All these trends can be interpreted as a decrease in $\psi_P$, so we will vary $\psi_P$ as our key parameter to generate passive fund growth.

We assume that $\psi_A \geq \psi_P$. Intuitively, it takes more time and effort to understand the investment strategy and fee structure of an active fund, compared to an index fund. Since

[8] Alternatively, we could assume that all investors have the same amount of wealth, in which case the proportionality of the search cost to wealth would be a normalization.

[9] See Section III.B in Hortaçsu and Syverson (2004) for a detailed discussion of search frictions in the context of index funds, and Appendix B in Garleanu and Pedersen (2018) for a description of investors' search process and the associated costs.

active funds in our model exploit trading opportunities and thus outperform passive funds, which simply invest in the market portfolio, fund investors face a trade-off between earning a higher rate of return on their portfolio but at a higher search cost vs. a lower rate of return at a lower cost. In a richer model with heterogeneity of skill among active fund managers, $\psi_A$ could be interpreted as the cost of searching for skill.

If an investor incurs the search cost and finds fund manager $i \in \{A, P\}$, the two negotiate the fee $f_i$ through Nash bargaining, as in Garleanu and Pedersen (2018, 2020). Fund managers have bargaining power $\eta$, and fund investors have bargaining power $1-\eta$. Modeling the fee setting through bargaining leads to a very tractable setup, which allows us to derive the equilibrium in closed form. In Section 5.2, we discuss why this assumption helps us abstract from second-order considerations in the fee-setting process, and why the main qualitative effects that arise in our model would also arise in other models of imperfect competition between funds.

We denote by $W_A$ and $W_P$ the AUM of the active and passive fund, respectively, after the investors make their capital allocation decisions.

### Assets and trading

There is a continuum of measure one of firms, indexed by $j \in [0, 1]$. Each firm's stock is in unit supply. The date-5 payoff of firm $j$ is:

$$R_j = R_0 + \sum_{i=1}^{M_j} e_{ij}, \tag{1}$$

where $R_0$ is publicly known, $M_j$ is the number of shareholders of firm $j$, and $e_{ij}$ is the amount of "effort" exerted by shareholder $i$ in firm $j$ at date 4, as described below.

The initial owners of each firm are assumed to have low enough valuations to be willing to sell their shares regardless of the price. For example, we can think of these initial owners as venture capitalists, who would like to exit the firm, and normalize their valuations to zero. Thus, the supply of shares in the market is always one. In addition to the initial owners, there are three types of traders who initially do not hold any stocks: active fund managers, passive fund managers, and competitive liquidity investors.

The trading model is broadly based on Admati, Pfleiderer, and Zechner (1994), augmented by passive fund managers:[10] (1) the active fund is strategic in that it takes into account the impact of its trading on the price; (2) the passive fund follows the mechanical rule of investing all its AUM in a value-weighted portfolio of all stocks; (3) competitive liquidity investors have rational expectations in their assessment of asset payoffs and trade anticipating the equilibrium effort of fund managers; and (4) the price is set to clear the market (i.e., a Walrasian trading mechanism). It can be microfounded by the following game, which is formalized in the online appendix. First, the active and passive fund each submits a market order, then liquidity investors submit their demand schedules as a function of the price, and the equilibrium price is the one that clears the market. Short sales are not allowed.

More specifically, for each stock, there is a large mass of competitive risk-neutral liquidity investors (noise traders), who can each submit any demand of up to one unit. Liquidity investors value an asset at its common valuation, given by (1), perturbed by an additional private value component. In particular, liquidity investors' valuation of stock $j$ is $R_j - Z_j$, where $Z_j$ captures the amount of liquidity demand driven by hedging needs or investor sentiment. Stocks with large $Z_j$ have relatively low demand from liquidity investors, while stocks with small $Z_j$ have relatively high demand. The role of different realizations of $Z_j$ for different stocks is to create potential gains from active portfolio management.

For simplicity, we assume that $Z_j$ are i.i.d. (across stocks) draws from a binary distribution: $\Pr(Z_j = Z_L) = \Pr(Z_j = Z_H) = \frac{1}{2}$, where $Z_L > Z_H$. We refer to these two types of stocks as $L$-stocks and $H$-stocks, i.e., stocks with low and high liquidity demand, respectively. Thus, the $L$-stocks are relatively more underpriced than the $H$-stocks. The realizations of $Z_j$ are publicly observed for all $j$. We assume that $\frac{Z_L+Z_H}{2} > 0$, which automatically also implies $Z_L > 0$ ($Z_H$ could be either positive or negative). In other words, the market portfolio and, even more so, the $L$-stocks, are undervalued by liquidity investors, which enables fund managers to realize gains from trade by buying these stocks.

In Sections 6.1 and 6.2, we generalize this setup in two directions. First, we allow the misvaluation $Z_j$ of firm $j$ to change with the firm's fundamental value and governance. Second, we allow liquidity investors to have heterogeneous valuations of the same stock.

[10] We extend Admati, Pfleiderer, and Zechner (1994) to a continuum of firms, multiple shareholders that can take actions (rather than one), and we introduce active and passive delegated asset management. In addition, differently from their paper, in which agents are risk-averse, we assume that all agents are risk-neutral, and trading occurs not due to risk-sharing motives but because of heterogeneous private valuations.

**Governance stage**

Denote by $x_{ij}$ the number of shares held by fund $i$ in firm $j$. After establishing a position in the firm, each fund manager decides on the amount of effort to exert. If he exerts effort $e$ and is of type $i \in \{A, P\}$, he bears a private cost $c_i(e)$. This cost is not shared with fund investors, capturing what happens in practice (although the equilibrium fees charged to fund investors will be indirectly affected by these costs). Thus, if the fund manager charges fee $f_i$, holds $x_{ij}$ shares, and exerts effort $e_{ij}$, his payoff from firm $j$, up to a constant that does not depend on $e_{ij}$, is:

$$f_i x_{ij} e_{ij} - c_i(e_{ij}). \tag{2}$$

We impose the standard assumptions that $c_i(0) = 0$, $c_i'(e) > 0$, $c_i''(e) > 0$, $c_i'(0) = 0$, and $c_i'(\infty) = \infty$, which guarantee an interior solution to fund managers' decisions on governance.

As discussed in the introduction, we think of effort as any action that shareholders can take to increase value: engaging with management, submitting shareholder proposals, nominating directors, as well as voting on important corporate decisions, such as proxy contests. All of these tactics are regularly employed by institutional investors, as evidenced by the survey of McCahery, Sautner, and Starks (2016).

While our results hold if active and passive funds have the same costs of monitoring, we also allow for potentially different costs, since different types of funds could be using different engagement strategies given their different comparative advantages. For example, as Fisch et al. (2019) and Kahan and Rock (2020) point out, while active funds' trading in the firm's stock could give them access to firm-specific information and allow them to better identify firm-specific problems, passive funds have the advantage of setting and implementing broad market-wide standards in areas such as governance, sustainability, and risk management. Indeed, the Big Three index fund families perform a large number of private engagements and public campaigns, promoting good governance practices across multiple firms in their portfolios (e.g., Gormley et al., 2021). In Section 5.1, we discuss the evidence on active and passive funds' engagement and how the relation between their costs of engagement affects our results.

# 3 Analysis

We solve the model by backward induction, starting with fund managers' monitoring decisions.

## 3.1 Governance stage

Given fund manager $i$'s payoff (2) from firm $j$, the first-order condition implies that his optimal effort satisfies:

$$e_{ij} = c_i'^{-1}\left(f_i x_{ij}\right). \tag{3}$$

The fund manager exerts more effort if he owns a higher fraction of the firm (higher $x_{ij}$) or if he keeps a higher fraction of the payoff rather than distributing it out to fund investors (higher $f_i$). Note that the level of effort that maximizes the combined payoff of all players is $c_i'^{-1}(1)$. Hence, (3) reflects two layers of the free-rider problem. First, $x_{ij} < 1$ manifests a free-rider problem among shareholders: the fund manager underinvests in effort because other shareholders benefit from his effort but do not bear the cost of it. Second, $f_i < 1$ manifests an agency problem between the fund manager and fund investors: given ownership of $x_{ij}$, the effort that would maximize their joint payoff if $c_i'^{-1}(x_{ij})$, but the fund manager monitors less because he only captures a fraction of the payoff.

Note also that at this stage, fund investors benefit from the fund manager's engagement. As we discuss below, however, engagement does not benefit fund investors from the ex-ante perspective because the price at which the fund buys shares reflects the expected engagement.

## 3.2 Trading stage

During the trading stage, all players rationally anticipate that fund managers' effort decisions will be made according to (3).

**Liquidity investors.** Liquidity investors have rational expectations about the effort that fund managers will exert. Specifically, if they expect the active and passive fund to hold $x_{Aj}$ and $x_{Pj}$ shares of stock $j$, respectively, their assessment of the payoff (1) is:

$$R_j\left(x_{Aj}, x_{Pj}\right) = R_0 + c_A'^{-1}\left(f_A x_{Aj}\right) + c_P'^{-1}\left(f_P x_{Pj}\right). \tag{4}$$

Each liquidity investor finds it optimal to buy stock $j$ if and only if his valuation exceeds the price, i.e., $R_j(x_{Aj}, x_{Pj}) - Z_j \geq P_j$. We focus on the parameter range for which liquidity investors hold at least some shares in each type of stock, $L$ and $H$. This happens when the total AUM, $W_A + W_P$, are not too high, so that funds' combined demand for the stock is lower than the supply, $x_{Aj} + x_{Pj} < 1$. A sufficient condition for this to hold is specified in Proposition 1 below. Thus, the price of stock $j$ is given by:

$$P_j = R_j - Z_j. \tag{5}$$

Equation (5) has intuitive properties. First, the price is lower if liquidity investors' demand is lower (i.e., $Z_j$ is higher), e.g., if there is lower hedging demand or lower investor sentiment. Second, the price is higher if $R_j = R_j(x_{Aj}, x_{Pj})$ is higher, i.e., if either the active or the passive fund holds more shares. This is because all else equal, higher fund ownership implies higher expected engagement and thus a higher payoff. We assume that $R_0 > Z_L$, which ensures that the price of each stock is always positive.

The fact that market participants incorporate the expected governance improvements into the price implies that the fund cannot make profits on its engagement efforts. This is similar to the results in Admati, Pfleiderer, and Zechner (1994) and Grossman and Hart (1980), where the benefit of an activist's (raider's) future value improvement is incorporated into the price. Nevertheless, the fund manager exerts effort in equilibrium because once investments are made, exerting effort increases his payoff (see Section 3.1).

Equation (5) also implies that as funds' ownership increases and they monitor more, the return $\frac{R_j}{P_j}$ decreases, so funds realize lower gains from trade. Thus, governance generates decreasing returns to scale from investment.

**Passive fund.** The passive fund is restricted to investing its AUM $W_P$ into the value-weighted portfolio of stocks. We denote this market portfolio by index $M$, and note that its price (i.e., the total market capitalization) is $P_M \equiv \int_0^1 P_j dj = \frac{P_L + P_H}{2}$. The passive fund buys $x_{Pj}$ units of stock $j$, such that the proportion of its AUM invested in this stock, $\frac{x_{Pj} P_j}{W_P}$, equals the weight of this stock in the market portfolio, $\frac{P_j}{P_M}$. It follows that $x_{Pj}$ is the same for all stocks and equals:

$$x_P = \frac{W_P}{P_M}. \tag{6}$$

**Active fund.** The active fund manager decides which assets to invest in, choosing between stocks of type $L$ and $H$. We focus on the case where the active fund finds it optimal to only buy $L$-stocks, and to diversify equally across all $L$-stocks (a sufficient condition for this to hold is specified in Proposition 1). Intuitively, stocks with higher liquidity demand are "overpriced" relative to stocks with lower liquidity demand, and the active fund only finds it optimal to buy the relatively cheaper stocks. As a result, the active fund holds a less diversified portfolio than the passive fund, consistent with practice. Since the total AUM $W_A$ are allocated evenly among mass $\frac{1}{2}$ of $L$-stocks, the fund's investment in each $L$-stock is:

$$x_{AL} = \frac{2W_A}{P_L}. \tag{7}$$

**Equilibrium at the trading and governance stages.** Combining the above arguments, we can characterize the equilibrium payoffs and prices as functions of funds' AUM $W_A$ and $W_P$ and fees $f_A$ and $f_P$, which are determined at stages 1 and 2. We denote the aggregate liquidity demand for the market portfolio by $Z_M \equiv \frac{Z_L+Z_H}{2}$, and the payoff of the market portfolio by $R_M \equiv \frac{R_L+R_H}{2}$. Since active funds only invest and engage in $L$-stocks and passive funds invest and engage in both $L$- and $H$-stocks, the equilibrium prices and payoffs of $L$-stocks and of the market portfolio are given by the following equations:

$$\begin{aligned} P_L &= R_L - Z_L, && (8) \\ P_M &= R_M - Z_M, && (9) \\ R_L &= R_0 + c_A'^{-1}\left(f_A x_{AL}\right) + c_P'^{-1}\left(f_P x_P\right), && (10) \\ R_M &= R_0 + \frac{1}{2} c_A'^{-1}\left(f_A x_{AL}\right) + c_P'^{-1}\left(f_P x_P\right), && (11) \end{aligned}$$

where $x_P$ and $x_{AL}$ are given by (6) and (7), respectively.

## 3.3 Capital allocation by investors and fee setting

Infinitesimal investors decide between private savings, which earn a return of one, and investing with an active or passive fund. Consider an investor with wealth $\varepsilon$. The active fund invests the investor's wealth into $L$-stocks; in particular, it buys $\frac{\varepsilon}{P_L}$ of $L$-stocks, where the payoff of each stock is $R_L$. Since the investor incurs a search cost $\psi_A \varepsilon$ to find the active fund and pays fee $f_A$, the investor's payoff from investing with the active fund is

$(1-f_A)\,R_L\frac{\varepsilon}{P_L}-\psi_A\varepsilon$, so his rate of return is $(1-f_A)\,\frac{R_L}{P_L}-\psi_A$. Similarly, the investor's return from investing with the passive fund is $(1-f_P)\,\frac{R_M}{P_M}-\psi_P$.

Our baseline analysis focuses on the case where the equilibrium AUM of each fund are positive; a sufficient condition for this to hold is specified in Proposition 1 (we relax this assumption in Section 7.4 of the online appendix). This implies that capital flows into the funds until, in equilibrium, investors earn the same rate of return from investing with the active and passive fund, which we denote by $\lambda$:

$$\lambda \equiv (1-f_A)\,\frac{R_L}{P_L}-\psi_A=(1-f_P)\,\frac{R_M}{P_M}-\psi_P. \tag{12}$$

Consider the fee-setting stage. Suppose that an investor with wealth $\varepsilon$ has already incurred the cost $\psi_A\varepsilon$ and is now bargaining with the active fund manager over the fee, $\tilde{f}_A$. To determine the Nash bargaining solution, we find each party's payoff upon agreeing and upon negotiations failing. The investor's payoff from agreeing on fee $\tilde{f}_A$ is $(1-\tilde{f}_A)R_L\frac{\varepsilon}{P_L}$, and his payoff if negotiations fail is $\lambda\varepsilon$ (e.g., he can incur the cost $\psi_P\varepsilon$ and invest with the passive fund for a rate of return $\lambda$). Next, note that for the fund manager, the effect of getting additional AUM $\varepsilon$ on his utility via a change in effort is second-order by the envelope theorem.[11] Hence, the fund manager's additional payoff from agreeing on fee $\tilde{f}_A$ and getting additional AUM $\varepsilon$ is $\tilde{f}_A R_L\frac{\varepsilon}{P_L}$, and his payoff if negotiations fail is zero. Given the fund manager's bargaining power $\eta$, fee $\tilde{f}_A$ is determined via the Nash bargaining solution:

$$\max_{\tilde{f}_A}\left((1-\tilde{f}_A)R_L\frac{\varepsilon}{P_L}-\varepsilon\right)^{1-\eta}\left(\tilde{f}_A R_L\frac{\varepsilon}{P_L}\right)^{\eta}. \tag{13}$$

Since the total surplus created from bargaining is $R_L\frac{\varepsilon}{P_L}-\lambda\varepsilon$, the fee must be such that the fund manager gets fraction $\eta$ of this surplus:

$$\tilde{f}_A R_L\frac{\varepsilon}{P_L}=\eta\left(R_L\frac{\varepsilon}{P_L}-\lambda\varepsilon\right). \tag{14}$$

This implies that, as conjectured previously, the active fund fee for all investors is indeed

[11] See Section 5.2 for a discussion of this property. To see why the effect of $\varepsilon$ via a change in effort is second-order, note that the active fund manager's payoff is $\max_e\{\frac{1}{2}[f_A x_{AL}\left(R_0+e+c_P'^{-1}\left(f_P x_P\right)\right)+\tilde{f}_A\frac{2\varepsilon}{P_L}\left(R_0+e+c_P'^{-1}\left(f_P x_P\right)\right)-c_A(e)]\}$, and by the envelope theorem, the derivative with respect to $\varepsilon$ at $\varepsilon=0$ is $\tilde{f}_A\frac{1}{P_L}\left(R_0+c_A'^{-1}\left(f_A x_{AL}\right)+c_P'^{-1}\left(f_P x_P\right)\right)=\tilde{f}_A\frac{R_L}{P_L}$.

the same, $\tilde{f}_A = f_A$, and is determined by the fixed point equation:

$$f_A = \eta \left( 1 - \lambda \frac{P_L}{R_L} \right). \tag{15}$$

Similarly, the passive fund fee is the same for all investors, $\tilde{f}_P = f_P$, and satisfies:

$$f_P = \eta \left( 1 - \lambda \frac{P_M}{R_M} \right). \tag{16}$$

To solve for the equilibrium fees, return $\lambda$, and funds' AUM, we next consider investors' decisions on how to allocate their capital. Since we focus on the case where the AUM of each fund are positive, there are two possible cases, depending on the parameters.

In the first case, investors earn a low equilibrium rate of return and are indifferent between all of the three options: saving privately, investing with the active fund, and investing with the passive fund. In this case, $\lambda = 1$ in (12), so investor indifference conditions imply:

$$(1 - f_A) \frac{R_L}{P_L} - \psi_A = 1, \tag{17}$$

$$(1 - f_P) \frac{R_M}{P_M} - \psi_P = 1. \tag{18}$$

In the second case, investors are indifferent between investing with the active fund and the passive fund, and both options strictly dominate private savings, i.e., $\lambda > 1$. Then, the investor indifference conditions (17) and (18) are replaced by: (a) the indifference condition between investing with the active and passive fund,

$$(1 - f_A) \frac{R_L}{P_L} - \psi_A = (1 - f_P) \frac{R_M}{P_M} - \psi_P, \tag{19}$$

and (b) the condition that the combined funds' AUM are equal to total investor wealth $W$:

$$W_A + W_P = W. \tag{20}$$

## 3.4 Equilibrium

From this point on, we assume that fund managers' costs of effort are quadratic, i.e.,

$$c_i(e) = \frac{c_i}{2} e^2.$$

While the assumption of quadratic costs is not necessary to characterize the equilibrium and is not important for many equilibrium properties discussed after Proposition 1 and in Section 4,[12] assuming quadratic costs allows us to formulate in closed form the sufficient conditions for the existence of this equilibrium and simplifies the exposition. In particular, funds' equilibrium effort levels are then given by $e_P = \frac{f_P x_P}{c_P}$ and $e_{AL} = \frac{f_A x_{AL}}{c_A}$.

Given the arguments above, the equilibrium $(f_A, f_P, x_{AL}, x_P, P_L, P_M, R_L, R_M)$ is the solution to the following system of equations: $(i)$ market clearing and optimal monitoring decisions (8)-(11); $(ii)$ fee negotiation conditions (15)-(16); and $(iii)$ investor capital allocation conditions: (17)-(18) in the case of $\lambda = 1$, and (19)-(20) in the case of $\lambda > 1$. This equilibrium is characterized in Proposition 1.

**Proposition 1 (equilibrium).** *Suppose $\psi_A \geq \psi_P \frac{c_A}{c_P}$, $z_1 < \frac{Z_M}{Z_L} < z_2$, and $w_1 < W < w_2$, where $z_i, w_i$ are given by (40)-(41) in the appendix. Then the equilibrium is as follows.*

- $(i)$ *The asset management fees are $f_A = \frac{\eta\psi_A}{\psi_A + \lambda(1-\eta)}$ and $f_P = \frac{\eta\psi_P}{\psi_P + \lambda(1-\eta)}$, and $f_A \geq f_P$.*
- $(ii)$ *The payoffs of the L-stocks and the market portfolio are $R_L = (1 + \frac{1-\eta}{\psi_A + (\lambda-1)(1-\eta)})Z_L$ and $R_M = (1 + \frac{1-\eta}{\psi_P + (\lambda-1)(1-\eta)})Z_M$.*
- $(iii)$ *The prices of the L-stocks and the market portfolio are $P_L = \frac{1-\eta}{\psi_A + (\lambda-1)(1-\eta)} Z_L$ and $P_M = \frac{1-\eta}{\psi_P + (\lambda-1)(1-\eta)} Z_M$.*
- $(iv)$ *There exists $\bar{W}$, such that if $W \geq \bar{W}$, the investors' rate of return satisfies $\lambda = 1$, whereas if $W < \bar{W}$, $\lambda$ strictly decreases in $W$ and satisfies the fixed point equation:*

$$W = \frac{c_A}{f_A} (R_L - R_M) P_L + \frac{c_P}{f_P} (2R_M - R_L - R_0) P_M. \tag{21}$$

The restrictions on parameters in Proposition 1 ensure that we consider the interesting case, i.e., one in which both funds raise positive AUM, do not together hold the entire supply of shares, and the active fund finds it optimal to invest in $L$-stocks and not in $H$-stocks. For the remainder of the paper, we assume that these assumptions hold, with a few exceptions that we explicitly point out. The assumption $\psi_A \geq \psi_P \frac{c_A}{c_P}$ is intuitive: if passive and active

[12] For example, for general costs of effort, the equilibrium characterized by Proposition 1 takes exactly the same form, except that equation (21) becomes $W = \frac{P_L}{2f_A} c'_A (2(R_L - R_M)) + \frac{P_M}{f_P} c'_P (2R_M - R_L - R_0)$. The proof of Proposition 1 in the appendix is presented for this more general case.

funds have the same monitoring technologies ($c_P = c_A$), it automatically follows from the assumption that active funds are harder to search for, $\psi_A \geq \psi_P$.

The properties of the equilibrium are as follows. If aggregate investor wealth is limited, asset managers compete for investor funds and offer relatively low fees, allowing investors to earn a rate of return $\lambda > 1$. If aggregate investor wealth is large, investors' outside options in negotiations are limited, which increases the fees charged by asset managers and decreases investors' rate of return, $\lambda = 1$. The active fund outperforms the passive fund before fees, $\frac{R_L}{P_L} \geq \frac{R_M}{P_M}$, due to its ability to invest strategically in the most undervalued stocks. Accordingly, and consistent with practice, the fee charged by the active fund is higher than the fee charged by the passive fund: $f_A \geq f_P$.

Because we are interested in the governance effects of passive fund growth, the next result demonstrates how the search cost $\psi_P$ affects the equilibrium. As we discuss in Section 2, a decrease in $\psi_P$ can be thought of as easier access to passive funds over time due to their growing inclusion in 401(k) plans, increased investor awareness about them, and improved disclosures about their fee structures.

**Proposition 2.** *As access to passive funds becomes easier ($\psi_P$ decreases): (1) funds' fees, $f_A$ and $f_P$, decrease; (2) funds' combined AUM, $W_A + W_P$, increase; and (3) fund investors' rate of return, $\lambda$, increases. In particular, there exists a cutoff $\bar{\psi}_P$, such that $\lambda = 1$ for $\psi_P \geq \bar{\psi}_P$ and $\lambda > 1$ for $\psi_P < \bar{\psi}_P$.*

Figure 2 demonstrates Proposition 2 via a numerical example; we use the same numerical example in the next section to illustrate the implications for governance. The x-axis in all panels captures $1/\psi_P$, so that access to passive funds becomes easier as we move to the right. Easier access to passive funds is beneficial for fund investors: it decreases active and passive fund fees (panels (c) and (d)) and increases investors' return on investment (panel (a)). As a result, as panel (b) shows, investors decrease their private savings and start allocating more capital to funds, so funds' combined AUM grow (all the monotonicity statements in Proposition 2 apply in a weak sense). The cutoff $\bar{\psi}_P$ separates the region $\psi_P > \bar{\psi}_P$, where investors are indifferent between investing through the funds and saving privately ($\lambda = 1$), and the region $\psi_P < \bar{\psi}_P$, where they prefer to invest through the funds ($\lambda > 1$). In the first region, easier access to passive funds brings additional money into the asset management industry ($W_A + W_P$ grows in panel (b)), whereas in the second region, all investor wealth is already invested in the funds ($W_A + W_P = W$ in panel (b)), so easier access to passive funds just reallocates capital from active to passive funds.

Proposition 2 is broadly consistent with empirical evidence if we think of the recent trends in the asset management industry as stemming from easier access to passive funds over time, i.e., a decrease in $\psi_P$. The assets held by passive funds have increased substantially over the last decades, both in absolute value and as a fraction of all fund assets. For example, the total AUM of passive funds have grown from less than \$1 trillion in the early 2000s to more than \$5 trillion in recent years. This growth been accompanied by a decline in both active and passive funds' expense ratios (captured by $f_A$ and $f_P$ in the model), from around 1% (0.23%) for active (passive) funds in the 2000s, to less than 0.7% (0.15%) in recent years.[13]

The result that lower search costs $\psi_P$ decrease fund fees follows from two effects. The first effect is that easier access to passive funds weakly improves investors' outside option in negotiations with fund managers. To see this, consider the case of high investor returns ($\lambda > 1$). A decrease in $\psi_P$ increases the investor's net (of search costs) return from investing with the passive fund and thereby increases his outside option in bargaining with the active fund, which induces the active fund manager to lower his fees. A reduction in active fund fees, in turn, increases the investor's net return from investing with the active fund and thereby increases his outside option in bargaining with the passive fund, resulting in a lower passive fund fee as well. In other words, easier access to the passive fund strengthens the competition between the active and passive fund, resulting in a reduction of their fees. This effect is reflected through a higher $\lambda$ in the expressions for $f_A$ and $f_P$ in Proposition 1. It is present when $\lambda > 1$ but is absent when $\lambda = 1$, since a reduction in $\psi_P$ improves investors' outside option in the former case but does not affect it in the latter case.

The second effect is that, holding investors' outside option (net equilibrium return $\lambda$) constant, a reduction in $\psi_P$ leads to a decrease in the market return $\frac{R_M}{P_M}$ earned by the passive fund. This is because as $\psi_P$ declines, investors' net (of search costs) return from investing with the passive fund increases. To achieve the same $\lambda$, capital starts flowing into the passive fund until its *gross* return, $\frac{R_M}{P_M}$, decreases in a way that investors' *net* return remains the same. A decrease in the passive fund's return, in turn, results in a lower passive fund fee (this can be formally seen from (16)). This effect is reflected through a dependence

[13] These stylized facts are based on the data on funds' AUM and expense ratios from the CRSP Mutual Fund database. We thank Davidson Heath, Daniele Macciocchi, Roni Michaely, and Matthew Ringgenberg for generously sharing these data with us.

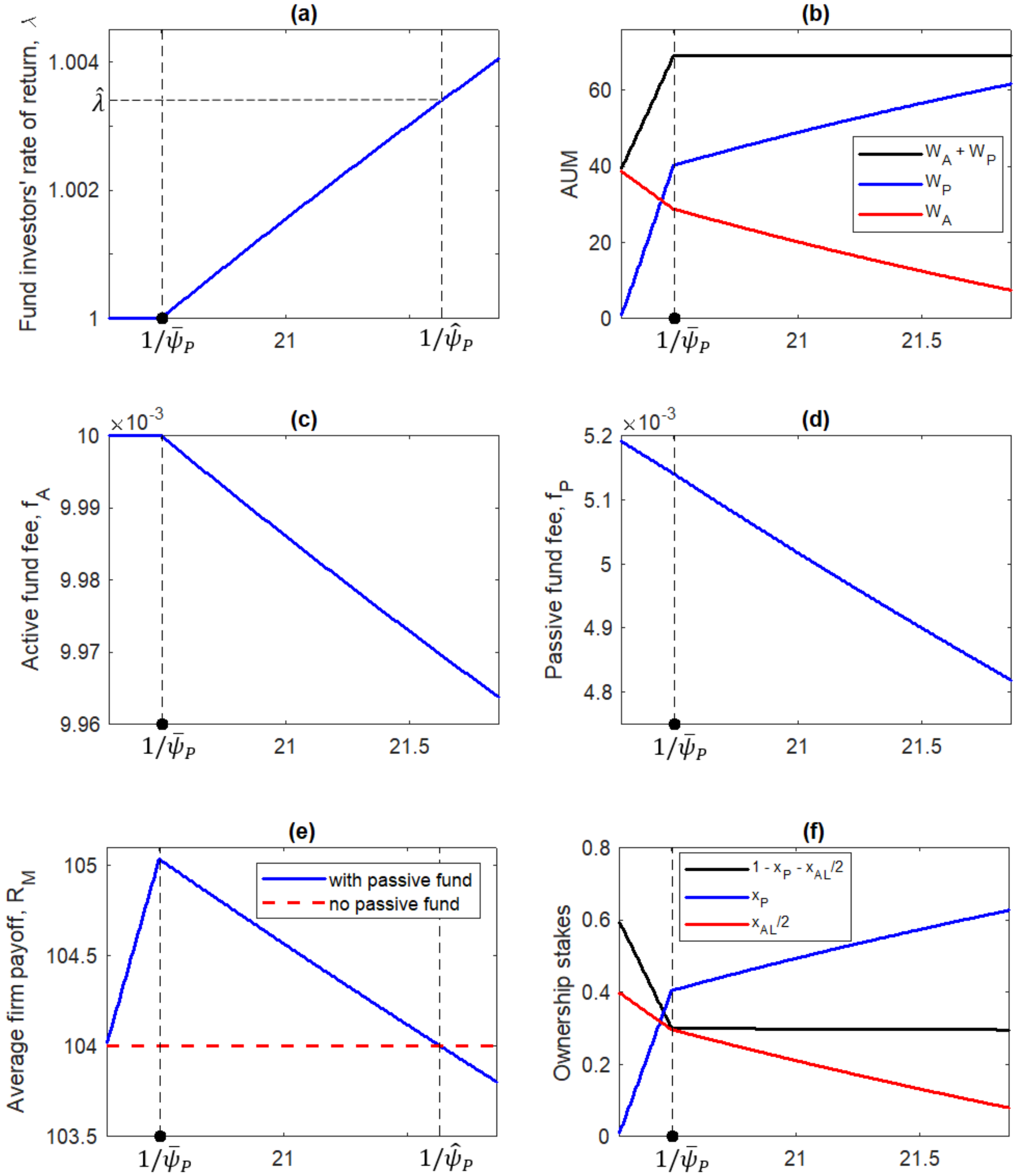


**Figure 2.** The x-axis in all panels captures $1/\psi_p$, i.e., moving to the right corresponds to easier access to passive funds. The y-axes are: (a) fund investors' rate of return $\lambda$; (b) funds' AUM; (c) active fund fee; (d) passive fund fee; (e) market payoff $R_M$ in the baseline parameter specification (solid blue line) and in the benchmark case without a passive fund (dashed red line); (f) average (across all firms) ownership stakes of the passive fund ($x_P$), active fund ($x_{AL}/2$), and liquidity investors ($1 - x_P - x_{AL}/2$). The parameters are $\eta = 0.1$, $c_A = c_P = 0.001$, $\psi_A = 0.1$, $Z_L = 10.8$, $Z_H = 0$, $R_0 = 100$, and $W = 69$.

of $f_P$ on $\psi_P$ directly (not via $\lambda$) in the expression for $f_P$ in Proposition 1.

# 4 Implications for governance

## 4.1 The governance role of passive funds

It is often argued that passive fund growth is detrimental to governance due to the lower fees that passive fund managers charge and, thereby, their lower incentives to stay engaged. This argument implicitly assumes that as passive funds grow, fund fees decrease, while other factors that affect fund managers' monitoring efforts do not change. However, in reality, fees do not change exogenously and in isolation: changes in fees are likely to be accompanied by other changes, such as changes in funds' AUM, changes in funds' ownership stakes, and the substitution between delegated asset management and private savings. In this section, we use our model to analyze the governance role of passive funds while formally accounting for a combination of these effects. Among other things, we show that passive fund growth can be beneficial for governance even if it results in lower fund fees.

As in Proposition 2, to study the implications of passive fund growth, we consider the comparative statics of parameter $\psi_P$. To understand its effect on aggregate governance, we examine the payoff of the market portfolio $R_M$, since $R_M$ reflects the level of investor monitoring in an average firm. Proposition 3 presents our main result.

**Proposition 3.** *Easier access to passive funds (lower $\psi_P$) improves aggregate governance $R_M$ if $\psi_P > \bar{\psi}_P$. If, in addition, $c_P \geq c_A$ and $e_{AL} < \frac{Z_L - Z_H}{2}$, then lower $\psi_P$ hurts governance if $\psi_P \leq \bar{\psi}_P$.*

We explain the intuition using the numerical example in Figure 2. As access to passive funds becomes easier, both active and passive fund fees weakly decrease (see Proposition 2 and panels (c) and (d) of Figure 2), which, other things equal, weakens fund managers' incentives to engage. However, in addition, investing with the passive fund becomes increasingly attractive to investors. Hence, capital flows to the passive fund (panel (b)), allowing it to take increasingly large stakes in its portfolio companies and increasing its incentives to engage (higher $x_P$ in panel (f)). Whether these higher passive fund stakes are beneficial for governance and outweigh the effect of lower fees depends on whether the passive fund primarily replaces liquidity investors or the active fund in firms' ownership structures. Liquidity investors do not engage in governance: we can think of them as retail shareholders, who have neither the ability nor incentives to monitor. Thus, replacing liquidity investors increases the overall level of investor monitoring. In contrast, active fund managers have higher incentives to monitor than passive fund managers given their higher fees, $f_A \geq f_P$. If, in addition, passive fund managers have a weakly lower ability to monitor (as captured by the assumption $c_P \geq c_A$ in Proposition 3; see Section 5.1 for a discussion of this assumption), then replacing active funds in firms' ownership structures is detrimental to governance.

The cutoff $\bar{\psi}_P$ separates the region where the passive fund primarily replaces liquidity investors and active fund fees do not decrease ($\psi_P > \bar{\psi}_P$) from the region where it primarily replaces the active fund and active fund fees decrease substantially ($\psi_P < \bar{\psi}_P$).

In particular, recall from Proposition 2 that when $\psi_P > \bar{\psi}_P$, investors are indifferent between investing in the funds and saving privately. Thus, easier access to passive funds crowds out private savings and brings new investor capital into the funds ($W_A + W_P$ grows in panel (b)), allowing funds on aggregate to replace liquidity investors in firms' ownership structures: in panel (f), the combined fund ownership increases and liquidity investor ownership in the average firm ($1 - x_P - \frac{x_{AL}}{2}$) decreases. In addition, because investors can save privately at the same rate of return as from investing with the funds, active fund fees do not decrease, so active funds continue to engage on the stakes they still own. That said, there are negative effects on governance as well: the passive fund also replaces the active fund in firms' ownership structures ($x_{AL}$ decreases in panel (f)), and passive fund fees decline. However, Proposition 3 shows that the positive effect of replacing liquidity investors strictly dominates the negative effects. The reason the positive effect always dominates in this region is that investors must earn a competitive return from investing with the funds, and we explain the intuition in detail in Section 4.1.2.

In contrast, when $\psi_P < \bar{\psi}_P$, all investor wealth is invested in the funds, so passive fund growth comes entirely from investors' allocations to the active fund. As a result, the passive fund primarily replaces the active fund, and not liquidity investors, in firms' ownership structures (panel (f)), which harms governance because, for a given ownership stake, the passive fund monitors less than the active fund. In addition, since the funds strongly compete with each other in this region, both active and passive fund fees decrease substantially, reducing funds' incentives to engage on the stakes they own.[14]

[14] There are two additional nuanced effects in this case, one negative and one positive. The negative effect

#### 4.1.1 Trade-off between governance and fund investors' well-being

An interesting implication of Proposition 3 is that there can be a trade-off between fund investors' well-being and governance. To see this, note that in the region $\psi_P < \bar{\psi}_P$, as access to passive funds becomes easier, fund investors' equilibrium rate of return increases, whereas aggregate governance worsens (panels (a) and (e) of Figure 2). A similar trade-off arises if we compare the baseline case (in which both the active and passive fund are present) to a benchmark case with $\psi_P = \infty$, where there is no passive fund and investors allocate their wealth between the active fund and private savings. The red dashed line in panel (e) of Figure 2 corresponds to the market payoff $R_M$ in this benchmark case.[15] Panels (a) and (e) show that while the introduction of the passive fund always weakly increases $\lambda$ compared to the benchmark case (in which $\lambda = 1$), it only improves governance if it does not decrease $\psi_P$ below $\hat{\psi}_P$ (where $1/\hat{\psi}_P$ is depicted in panel (e)) and, accordingly, does not increase $\lambda$ too much (above $\hat{\lambda}$ in panel (a)). We summarize these observations in Corollary 1:

**Corollary 1**. *Easier access to passive funds (lower $\psi_P$) improves aggregate governance if and only if it does not increase fund investors' returns too much.*

Intuitively, passive fund growth is especially beneficial for fund investors (i.e., increases $\lambda$ substantially) when it results in strong competition between funds and significantly decreases fund fees. However, this competition implies that funds primarily replace each other, rather than liquidity investors, in firms' ownership structures. Moreover, a reduction in fees implies lower incentives to monitor: to have incentives to stay engaged, fund managers need to earn enough rents from managing investors' portfolios and not leave too much money to fund investors. These effects create a trade-off between governance and fund investor well-being.

This intuition is more general and applies to changes in several other parameters as well. To see this, recall from Proposition 1 that $R_M = (1 + \frac{1-\eta}{\psi_P+(\lambda-1)(1-\eta)})Z_M$. Thus, for any parameter that does not enter this relation (e.g., $\psi_A$, $c_i$, or $W$), a change in this parameter that increases investors' equilibrium return $\lambda$, inevitably leads to a decline in aggregate

is that since the passive fund invests in more expensive stocks than the active fund ($P_H > P_L$), the combined ownership of the two funds declines, while liquidity investors' ownership increases, which further reduces overall investor monitoring. The positive effect is that the reduction in $R_L$ means that the active fund can buy $L$-stocks at a lower price, and hence the active fund's ownership stakes do not decrease as much. Condition $e_{AL} < \frac{Z_L - Z_H}{2}$ in Proposition 3 ensures that this positive effect is relatively minor. In the proof of Proposition 3, we show that there exists a cutoff $\underline{\psi}_P$ such that this condition is satisfied for $\psi_P < \underline{\psi}_P$.

[15] Lemma 7 in the online appendix presents sufficient conditions for such a "corner" equilibrium to exist.

governance $R_M$, and vice versa. For example, when aggregate investor wealth $W$ is more limited, investors' equilibrium return is higher because funds compete for investors' capital (see part $(iv)$ of Proposition 1), but governance is worse because lower AUM and ownership stakes of the funds decrease their incentives to engage in an average firm. A similar intuition applies to search costs for the active fund $\psi_A$ and costs of monitoring $c_i$; we discuss the comparative statics in $c_i$ in more detail in Section 4.2. Moreover, as we show in Sections 6.1 and 6.4, the trade-off between governance and fund investor well-being is robust to more general assumptions about stock misvaluations, and also arises for general compensation contracts.

#### 4.1.2 Relation between fund fees and governance

The trade-off between governance and fund investor well-being does not arise in the region $\psi_P > \bar{\psi}_P$, where aggregate governance improves, even though passive fund fees decline. Thus, the link between asset management fees and funds' incentives to engage is not immediate:

**Corollary 2**. *If $\psi_P > \bar{\psi}_P$, then easier access to passive funds (lower $\psi_P$) improves aggregate governance $R_M$, even though it decreases fund fees.*

The reason why the relation between fees and governance is positive in this region is that fund fees do not change in isolation: the reduction in fees is accompanied by an increase in the passive fund's AUM and ownership stakes, and thereby a replacement of liquidity investors. Why does this positive effect dominate the negative effect of lower passive fees (and the partial crowding out of the active fund) in this region? The intuition is as follows. As $\psi_P$ decreases, capital starts flowing into the passive fund, increasing its AUM and holdings $x_P$ in its portfolio firms, so that in equilibrium, investors remain indifferent between investing with the passive fund and their private savings (e.g., Berk and Green, 2004). In other words, $(1 - f_P)\frac{R_M}{R_M - Z_M} - \psi_P = 1$ (see (18)), and hence, the decrease in $f_P$ and $\psi_P$ must be accompanied by a decrease in $\frac{R_M}{R_M - Z_M}$, i.e., an increase in $R_M$. This argument emphasizes that fee-related criticisms of passive funds need to take into account that lower fees are frequently accompanied by higher AUM and fund ownership.

Another implication is that passive fund growth can have heterogeneous effects on the governance of different types of firms, depending on whether they are primarily held by retail shareholders or active fund managers. For example, the positive governance effect of passive fund growth in the region $\psi_P > \bar{\psi}_P$ comes entirely from improvements in $H$-firms. Because the active fund does not hold these relatively more expensive firms, the passive fund is only replacing liquidity investors in these firms' ownership structures, which increases shareholder engagement in these firms. In contrast, the value $R_L$ of the cheaper $L$-firms remains unaffected: the passive fund replaces not only liquidity investors but also the active fund in these firms' ownership structures, and the combined effect is neutral.[16]

## 4.2 Who benefits from lower costs of engagement?

Over the last decades, regulations and corporate charter amendments have empowered shareholders and made it easier for them to promote changes in their portfolio firms. Mandatory say-on-pay votes, the move towards annual director elections, increased use of majority (rather than plurality) voting for directors, and proxy access are only some examples of these changes.[17] In the context of our model, we can think of these changes as reducing both funds' costs of engagement, $c_A$ and $c_P$. In addition, individual asset managers have been taking steps to decrease their own costs of engagement, e.g., by increasing the size of their stewardship teams.[18] In this section, we explore the effects of reductions in funds' monitoring costs on prices, investors' returns, and the sizes of the active and passive sectors.

**Proposition 4**. *Suppose fund manager i's cost of monitoring $c_i$ decreases and fund manager j's cost of monitoring $c_j$ stays constant or decreases. Then:*

*(i) firms' payoffs and prices always weakly increase, and strictly increase if $\psi_P < \bar{\psi}_P$;*

*(ii) fund investors' return always weakly decreases, and strictly decreases if $\psi_P < \bar{\psi}_P$;*

*(iii) if $\psi_P \geq \bar{\psi}_P$, fund manager i's payoff strictly decreases and fund manager j's payoff weakly decreases.*

Parts (*i*) and (*ii*) show that lower monitoring costs increase fund managers' engagement and thus firms' payoffs, but can make fund investors worse off. The opposite effect of $c_i$ on

[16] Formally, because investors are indifferent between investing with the active fund and saving privately, the active fund's after-fee return $(1 - f_A)\,\frac{R_L}{R_L - Z_L}$ must remain the same (see (17)), which together with (15), implies that both the active fund fee $f_A$ and the return $\frac{R_L}{R_L - Z_L}$ must remain unaffected.

[17] See, e.g., "The Long View: The Role of Shareholder Proposals in Shaping U.S. Corporate Governance (2000-2018)," *Harvard Law School Forum on Corporate Governance*, February 6, 2019.

[18] For example, in his 2018 letter to CEOs, BlackRock's Larry Fink committed "to double the size of the investment stewardship team over the next three years."

governance and fund investors' returns is a manifestation of the general trade-off between the two discussed at the end of Section 4.1.1. Intuitively, because investors in financial markets have rational expectations about the effect of $c_i$ on funds' equilibrium engagement and firms' payoffs, a decrease in $c_i$ translates into higher prices and thereby lower returns. In particular, even though firms' payoffs ($R_L$ and $R_M$) increase, prices ($P_L = R_L - Z_L$ and $P_M = R_M - Z_M$) increase as well. Higher prices imply that funds can buy a lower number of shares and hence realize lower gains from trade, leading funds' returns to fall, and investors' equilibrium returns to decline as well when $\lambda > 1$.[19] Thus, while initial owners of the firm (e.g., venture capitalists) are better off as they can now sell their shares for a higher price, the new owners of the firm (i.e., fund investors) are worse off.

The fact that *all* fund investors are worse off when monitoring becomes cheaper is a property of our static model. In a richer dynamic model, lower monitoring costs would be harmful for some fund investors but beneficial for others. Specifically, suppose that at a given point in time, the fund already has some existing investors and has acquired ownership stakes using their capital. If, at this point, the fund's monitoring cost unexpectedly declines (e.g., due to an unanticipated policy change), this benefits existing investors on the positions that the fund already holds. Indeed, as discussed in Section 3.1, once trade has taken place, fund investors always benefit from more monitoring. However, and for the same reason as in our setting, this decrease in $c_i$ hurts all future investors of the fund, as well as its existing investors on any of their future contributions to the fund.

Whether decreasing $c_i$ is beneficial for fund managers depends on the following trade-off. The positive effect is that for given AUM and fees, and once the fund has established a position in a firm, lower monitoring costs increase the fund manager's equilibrium payoff.[20] However, since fund investors anticipate a lower return on their investments, the fund's AUM may change, and in particular, the fund may attract less capital than before. This is exactly what happens in the region $\psi_P \geq \bar{\psi}_P$, where $\lambda = 1$: as $c_i$ decreases, investors allocate less capital to the fund and increase their private savings, which decreases the fund manager's AUM and thereby the fees he can collect (part (*iii*) of Proposition 4).[21] Alluding again to

[19] As discussed in Section 3.2, this inability to profit from ex post monitoring is similar to Admati, Pfleiderer, and Zechner (1994) and the free-rider problem in Grossman and Hart (1980).

[20] In particular, given fee $f$ and stake $x$ in a certain firm, the fund manager's payoff from this firm, up to a constant, is $V(c) = \arg\max_e \{fxe - \frac{c}{2}e^2\}$, and by the envelope theorem, $V'(c) < 0$.

[21] In Section 7.3 of the online appendix, we examine the effect of $c_i$ on the combined welfare of all players—firms' initial owners, fund investors, fund managers, and liquidity investors—and show that decreasing funds' costs of engagement beyond a certain threshold is detrimental to total welfare.

the richer dynamic model, the fund manager benefits from stronger shareholder rights and an easier ability to intervene on the investments he has already made. However, he may be worse off in the long run, given his lower ability to attract investor capital in the future.

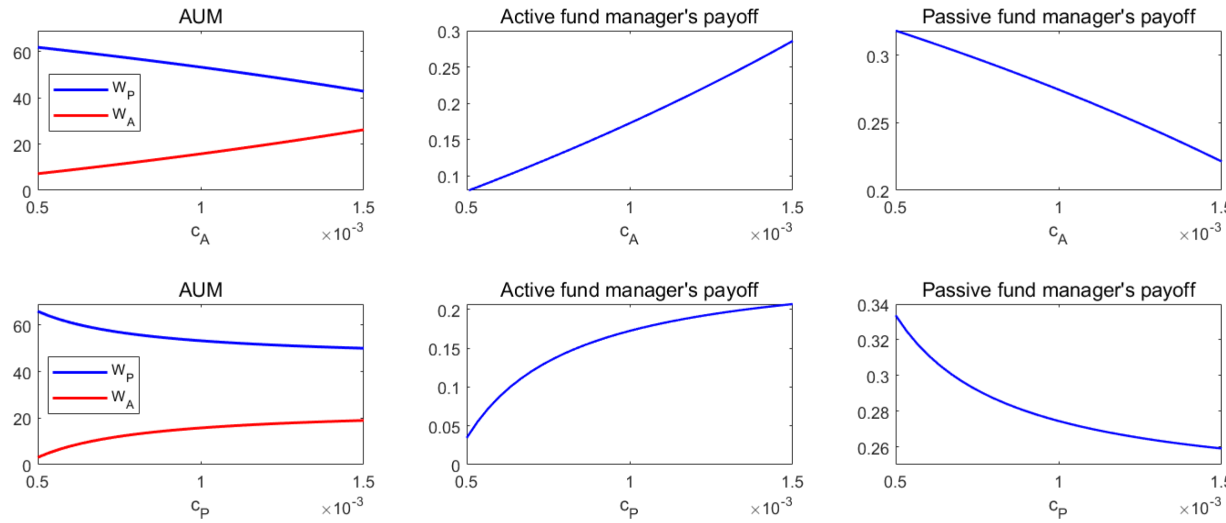


**Figure 3.** In this figure, we plot funds' AUM and fund managers' payoffs as functions of funds' monitoring costs $c_A$ (top row) and $c_P$ (bottom row) in the region $\psi_P < \bar{\psi}_P$. The parameters are $c_A = 0.001$ (when $c_P$ varies), $c_P = 0.001$ (when $c_A$ varies), $\eta = 0.1$, $\psi_A = 0.1$, $\psi_P = 0.047$, $Z_L = 10.8$, $Z_H = 0$, $R_0 = 100$, and $W = 69$.

When $\psi_P < \bar{\psi}_P$ and private savings deliver a lower return than investing with the funds, the dynamics of fund flows is different. In this case, all investor capital is allocated to the funds, and thus a change in $c_i$ leads to a reallocation of investor capital from one fund to the other. Numerically we find that as any fund's costs of monitoring decrease, capital flows out of the active fund and into the passive fund. Figure 3 illustrates this dynamic. We consider the same parameters as in Figure 2, but pick the value of $\psi_P$ for which $\lambda > 1$, and vary $c_A$ and $c_P$. The first column of the figure shows that when either $c_A$ or $c_P$ decreases, $W_A$ decreases and $W_P$ increases. Accordingly, the active fund manager's payoff decreases (second column), and the passive fund manager's payoff increases (third column).

The broad intuition is that under the conditions of Proposition 3, as investor engagement increases and firm valuations rise, the return of the active fund, $\frac{R_L}{P_L}$, decreases more than the return of the passive fund, $\frac{R_M}{P_M}$, leading investors to reallocate capital from the active fund to the passive fund. To see this, suppose $c_A$ decreases. Then the active fund starts monitoring more, but only in $L$-stocks (since it does not invest in $H$-stocks), and thus $\frac{R_L}{P_L}$ decreases more than $\frac{R_M}{P_M}$. Likewise, if $c_P$ decreases, the passive fund starts monitoring more in both types of stocks, but the return of $L$-stocks again declines more than the return of $H$-stocks because they are cheaper.[22]

Overall, the arguments in this section have two implications. First, stronger shareholder rights and regulations designed to reduce the costs of monitoring not only affect corporate governance, but can also change the sizes of the active and passive fund sectors. Second, the net effect of such regulations is ambiguous: while they improve governance and benefit fund investors and fund managers on the positions that are already established, they may decrease the returns of future fund investors and weaken some funds' ability to attract capital.

# 5 Discussion of assumptions

In this section, we discuss several assumptions and properties of the model.

## 5.1 Active and passive funds' engagement strategies

It is important for our results that both active and passive funds can engage in governance and increase firm value. While passive funds do not run activist campaigns or take board seats, they have other strategies to influence management that they can and do regularly use. The two engagement channels most commonly used by institutional investors are discussions with management and voting (McCahery, Sautner, and Starks, 2016). Accordingly, Fisch et al. (2019) point out that over the last decades, all institutional investors, but large passive fund managers especially, have become increasingly involved in governance through voting and communications with management. Many large asset managers have special governance committees that analyze how votes should be cast, and their votes are often pivotal in deciding important issues, such as proxy fights or contentious M&As.[23] Passive funds also regularly talk with their portfolio firms about their policies and expectations. For example, in 2017, BlackRock, Vanguard, and State Street had, respectively, over 1600, 950, and 650

[22] A more formal argument is in the appendix, after the proof of Proposition 4.

[23] Kahan and Rock (2020) discuss that on such consequential issues, when passive fund managers are likely to be pivotal, they tend to invest significant resources in acquiring firm-specific information and deciding the outcome. Consistent with this, BlackRock's Investment Stewardship report writes: "In some cases, we have multiple meetings with both the company and the activist over many months as the situation evolves." (https://www.blackrock.com/corporate/literature/publication/blk-profile-of-blackrock-investment-stewardship-team-work.pdf)

conversations with management teams, and also sent hundreds of letters to them.[24] The evidence in Gormley et al. (2021) suggests that governance campaigns by the Big Three passive fund families have a material impact on board composition of their portfolio firms.

While both active and passive funds engage in governance, how different are their costs of doing so? In particular, what is the rationale and the role of the assumption $c_P \geq c_A$ in Proposition 3? This assumption is consistent with the commonly expressed view that "governance interventions are especially costly for passive funds, which do not generate firm-specific information as a byproduct of investing" (Lund, 2018). In addition, Bebchuk and Hirst (2019b) point out that "index fund managers ... have a web of financially significant business ties with corporate managers," which could make them more reluctant to vote against management and increase their costs of monitoring relative to active funds (e.g., Cvijanovic, Dasgupta, and Zachariadis, 2016). Consistent with this idea, Boone et al. (2020), Brav et al. (2021), and Heath et al. (2021) find that active mutual funds are more likely to vote against management than passive funds across multiple proposal types.

However, this view is not universally held, and some argue that passive funds could be more effective in their engagement efforts than active funds (e.g., Kahan and Rock, 2020). For example, passive funds' long-term horizon could give credibility to their demands and make it easier for them to influence management, so that they can induce the same changes with lower effort compared to active funds with high turnover. Kahan and Rock (2020) also point out that in addition to issues where firm-specific information is required, there are other issues for which the market-wide expertise of index funds is more valuable. In the context of our model, if these considerations lead passive funds to have lower monitoring costs, $c_P < c_A$, then passive funds replacing active funds in firms' ownership structures could have an ambiguous effect: passive funds would have lower incentives to engage due to lower fees, but a greater ability to do so. However, all the other effects would remain the same, and hence the trade-offs described in Section 4.1 would arise in this setting as well. In particular, since the numerical example of Figure 2 features $c_A = c_P$, it would remain qualitatively unchanged if $c_P$ is slightly lower than $c_A$, except that the negative effects of passive fund growth in the region $\psi_P \leq \bar{\psi}_P$ would not be as strongly pronounced.

[24] See "At BlackRock, Vanguard and State Street, 'Engagement' Has Different Meanings," *The Wall Street Journal*, January 20, 2018.

**Implications for hedge fund activism.** If we return to the interpretation of funds' engagement efforts $e_{ij}$ as voting, in particular, in proxy contests run by activist hedge funds, our model has implications for hedge fund activism. Proxy contests are typically close votes, and large mutual funds are often pivotal voters (e.g., Fos and Jiang, 2015; Brav et al., 2021). Making an informed voting decision in this situation (i.e., exerting effort) is likely to be costly, both because of the high uncertainty about the value of the dissident vis-à-vis the incumbent management, and because it may require voting against management, risking managerial retaliation. The feature of our model that, other things equal, passive funds are stronger monitors than liquidity (retail) investors, but weaker monitors than active mutual funds, is consistent with the observed voting patterns in proxy contests. Brav et al. (2021) show that while passive funds do frequently dissent, especially when the dissident has a strong case, they are substantially less likely to support dissidents compared to active mutual funds. They also point out that mutual funds are expected to be more diligent and informed voters than retail investors. Relatedly, Appel, Gormley, and Keim (2019) find that an increase in passive fund ownership (instrumented using Russell index assignments) is associated with higher activists' success rates in achieving changes in governance and control, such as reaching a proxy fight settlement. Importantly, the authors point out that in their sample, higher passive fund ownership corresponds to lower retail ownership, and not to lower ownership by other institutions, such as active mutual funds.

Under the interpretation of funds' effort as voting in activist campaigns, one can think of aggregate governance $R_M$ as capturing the success of such campaigns. Our results then suggest that when passive funds primarily crowd out private savings and replace retail investors in firms' ownership structures, activist hedge fund campaigns are more likely to succeed, whereas if passive funds primarily replace active mutual funds, such campaigns are more likely to fail. One might then potentially link the increased flows to hedge fund activists over the last two decades[25] to the increased replacement of retail investors by large asset managers in firms' ownership structures, which has been observed in practice and corresponds to the region $\psi_P > \bar{\psi}_P$ in the model.

[25] See, e.g., "Outlook Remains Bright for Activist Investing," at https://sophisticatedinvestor.com/outlook-remains-bright-for-activist-investing (February 1, 2016).

## 5.2 Bargaining over fees

Assuming that fees are set via bargaining makes the model tractable and allows us to obtain closed form solutions. This assumption is natural if we think of fund investors as institutional investors, but may be less natural in the context of individual investors. However, the qualitative effects that arise in our model are likely robust to other models of imperfect competition among fund managers. This is because the property of fees that is needed for our effects is that easier access to passive funds, by improving fund investors' outside options, decreases the fees of the active fund, and the extent of this effect depends on whether the active fund primarily competes with the passive fund or with investors' private savings. This property is likely to hold in other models of imperfect competition, e.g., in a model where fund managers set their fees in advance and investors need to incur heterogeneous "transportation" costs to invest with the funds, as in Hotelling (1929) and Salop (1979). The complication that would arise in this alternative setting is that when setting the fees, fund managers would take into account the effect of fees on their future monitoring efforts. This "governance effect" on fees is likely to be second-order in practice. Modeling fee setting via Nash bargaining allows us to abstract from the "governance effect" (see Section 3.3 and footnote 11), while capturing the more first-order effects stemming from competition between funds and fund investors' outside options.

## 5.3 After-fee performance of active and passive funds

In our model, the after-fee return of the active fund is higher than that of the passive fund; otherwise, rational investors would not be willing to incur a higher search cost to invest with the active fund. However, the model could be easily modified to capture the empirically observed after-fee underperformance of active funds (Fama and French, 2010), while delivering the same implications for governance. For example, one possible reason why investors delegate capital to active funds despite their negative after-fee alphas is that they incorrectly overvalue managerial skill, e.g., because they cannot distinguish performance due to skill from performance due to exposures to systematic factors (Song, 2020). Another possible reason is that some fund investors demand a non-market portfolio due to their unique investment needs (e.g., hedging labor income or real estate) and are willing to pay for it via higher fees. Finally, as Pastor and Stambaugh (2012) show, if investors have uncertainty about the extent of decreasing returns to scale, then the equilibrium allocation to active funds would be high despite the historical evidence on their underperformance. Our model could be enriched to incorporate these features. For example, the overvaluation of skill could be captured by assuming that if the equilibrium return of an active fund is $r_A$, fund investors perceive it to be $r_A + \rho$ for some $\rho > 0$. In such a setting, the active fund manager would charge an excessively high fee, resulting in after-fee underperformance relative to the passive fund. Importantly, our results about governance would remain qualitatively unchanged: a reduction in the search cost $\psi_P$ would reduce fund fees, and its effect on governance would depend on whether the passive fund crowds out the active fund or private savings.

# 6 Extensions

## 6.1 Generalization of mispricing

In our basic model, the degree of misvaluation of a firm's stock does not depend on the firm's fundamental value: liquidity investors value stock $j$ at $R_j - Z_j$, where $Z_j$ is independent of $R_j$. It is plausible that the degree of misvaluation changes with fundamental value, and governance in particular. For example, better governance could be associated with the adoption of better reporting and disclosure practices (e.g., Boone and White, 2015), in which case the degree of misvaluation will decrease with $R_j$. Alternatively, if misvaluation comes from excessive investor optimism or pessimism about a particular technology the firm is using, and higher $R_j$ leads firm $j$ to increase investment in that technology, then the degree of misvaluation will increase with $R_j$.

In this section, we extend the model by assuming that if stock $j$ is of type $t_j \in \{L, H\}$, then liquidity investors value it at $R_j - Z_{t_j}(R_j)$, where $Z_{t_j}(R_j) = A_{t_j} + BR_j$ for some constants $A_L$, $A_H$, and $B$, where $A_L > A_H$ and $A_M \equiv \frac{A_L + A_H}{2} > 0$. If $B = 0$, this specification reduces to the one in the basic model. If $B < 0$ ($B > 0$), then the degree of misvaluation is decreasing (increasing) in the fundamental value of the firm, as in the first (second) example.

Notice that the solution of the model is largely unaffected. In particular, the equilibrium fee bargaining equations, (15)-(16), and the investor capital allocation equations, (17)-(20), are unchanged. However, the market-clearing conditions change from (8)-(9) to:

$$P_L = (1 - B) R_L - A_L, \tag{22}$$

$$P_M = (1 - B) R_M - A_M. \tag{23}$$

As a result, as we show in the appendix, the equilibrium market payoff is now given by:

$$R_M = \frac{A_M}{1 - B - \frac{1-\eta}{\psi_P + \lambda(1-\eta)}}. \tag{24}$$

We focus on $B < 1$ since if $B \geq 1$, the stock price either does not depend on or decreases with the firm' payoff.

To see the effects of this generalization, it is easiest to consider the region in which $\lambda = 1$ in equilibrium. Proposition 5 shows that the conclusion that easier access to passive funds improves governance continues to hold. Moreover, this improvement in governance is higher if $B$ is higher.

**Proposition 5**. *If $\lambda = 1$ and $B < 1$, easier access to passive funds (lower $\psi_P$) improves aggregate governance $R_M$. The change in $R_M$ is higher if $B$ is higher.*

To see the intuition, recall why a reduction in $\psi_P$ improves governance in the basic model when $\lambda = 1$. A reduction in $\psi_P$ induces investors to reallocate capital from private savings to the passive fund until the market return declines to the point where investors again become indifferent between investing with the fund and saving privately. The decline in the market return implies that in equilibrium, the increase in the passive fund's AUM must be sufficiently high, so that the resulting growth in the fund's ownership stakes improves aggregate governance despite lower fees (Section 4.1.2). The same logic holds in this extended model, but parameter $B$ now affects the speed with which the market return decreases as governance improves. If $B$ is higher, then the market return decreases more slowly, since better governance also leads to higher misvaluation of assets by liquidity investors. Thus, if $B$ is higher, a reduction in $\psi_P$ leads to a greater increase in the passive fund's AUM, implying a stronger improvement in governance.

Proposition 5 focuses on the case $\lambda = 1$. If $\lambda > 1$, then similar to the basic model, easier access to passive funds can be harmful for governance, because capital is reallocated from the active fund to the passive fund with lower incentives to engage. In addition, (24) implies that as in the basic model, there is a trade-off between governance and fund investor well-being: for any parameter that does not enter (24), a change in this parameter that improves governance leads to lower investor returns, and vice versa. For example, a decrease in funds' monitoring costs $c_i$ increases investor engagement and improves governance, but decreases $\lambda$, as in Section 4.2.

## 6.2 Heterogeneous valuations of liquidity investors

The basic model assumes that for a given stock, all liquidity investors have the same valuation. A consequence of this assumption is that the price impact of a mutual fund's trade arises only because of an anticipated change in governance. It is natural to consider the case in which liquidity investors are heterogeneous in their valuations. Then, the price impact will occur not only because of a change in governance but also because of a change in the identify of the marginal liquidity investor.

To analyze this extension, consider the basic model with one change. Suppose that there is a unit mass of liquidity investors for each stock, and that liquidity investor $k$ values stock $j$ at $R_j - Z_{kj}$, where $Z_{kj}$ is a conditionally i.i.d. (across liquidity investors) draw from a uniform distribution over $[Z_j - \Delta, Z_j + \Delta]$, $\Delta \geq 0$ is a constant, and $Z_j \in \{Z_L, Z_H\}$ is, as before, an i.i.d. (across stocks) draw from a binary distribution with $Z_L > Z_H$ and $Z_M = \frac{Z_L + Z_H}{2} > 0$. Thus, as in the basic model, $L$-stocks are undervalued by liquidity investors compared to $H$-stocks, in the sense that the distribution of investors' valuations is shifted downwards by a constant. The basic model corresponds to $\Delta = 0$.

This model is solved similarly to the basic model. For a fixed $\lambda$, the equilibrium fee bargaining and investor capital allocation conditions, (15)-(20), are unchanged. The only difference is in the market-clearing conditions: conditions (8)-(9) are replaced by:

$$P_L = R_L - Z_L + \Delta\left(2x_P + 2x_{AL} - 1\right), \tag{25}$$

$$P_M = R_M - Z_M + \Delta\left(2x_P + x_{AL} - 1\right), \tag{26}$$

where, as before, $x_P$ and $x_{AL}$ are the ownership stakes of the passive and active fund (see the proof of Proposition 6 for the derivation). The reason $P_L$ and $P_M$ increase in $x_P$ and $x_{AL}$ is that higher ownership by the funds implies lower ownership by liquidity investors. Since the stock is owned by investors with the highest valuations, higher fund ownership crowds out liquidity investors with the lowest valuations. Hence, the marginal liquidity investor has a higher valuation, so the market-clearing price is higher.

Therefore, the extended model features decreasing returns to scale for two separate reasons. The first, as in the basic model, is due to improvements in governance (higher fund ownership increases the fund's engagement and the firm's payoff, which decreases the relative amount of mispricing; see Section 3.2); the second is because higher fund ownership increases the valuation of the marginal liquidity investor.

Does this model lead to similar governance implications? In particular, can passive fund growth still be beneficial for governance? Recall that in the basic model, if $\lambda = 1$, easier access to passive funds (lower $\psi_P$) always improves governance: the positive effect of higher passive fund's AUM dominates the negative effects of lower fund fees and a partial replacement of the active fund. Whether this conclusion holds in the extended model depends on the magnitude of $\Delta$. Intuitively, as $\psi_P$ declines, capital flows into the passive fund until its gross return, $\frac{R_M}{P_M}$, declines to a point where investors again become indifferent between investing with the fund and saving privately (see (18)). As discussed above, the return $\frac{R_M}{P_M}$ declines with AUM for two reasons: an improvement in governance and an increase in the marginal liquidity investor's valuation, where the extent of the second effect is captured by $\Delta$. If $\Delta$ is not too high, the second effect is relatively weak, and hence the conclusion that easier access to passive funds improves governance continues to hold:

**Proposition 6**. *There exists $\bar{\Delta} > 0$ such that for any $\Delta < \bar{\Delta}$, if $\lambda = 1$, easier access to passive funds (lower $\psi_P$) improves aggregate governance $R_M$.*

In contrast, if $\Delta$ is sufficiently high, an increase in the passive fund's AUM caused by lower $\psi_P$ can be relatively modest, because a rapid increase in the valuations of marginal liquidity investors quickly reduces the fund's return. Then, an increase in the passive fund's AUM does not overcompensate the negative effects, and governance may worsen.

## 6.3 Multiple active and passive funds

In this section, we extend the basic model to a general number of funds of each type, $N_A$ and $N_P$. All passive funds hold the market portfolio, and suppose that all active funds find it optimal to diversify across $L$-stocks and not invest in $H$-stocks (which can be guaranteed by conditions similar to those imposed in Proposition 1). We restrict attention to symmetric equilibria, in which funds of the same type have the same AUM and asset management fees.

Denote by $x_{AL}$ the combined holdings of all active funds in each $L$-firm. Then, each active fund manager owns $\frac{x_{AL}}{N_A}$ shares, so his optimal effort is $\frac{f_A x_{AL}}{c_A N_A}$, and all active funds' collective effort in each $L$-firm is $\frac{f_A x_{AL}}{c_A}$. Similarly, if the combined holdings of all passive funds in each firm are $x_P$, then the optimal effort of each passive fund manager is $\frac{f_P x_P}{c_P N_P}$, and their collective effort is $\frac{f_P x_P}{c_P}$. Thus, the only thing that matters for governance are the combined holdings of all active fund managers, $x_{AL}$, and all passive fund managers, $x_P$, while the exact number of funds and their individual ownership stakes do not matter, holding the fees constant. The reason is that under quadratic costs of effort, the following two opposite effects cancel out. First, there is a free-rider effect: with more funds of each type, each fund holds fewer shares, so each fund manager captures a lower fraction of the payoff from his effort. This effect works in the direction of a higher number of funds reducing the total amount of effort. Second, although each fund manager exerts lower effort, there are now more fund managers who exert effort. This effect works in the direction of a higher number of funds increasing the total amount of effort. Under a quadratic cost function, these two effects cancel out, and the total amount of effort depends on the total ownership of each type of funds. If the cost function has more curvature than quadratic (e.g., if $c_i(e) = \frac{c_i}{\alpha} e^{\alpha}$ for $\alpha > 2$), then the second effect dominates. If the cost function has less curvature than quadratic (e.g., if $c_i(e) = \frac{c_i}{\alpha} e^{\alpha}$ for $\alpha < 2$), then the first effect dominates.

Since the combined effort of all fund managers is $\frac{f_A x_{AL}}{c_A} + \frac{f_P x_P}{c_P}$, equations (8)-(11) continue to hold. Moreover, for given search costs $\psi_A$ and $\psi_P$, the fees determined through Nash bargaining are exactly the same as in the basic model. To see this, suppose that investors' equilibrium rate of return is $\lambda$. Then investors' and fund managers' payoffs from agreeing and from negotiations failing are given by the same expressions as in the basic model, leading to the same equations for fees, (15)-(16). Investors' capital allocation conditions ((17)-(18) in the case of $\lambda = 1$, and (19)-(20) in the case of $\lambda > 1$) remain the same as well, except that $W_A$ and $W_P$ now stand for the combined AUM of all active and passive funds, respectively. We conclude that Propositions 1, 2, and 3 continue to hold, and hence our predictions about the effects of easier access to passive funds remain unchanged.

In the discussion above, we take $N_A$ and $N_P$ as given, but one could also endogenize funds' entry decisions by introducing costs of entry for each fund type. In such a model, a change in the search cost $\psi_P$ would change the equilibrium number of funds through a change in fund managers' expected payoffs. However, because the equilibrium level of governance $R_M$ does not depend on $N_A$ and $N_P$ as discussed above, this would not change the comparative statics of governance in $\psi_P$. Alternatively, one could also endogenize the search costs and assume that $\psi_A$ and $\psi_P$ are functions of the equilibrium number of funds, as in Garleanu and Pedersen (2018). In such a model, the search costs and the equilibrium number of funds would be interrelated and determined in equilibrium.

## 6.4 General compensation contracts

Our model is also tractable for more general compensation contracts. For example, a hedge fund manager's fee structure typically includes a management fee, a performance fee, as well as high water marks and/or hurdle rates for the performance fee to be paid. In this section, we show how the analysis can be extended for contracts of general shape.

Suppose that fund managers are compensated by contracts from a given ordered set, denoted by $\phi(r, f)$, where $r \in \mathbb{R}$ is the realized gross return of the fund (i.e., $\frac{R_L}{P_L}$ for the active fund and $\frac{R_M}{P_M}$ for the passive fund) and $f \in [f_L, f_H]$ is the index of a contract; $\phi(r, f)$ is the compensation of the fund manager per dollar of investment. After an investor finds a fund manager, they bargain over index $f \in [f_L, f_H]$. As in the basic model, in a symmetric equilibrium, all investors that go to the active (passive) fund sign the same contract with some index $f_A$ ($f_P$). Function $\phi(r, f)$ can be any function satisfying the following conditions. First, for any $f \in [f_L, f_H]$, $\phi(r, f)$ is increasing in $r$ and locally differentiable at each equilibrium fund return (i.e., at equilibrium levels of $\frac{R_L}{P_L}$ and $\frac{R_M}{P_M}$). Second, for each $r$, $\phi(r, f)$ is increasing and continuous in $f \in [f_L, f_H]$, and strictly increasing in $f$ at equilibrium values of $r$. Third, for each $r$, $\phi(r, f_L) \le 0$ and $\phi(r, f_H) \ge \max\{r, 0\}$. Intuitively, the first condition ensures that the solution to the governance problem is well-behaved, while the second and third conditions ensure that any surplus division between a fund manager and an infinitesimal investor can be attained with an appropriate contract index $f$. Note that when $\phi(r, f) = fr$, $f_L = 0$, and $f_H = 1$, this extension is equivalent to the basic model.

We first show how the equilibrium can be derived for such a general compensation contract, and then discuss which features change and which remain the same as in the basic model. If a fund investor invests wealth $\varepsilon$ with fund manager $i \in \{A, P\}$ and the fund generates gross return $r_i$, then the fund manager's compensation is $\phi(r_i, f_i)\varepsilon$, the fund investor's payoff is $r_i\varepsilon - \phi(r_i, f_i)\varepsilon$, and the surplus from bargaining between them is $(r_i - \lambda)\varepsilon$. Thus, using the arguments in Section 3.3, we obtain the following analogs of equation (14):

$$\phi\left(\frac{R_L}{P_L}, f_A\right) = \eta\left(\frac{R_L}{P_L} - \lambda\right) \quad \text{and} \quad \phi\left(\frac{R_M}{P_M}, f_P\right) = \eta\left(\frac{R_M}{P_M} - \lambda\right), \tag{27}$$

and the analog of the investor's indifference condition (12) is:

$$(1-\eta)\frac{R_L}{P_L} + \eta\lambda - \psi_A = (1-\eta)\frac{R_M}{P_M} + \eta\lambda - \psi_P = \lambda. \tag{28}$$

It follows that given the equilibrium rate of return $\lambda$ of fund investors, we can find the equilibrium $(R_L, P_L, R_M, P_{M,}, f_A, f_P)$ as solutions to the system of equations (27)-(28) and the pricing equations (8)-(9). These solutions (as functions of $\lambda$) do not depend on the shape of the compensation contract and are the same as in the basic model. In particular, the equilibrium payoffs and prices are given by $(ii)$-$(iii)$ in Proposition 1. However, as shown in the appendix, the equation that determines $\lambda$ when $\lambda > 1$ is generalized from (21) to:

$$W = \frac{c_A\left(R_L - R_M\right)}{\frac{\partial}{\partial r}\phi\left(\frac{R_L}{P_L}, f_A\right)} P_L + \frac{c_P\left(2R_M - R_L - R_0\right)}{\frac{\partial}{\partial r}\phi\left(\frac{R_M}{P_M}, f_P\right)} P_M. \tag{29}$$

While the equilibrium for a fixed $\lambda$ is the same, the shape of the compensation contract affects the equilibrium and matters for governance because it affects the equilibrium return $\lambda$. For example, suppose that the contract is steeper than in the basic model: instead of $\phi(r, f) = fr$ in the basic model, $\phi(r, f) = f \max\{0, r - w\}$ for some water mark $w > 0$, assumed to be below the equilibrium returns of the funds. Then, to implement the same sharing of surplus between the fund manager and each investor, $f_i$ must be higher than in the basic model. This implies that the fund managers will exert higher effort given the same AUM, which in turn will lead to a lower equilibrium $\lambda$.[26]

Although the equilibrium changes, the key trade-offs of passive fund growth for governance remain similar. First, suppose that the search cost $\psi_P$ is high enough, so that investors are indifferent between investing with the funds and saving privately, i.e., $\lambda = 1$. Then, Proposition 1 implies that aggregate governance (captured by the payoff of the market portfolio) is given by $R_M = (1 + \frac{1-\eta}{\psi_P})Z_M$. Thus, governance improves when access to passive funds becomes easier, as in the basic model. Second, for a general $\lambda$, the fact that $R_M = (1 + \frac{1-\eta}{\psi_P + (\lambda-1)(1-\eta)})Z_M$, again implies a trade-off between governance and investor well-being: a change in any parameter that does not enter this relation (e.g., $\psi_A$ or $c_i$), improves governance $R_M$ if and only if it decreases investors' return $\lambda$.

[26] Another interesting extension is to allow investors and fund managers to sign any contract, without restricting attention to a specific ordered set of contracts. We conjecture that any equilibrium in the model of Section 6.4 (i.e., an equilibrium that arises for a given ordered set of contracts) is also an equilibrium in this more general extension. Intuitively, when an investor with infinitesimal wealth $\varepsilon$ and a fund manager bargain over a contract, the result of the bargaining has no effect on equilibrium in the financial market (since the investor is infinitesimal), and thus both the fund manager and fund investor are indifferent between all contracts that attain the same division of surplus. Since the ordered set of contracts $\{\phi(r, f),\ f \in [f_L, f_H]\}$ is sufficiently large to cover any division of surplus (given the second and third restrictions on function $\phi(r, f)$ above), the fund manager and investor will not benefit from deviating to a different type of contract.

# 7 Conclusion

The governance role of delegated portfolio managers, and passive funds in particular, is the subject of an ongoing debate among academics and policymakers. In this paper, we develop a tractable theoretical framework to study the governance effects of active and passive funds in a general equilibrium setting. Analyzing market equilibrium is critical for understanding the governance implications of passive fund growth because their greater availability changes not only firms' ownership structures, but also the fees and AUM of both active and passive funds, which all affect fund managers' incentives to engage.

We show that whether passive fund growth is beneficial for governance depends on whether it primarily crowds out investors' private savings or their allocation to active funds. In the former case, governance improves: the dominant effect is that retail shareholders are replaced by passive funds in firms' ownership structures, and passive funds have incentives to engage given their large ownership stakes. Moreover, passive fund growth improves governance even though it is accompanied by a decrease in fund fees. However, if passive fund growth crowds out investors' allocation to active funds, it is more likely to hurt governance. The increased competition between funds decreases active funds' fees, which weakens their incentives to engage. In addition, passive funds replace active funds in firms' ownership structures, which can further reduce aggregate investor monitoring. Overall, passive fund growth is beneficial for governance only if it does not substantially increase the equilibrium returns of fund investors, i.e., there can be a trade-off between governance and fund investor well-being. We also emphasize that to analyze the effects of governance regulations, such as those that increase shareholders' power to intervene, it is important to consider not only their direct effects on shareholder engagement, but also their indirect effects. By changing fund returns and thereby fund investors' capital allocation decisions, these regulations can affect funds' AUM and fees, which have important effects on funds' incentives to engage.

To focus on the interplay between fund managers' AUM, fees, investment strategies, and ownership stakes, we abstract from several important features of the engagement process, such as investors' private information about firms, dynamic considerations due to differences in investors' horizons, or potential coordination between shareholders in their engagement efforts. An in-depth look at these questions and their interaction with the mechanisms we study in the paper provides interesting avenues for future research.

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# Appendix

Certain auxiliary results (Lemma 1 through Lemma 8) and derivations (equations (63)–(117)) have been relegated to the online appendix. We refer to these results and equations in some places of the main appendix.

**Proof of Proposition 1.** There are two possible cases: 1) $\lambda = 1$, and 2) $\lambda > 1$. We consider each case separately.

**(1) Equilibrium when $\lambda = 1$.**

Consider the three equations for the active fund manager and $L$-stocks, i.e., (8), (15), and (17), which we can rewrite as:

$$
\begin{aligned}
f_A &= \eta \frac{Z_L}{R_L} \quad \text{(fee bargaining)} && (30)\\
(1 - f_A)\frac{R_L}{P_L} &= 1 + \psi_A \quad \text{(investor indifference)} && (31)\\
R_L - P_L &= Z_L \quad \text{(market clearing)} && (32)
\end{aligned}
$$

Plugging $f_A$ from (30) and $P_L$ from (32) into (31) gives:

$$\left(1 - \frac{\eta Z_L}{R_L}\right)\frac{R_L}{R_L - Z_L} = 1 + \psi_A \Leftrightarrow (1 + \psi_A - \eta)\, Z_L = \psi_A R_L.$$

Hence, $R_L = \left(1 + \frac{1-\eta}{\psi_A}\right) Z_L$. Then, (32) implies $P_L = R_L - Z_L = \frac{1-\eta}{\psi_A} Z_L$, and (30) implies

$$f_A = \eta \frac{Z_L}{\frac{1+\psi_A-\eta}{\psi_A} Z_L} = \frac{\eta \psi_A}{1 + \psi_A - \eta}.$$

Similarly, we can rewrite the three equations for the passive fund manager and the market portfolio, i.e., (9), (16), and (18), as

$$
\begin{aligned}
f_P &= \eta \frac{Z_M}{R_M} \quad \text{(fee bargaining)}\\
(1 - f_P)\frac{R_M}{P_M} &= 1 + \psi_P \quad \text{(investor indifference)}\\
R_M - P_M &= Z_M \quad \text{(market clearing)}
\end{aligned}
$$

Since this system looks similar to the corresponding system for the active fund and the $L$-stocks, the solution is: $R_M = \left(1 + \frac{1-\eta}{\psi_P}\right) Z_M$, $P_M = \frac{1-\eta}{\psi_P} Z_M$, and $f_P = \frac{\eta \psi_P}{1+\psi_P-\eta}$.

**(2) Equilibrium when $\lambda > 1$.**

We start by deriving (21). Using (6) and (7) and plugging them into (20), we get

$$W = \frac{1}{2} x_{AL} P_L + x_P P_M. \tag{33}$$

Next, using (10) and (11),

$$\begin{aligned} R_L - R_M &= \frac{1}{2} c_A'^{-1} \left( f_A x_{AL} \right) \Leftrightarrow c_A'(2 \left( R_L - R_M \right)) = f_A x_{AL}, & (34) \\ 2R_M - R_L &= R_0 + c_P'^{-1} \left( f_P x_P \right) \Leftrightarrow c_P' \left( 2R_M - R_L - R_0 \right) = f_P x_P. & (35) \end{aligned}$$

Plugging these into (33) gives (21). We next characterize the equilibrium as a function of $\lambda$, using (8)-(11); (15), (16); and (19), (21).

First, consider $L$-stocks and the active fund and use (15), (19), and (8):

$$\begin{aligned} f_A \frac{R_L}{P_L} &= \eta \left( \frac{R_L}{P_L} - \lambda \right) && \text{(fee bargaining)} & (36) \\ (1 - f_A) \frac{R_L}{P_L} &= \psi_A + \lambda && \text{(investor indifference)} & (37) \\ P_L &= R_L - Z_L && \text{(market clearing)} & (38) \end{aligned}$$

From (36), $\frac{R_L}{P_L} = \frac{\eta\lambda}{\eta - f_A}$, and plugging this into (37) gives

$$(1 - f_A) \frac{\eta\lambda}{\eta - f_A} = \psi_A + \lambda \Leftrightarrow f_A = \frac{\eta \psi_A}{\psi_A + \lambda (1 - \eta)}.$$

Plugging this into (36) gives

$$\frac{R_L}{P_L} \eta \left( 1 - \frac{\psi_A}{\psi_A + \lambda (1 - \eta)} \right) = \eta\lambda \Leftrightarrow \left( \psi_A + \lambda (1 - \eta) \right) P_L = (1 - \eta) R_L,$$

and using (38) gives

$$R_L = \left( 1 + \frac{1 - \eta}{\psi_A + (\lambda - 1)(1 - \eta)} \right) Z_L. \tag{39}$$

Finally, using (38) and (39), $P_L = R_L - Z_L = \frac{1-\eta}{\psi_A + (\lambda - 1)(1 - \eta)} Z_L$.

Second, consider asset $M$ (the market portfolio) and the passive fund manager. Since the system of equations (9), (16), and (19) looks exactly the same as the corresponding system for active fund managers and the $L$-asset (36)-(38), the solution looks the same as well, which gives the expressions for $f_P$, $R_M$, and $P_M$ in the statement of the proposition.

Thus, all equilibrium outcomes – $f_A$, $f_P$, $R_L$, $R_M$, $P_L$, $P_M$ – are expressed as a function of $\lambda$ and the exogenous parameters of the model. The equilibrium $\lambda$ is then determined from the equilibrium condition that investors invest all of their capital either with the active or with the passive fund manager, i.e., the fixed point solution to (21).

**(3) Combining the two cases together.**

By Lemma 1 in the online appendix, if $c_P \geq \frac{\psi_P}{\psi_A} c_A$, then $\lambda$ is decreasing in $W$. Hence, there exists $\bar{W}$ such that $\lambda > 1$ for $W < \bar{W}$ and $\lambda = 1$ for $W \geq \bar{W}$. As also shown in Lemma 1, $\lambda$ strictly decreases in $W$ if $W < \bar{W}$ and $c_P \geq \frac{\psi_P}{\psi_A} c_A$. It remains to ensure that in the conjectured equilibrium: (1) the active fund indeed finds it optimal to only invest in $L$-stocks and to diversify across all $L$-stocks; (2) both the active and passive fund raise positive AUM; and (3) the active and passive fund combined do not hold all the shares, so that liquidity investors hold at least some shares in each firm. Lemma 2 in the online appendix proves that the active fund will indeed diversify equally across $L$-stocks. Part $(ii)$ of Lemma 3 in the online appendix imposes conditions that are sufficient for the active fund to not deviate to investing in $H$-stocks. Lemma 4 in the online appendix imposes sufficient conditions for both funds' AUM to be positive, and Lemma 5 in the online appendix imposes sufficient conditions for the active and passive fund combined to not hold all the shares. Combining these conditions together yields the following two conditions:

$$\max\left\{\frac{\frac{R_0}{Z_L} + \left[1 + \frac{1-\eta}{\psi_A}\right]}{2\left[1 + \frac{1-\eta}{\psi_P}\right]}, \frac{\xi_A \xi_P + \xi_A - \xi_P}{\xi_P^2}\right\} \;<\; \frac{Z_M}{Z_L} < \frac{1 + \frac{1-\eta}{\psi_A}}{1 + \frac{1-\eta}{\psi_P}}, \tag{40}$$

$$\hat{W} \;\leq\; W < \frac{R_0 - Z_L}{2}, \tag{41}$$

where $\xi_A$ and $\xi_P$ are given by (87)-(88) and $\hat{W} < \bar{W}$ is given by (96) in the online appendix. Finally, we point out that the conditions of the proposition describe a non-empty set of parameters. For example, $\eta = 0.01$, $c_A = 0.001$, $c_P = 0.002$, $\psi_A = 0.1$, $Z_L = 1$, $Z_H = 0.81$, $R_0 = 10.75$, $W = 1.5$, and $\psi_p \in [0.0897; 0.08974]$ satisfy these conditions. ■

**Proof of Proposition 2.** (1) We start by deriving the expressions for active and passive funds' AUM. Using Proposition 1 and (64),

$$\begin{aligned} W_P = x_P P_M = \frac{c_P e_P}{f_P} \frac{R_M}{\frac{\psi_P}{1-\eta} + \lambda} &= c_P \left(2R_M - R_L - R_0\right) \frac{\psi_P + \lambda(1-\eta)}{\eta \psi_P} \frac{R_M(1-\eta)}{\psi_P + \lambda(1-\eta)} \\ &= \frac{1-\eta}{\eta} \frac{c_P}{\psi_P} R_M \left(2R_M - R_L - R_0\right). \end{aligned} \tag{42}$$

Similarly, using Proposition 1 and (63),

$$\begin{aligned} W_A = \tfrac{1}{2} x_{AL} P_L = \tfrac{1}{2} \frac{c_A e_{AL}}{f_A} \frac{R_L}{\frac{\psi_A}{1-\eta} + \lambda} &= \tfrac{1}{2} 2 c_A \left(R_L - R_M\right) \frac{\psi_A + \lambda(1-\eta)}{\eta \psi_A} \frac{R_L(1-\eta)}{\psi_A + \lambda(1-\eta)} \\ &= \frac{1-\eta}{\eta} \frac{c_A}{\psi_A} R_L \left(R_L - R_M\right). \end{aligned} \tag{43}$$

Note, as an auxiliary result, that these expressions imply that when $\lambda = 1$, AUM of fund $i$ are decreasing in $\psi_i$. Indeed, if $\lambda = 1$, then $R_L$ does not depend on $\psi_P$, and $W_P$ strictly decreases in $\psi_P$ if and only if

$$-\frac{c_P}{\psi_P^2}R_M\left(2R_M-R_L-R_0\right)+\frac{c_P}{\psi_P}\left(4R_M-R_L-R_0\right)\frac{dR_M}{d\psi_P}<0,$$

which holds since $2R_M - R_L - R_0 > 0$ and $\frac{dR_M}{d\psi_P} < 0$. Similarly, if $\lambda = 1$, then $R_M$ does not depend on $\psi_A$, and $W_A$ strictly decreases in $\psi_A$ if and only if

$$-\frac{c_A}{\psi_A^2}R_L\left(R_L-R_M\right)+\frac{c_A}{\psi_A}\left(2R_L-R_M\right)\frac{dR_L}{d\psi_A}<0,$$

which holds since $R_L - R_M > 0$ and $\frac{dR_L}{d\psi_A} < 0$. Note also that the same arguments hold for the equilibria of Lemma 7 in the online appendix, in which only one fund raises AUM – this is because the above expressions for $W_A$ ($W_P$) are still valid in the equilibrium where only the active (passive) fund raises AUM.

(2) Next, we show that the combined AUM of active and passive fund managers, $W_A + W_P$, strictly decrease in $\psi_P$ if $\lambda = 1$. This automatically implies that $W_A + W_P$ always weakly decrease in $\psi_P$ (because when $\lambda > 1$, $W_A + W_P = W$). To show that total AUM decrease in $\psi_P$, note, using (43)-(42), that

$$W_A+W_P=\frac{1-\eta}{\eta}\left(\frac{c_A}{\psi_A}R_L\left(R_L-R_M\right)+\frac{c_P}{\psi_P}R_M\left(2R_M-R_L-R_0\right)\right). \tag{44}$$

Since $R_L$ does not depend on $\psi_P$ for $\lambda = 1$, $W_A + W_P$ decrease in $\psi_P$ if and only if

$$\begin{aligned}
-\frac{c_A}{\psi_A}R_L\frac{dR_M}{d\psi_P}-\frac{c_P}{\psi_P^2}R_M\left(2R_M-R_L-R_0\right)+\frac{c_P}{\psi_P}\left(4R_M-R_L-R_0\right)\frac{dR_M}{d\psi_P} &< 0 \Leftrightarrow \\
\left[-\frac{c_A}{\psi_A}R_L+\frac{c_P}{\psi_P}\left(4R_M-R_L-R_0\right)\right]\frac{dR_M}{d\psi_P}-\frac{c_P}{\psi_P^2}R_M\left(2R_M-R_L-R_0\right) &< 0.
\end{aligned}$$

Since $2R_M - R_L - R_0 > 0$ and $\frac{\partial R_M}{\partial \psi_P} < 0$, it is sufficient to show that

$$-\frac{c_A}{\psi_A}R_L+\frac{c_P}{\psi_P}\left(4R_M-R_L-R_0\right)\geq 0. \tag{45}$$

Note that $e_P = 2R_M - R_L - R_0 \geq 0$ and hence $2R_M - R_L > 0$, and summing up these two inequalities gives $4R_M - R_L - R_0 > R_L$. This, together with the assumption of Proposition 1 that $\frac{c_P}{\psi_P} \geq \frac{c_A}{\psi_A}$, implies (45), as required. The same result with respect to $\psi_P$ also applies in the equilibrium of Lemma 7 in the online appendix in which only the passive fund raises positive AUM.

The fact that $W_A + W_P$ decrease in $\psi_P$ implies the last statement of the lemma, i.e., that $\lambda = 1$ only when $\psi_P$ is large enough. Indeed, if $\lambda = 1$, fund investors invest their funds both with the fund managers and in private savings, and hence $W_A + W_P < W$, while if $\lambda > 1$, all investor funds are allocated to the fund managers, i.e., $W_A + W_P = W$. Hence, $\lambda = 1$

applies if and only if $W_A + W_P < W$, or if and only if $\psi_P$ is large enough.

(3) Next, we prove that $\lambda$ decreases in $\psi_P$ under the conditions of Proposition 1. This is weakly satisfied for the region where $\lambda = 1$. To see this for the region where $\lambda > 1$, note that the combined AUM of the two funds, $W_A + W_P$, satisfy (44). In addition, for a fixed $\lambda$, $R_L$ does not depend on $\psi_P$ and $R_M$ decreases in $\psi_P$, so repeating the steps subsequent to (44), implies that for a fixed $\lambda$, $W_A + W_P$ decreases in $\psi_P$. Moreover, if $\lambda > 1$, then $W_A + W_P = W$. On the other hand, as follows from the proof of Lemma 1 in the online appendix, equality (54) holds, where the right-hand side decreases in $\lambda$. Combined, we have

$$W_A\left(\lambda, \psi_P\right) + W_P\left(\lambda, \psi_P\right) = W,$$

and hence,

$$\frac{\partial\left(W_A + W_P\right)}{\partial \lambda}\frac{d\lambda}{d\psi_P} + \frac{\partial\left(W_A + W_P\right)}{\partial \psi_P} = 0,$$

where $\frac{\partial(W_A+W_P)}{\partial\lambda} < 0$ and $\frac{\partial(W_A+W_P)}{\partial\psi_P} < 0$. Thus, $\frac{d\lambda}{d\psi_P} < 0$, as required.

(4) Finally, we prove the result for fund fees, i.e., that both $f_A$ and $f_P$ increase in $\psi_P$. Since $f_A = \frac{\eta\psi_A}{\psi_A+\lambda(1-\eta)}$, it weakly increases in $\psi_P$ (it does not depend on $\psi_P$ if $\lambda = 1$ and strictly increases if $\lambda > 1$ given $\frac{d\lambda}{d\psi_P} < 0$). And, since $f_P = \frac{\eta\psi_P}{\psi_P+\lambda(1-\eta)}$, it always strictly increases in $\psi_P$: if $\lambda = 1$, this is because $f_P = \frac{\eta\psi_P}{\psi_P+1-\eta}$, while if $\lambda > 1$, this is because $\frac{df_P}{d\psi_P} = \frac{\partial f_P}{\partial\lambda}\frac{d\lambda}{d\psi_P} + \frac{\partial f_P}{\partial\psi_P} > 0$, which follows from $\frac{\partial f_P}{\partial\lambda} < 0$, $\frac{d\lambda}{d\psi_P} < 0$, and $\frac{\partial f_P}{\partial\psi_P} > 0$. This completes the proof. ∎

**Proof of Proposition 3.** Note that $c_P \geq c_A$ and $\psi_P \leq \psi_A$ together imply that $c_P \geq \frac{\psi_P}{\psi_A}c_A$. Recall that by Proposition 2, $\lambda = 1$ if $\psi_P \geq \bar{\psi}_P$ and $\lambda > 1$ if $\psi_P < \bar{\psi}_P$. Therefore, if $\psi_P > \bar{\psi}_P$, Proposition 1 implies that $R_M$ strictly increases as $\psi_P$ decreases.

Second, to establish that the continuity of equilibrium also applies at $\psi_P = \bar{\psi}_P$, we prove that $\lim_{\psi_P \uparrow \bar{\psi}_P} \lambda = 1$, and that $\psi_P = \bar{\psi}_P$ satisfies the fixed point equation (21) with $\lambda = 1$. To see this, note that Propositions 1 and 2 imply that for all $\psi_P < \bar{\psi}_P$, (21) is satisfied for the equilibrium $\lambda$. Denote the right hand side of (21) by $RHS(\lambda, \psi_P)$, and recall that by the proof of Proposition 1, $RHS(\lambda, \psi_P)$ represents the total AUM of active and passive funds (that is, $W_A + W_P$). Also note that $RHS(\lambda, \psi_P)$ is continuous w.r.t. $\lambda$ and $\psi_P$, is strictly decreasing with $\psi_P$ (by step (3) of the proof of Proposition 2), and is strictly decreasing in $\lambda$ (by Proposition 1). Therefore, it is sufficient to show that $\psi_P = \bar{\psi}_P$ satisfies (21) with $\lambda = 1$ (since it would also imply that $\lim_{\psi_P \uparrow \bar{\psi}_P} \lambda = 1$). Suppose this is not the case. Then, since $\lambda = 1$ has to hold by Proposition 2, it must be that $W \neq RHS(1, \bar{\psi}_P)$. Since $RHS(\lambda, \psi_P)$ represents the total AUM, it cannot be $W < RHS(1, \bar{\psi}_P)$, and hence it must be $W > RHS(1, \bar{\psi}_P)$. However, then by continuity of $RHS(\lambda, \psi_P)$ in $\psi_P$, there exists $\delta > 0$ such that $W > RHS(1, \psi'_P)$ for any $\psi'_P \in (\bar{\psi}_P - \delta, \bar{\psi}_P)$. Therefore, for any such $\psi_P = \psi'_P$, $\lambda = 1$ should be an equilibrium according to step (1) in the proof of Proposition 1, which yields a contradiction with Proposition 2 since $\psi'_P < \psi_P$.

Third, we prove that if $W_A$ weakly increases as $\psi_P$ decreases and $\psi_P \leq \bar{\psi}_P$, then $R_M$

strictly decreases as $\psi_P$ decreases. Note that as $\psi_P$ decreases, Proposition 2 implies that $\lambda$ strictly increases, where "strictly" follows step (3) in the proof of Proposition 2. Therefore, Proposition 1 implies that $R_L$ strictly decreases as $\psi_P$ decreases. Therefore, since $W_A$ is given by (43), for $W_A$ to weakly increase it must be that $R_M$ strictly decreases.

Fourth, we re-formulate $R_H$ and $R_L$. Denote the total capital invested by the passive fund in $L$-firms and $H$-firms by $W_{PL}$ and $W_{PH}$, respectively. Then, using this notation, we can re-formulate $R_H$ and $R_L$ as follows.

(a) Re-formulation of $R_H$: By (3) and $x_{AH} = 0$, we have $R_H = R_0 + \frac{f_P x_P}{c_P}$. Plugging in $x_P = \frac{W_{PH}}{\frac{1}{2}P_H}$ (since there is $\frac{1}{2}$ measure of $H$-firms) and $P_H = R_H - Z_H$,

$$
\begin{aligned}
R_H &= R_0 + \frac{f_P}{c_P}\frac{2W_{PH}}{R_H - Z_H} \Leftrightarrow R_H\left(R_H - Z_H\right) = R_0\left(R_H - Z_H\right) + \frac{f_P}{c_P}2W_{PH} \\
&\Leftrightarrow R_H^2 - \left(R_0 + Z_H\right)R_H - \left(\frac{f_P}{c_P}2W_{PH} - R_0 Z_H\right) = 0.
\end{aligned}
$$

The discriminant of this quadratic equation is given by $\Delta = \left(R_0 - Z_H\right)^2 + 8\frac{f_P}{c_P}W_{PH}$. Since $\sqrt{\Delta} > R_0 - Z_H$, the smaller root for $R_H$ is smaller then $Z_H$, contradicting with $P_H = R_H - Z_H > 0$. Therefore, $R_H$ is given by the larger root:

$$
R_H = \frac{1}{2}\left(R_0 + Z_H\right) + \sqrt{\frac{1}{4}\left(R_0 - Z_H\right)^2 + 2\frac{f_P}{c_P}W_{PH}}. \tag{46}
$$

Hence,

$$
\frac{dR_H}{d\psi_P} = \frac{2}{2R_H - Z_H - R_0}\left(\frac{f_P}{c_P}\frac{dW_{PH}}{d\psi_P} + \frac{1}{c_P}W_{PH}\frac{df_P}{d\psi_P}\right). \tag{47}
$$

(b) Re-formulation of $R_L$: By (3), we have $R_L = R_0 + \frac{f_P x_P}{c_P} + \frac{f_P x_{AL}}{c_A}$. Plugging in $x_P = \frac{W_{PL}}{\frac{1}{2}P_L}$ and $x_{AL} = \frac{W_A}{\frac{1}{2}P_L}$ (since $x_{AH} = 0$ and there is $\frac{1}{2}$ measure of $H$-firms) and using derivations analogous to part (a) yields

$$
R_L = \frac{1}{2}\left(R_0 + Z_L\right) + \sqrt{\frac{1}{4}\left(R_0 - Z_L\right)^2 + \frac{f_P}{c_P}2W_{PL} + \frac{f_A}{c_A}2W_A}. \tag{48}
$$

Hence,

$$
\frac{dR_L}{d\psi_P} = \frac{2}{2R_L - Z_L - R_0}\left(\frac{f_P}{c_P}\frac{dW_{PL}}{d\psi_P} + \frac{f_A}{c_A}\frac{dW_A}{d\psi_P} + \frac{1}{c_P}W_{PL}\frac{df_P}{d\psi_P} + \frac{1}{c_A}W_A\frac{df_A}{d\psi_P}\right). \tag{49}
$$

Fifth, we prove that if $W_A$ strictly decreases as $\psi_P$ decreases, $\psi_P \leq \bar{\psi}_P$, and $Z_L - Z_H > 2e_{AL}$, then $\frac{dR_M}{d\psi_P} > 0$. Note that as noted in the third step above, as $\psi_P$ decreases, $\lambda$ strictly increases and $R_L$ strictly decreases. Denote the total capital invested by the passive fund in $L$-firms and $H$-firms by $W_{PL}$ and $W_{PH}$, respectively. Then, combining $W_A + W_P = W_A + W_{PL} + W_{PH}$ with $W = W_A + W_P$ (where the latter follows by the arguments in the second step above) yields

$$\frac{dW_A}{d\psi_P} + \frac{dW_{PL}}{d\psi_P} = -\frac{dW_{PH}}{d\psi_P}. \tag{50}$$

(When $\psi_P = \bar{\psi}_P$, we replace all derivatives with left-hand derivatives, i.e., derivatives as $\psi_P \uparrow \bar{\psi}_P$.) Note that $\frac{dW_A}{d\psi_P} > 0$ since we are focusing on the case where $W_A$ strictly decreases as $\psi_P$ decreases. Also note that $\frac{d\lambda}{d\psi_P} < 0$ together with Propositions 1 and 2 imply that $\frac{df_P}{d\psi_P} > 0$ and $\frac{df_A}{d\psi_P} > 0$. There are two scenarios to consider:

(1) Suppose that $\frac{dW_A}{d\psi_P} + \frac{dW_{PL}}{d\psi_P} \leq 0$. Then, (50) implies that $\frac{dW_{PH}}{d\psi_P} \geq 0$. Therefore, $\frac{df_P}{d\psi_P} > 0$ and (47) imply that $\frac{dR_H}{d\psi_P} > 0$, i.e., $R_H$ strictly decreases as $\psi_P$ decreases. Since we have previously established that $\frac{dR_L}{d\psi_P} > 0$, this implies that $\frac{dR_M}{d\psi_P} = \frac{1}{2}\left(\frac{dR_L}{d\psi_P} + \frac{dR_H}{d\psi_P}\right) > 0$.

(2) Suppose that $\frac{dW_A}{d\psi_P} + \frac{dW_{PL}}{d\psi_P} > 0$. Due to (50), this implies that $\frac{dW_{PH}}{d\psi_P} < 0$. Since $\frac{df_P}{d\psi_P} > 0$ and $\frac{df_A}{d\psi_P} > 0$, (47) and (49) imply that to show $\frac{dR_M}{d\psi_P} = \frac{1}{2}\left(\frac{dR_L}{d\psi_P} + \frac{dR_H}{d\psi_P}\right) > 0$, it is sufficient to prove that

$$0 < \frac{1}{2R_H - Z_H - R_0}\frac{f_P}{c_P}\frac{dW_{PH}}{d\psi_P} + \frac{1}{2R_L - Z_L - R_0}\left(\frac{f_P}{c_P}\frac{dW_{PL}}{d\psi_P} + \frac{f_A}{c_A}\frac{dW_A}{d\psi_P}\right). \tag{51}$$

Recall that $\frac{dW_A}{d\psi_P} > 0$. Combining with $c_P \geq c_A$ and $f_P \leq f_A$ (where the latter is by Proposition 1), this implies that to show (51), it is sufficient to show

$$0 < \frac{1}{2R_H - Z_H - R_0}\frac{dW_{PH}}{d\psi_P} + \frac{1}{2R_L - Z_L - R_0}\left(\frac{dW_{PL}}{d\psi_P} + \frac{dW_A}{d\psi_P}\right). \tag{52}$$

In turn, (50) and $\frac{dW_{PH}}{d\psi_P} < 0$ imply that (52) is equivalent to

$$0 < -\frac{1}{2R_H - Z_H - R_0} + \frac{1}{2R_L - Z_L - R_0} \Leftrightarrow 2R_L - Z_L < 2R_H - Z_H \Leftrightarrow 2e_{AL} < Z_L - Z_H,$$

where the equivalence follows from $R_H = R_0 + e_P$ (since $x_{AH} = 0$) and $R_L = R_0 + e_P + e_{AL}$. Since $Z_L - Z_H > 2e_{AL}$ holds by assumption, this concludes the proof of the proposition.

We now show that there exists a cutoff $\underline{\psi}_P$ such that condition $e_{AL} < \frac{1}{2}(Z_L - Z_H)$ is satisfied if $\psi_P < \underline{\psi}_P$. Since $e_{AL} = 2(R_L - R_M)$, this reduces to $\frac{1}{2}(Z_L - Z_H) > 2(R_L - R_M)$. Plugging in $Z_H = 2Z_M - Z_L$ and $R_L$ and $R_M$ from Proposition 1, this inequality becomes

$$\begin{aligned} Z_L - Z_M &> 2\left(1 + \frac{1-\eta}{\psi_A + (\lambda-1)(1-\eta)}\right)Z_L - 2\left(1 + \frac{1-\eta}{\psi_P + (\lambda-1)(1-\eta)}\right)Z_M \\ \Leftrightarrow & \quad \frac{1 + 2\frac{1-\eta}{\psi_P + (\lambda-1)(1-\eta)}}{1 + 2\frac{1-\eta}{\psi_A + (\lambda-1)(1-\eta)}} > \frac{Z_L}{Z_M}. \end{aligned} \tag{53}$$

Since $\psi_P \leq \psi_A$, the left-hand side decreases in $\lambda$. Since $\lambda \leq \lambda_{\max} = \frac{R_0}{R_0 - Z_L} - \psi_A$ by Lemma

6 in the online appendix, it is sufficient to show that (53) holds for $\lambda = \lambda_{\max}$, i.e.,

$$\psi_P < 2\frac{1-\eta}{\frac{Z_L}{Z_M}\left(1+2\frac{1-\eta}{\psi_A+(\lambda_{\max}-1)(1-\eta)}\right)-1} - (\lambda_{\max}-1)(1-\eta) \Leftrightarrow$$
$$\psi_P < \underline{\psi}_P \equiv 2\frac{1-\eta}{\frac{Z_L}{Z_M}\left(1+2\frac{1-\eta}{\psi_A+\left(\frac{R_0}{R_0-Z_L}-\psi_A-1\right)(1-\eta)}\right)-1} - \left(\frac{R_0}{R_0-Z_L}-\psi_A-1\right)(1-\eta).$$

■

**Proof of Proposition 4.**

Note that by Proposition 2, $\lambda = 1$ if $\psi_P \geq \bar{\psi}_P$ and $\lambda > 1$ if $\psi < \bar{\psi}_P$. By Proposition 1, $\lambda = 1$ if $W \geq \bar{W}$ and $\lambda > 1$ if $W < \bar{W}$. Therefore, it must be that if $\psi_P \geq \bar{\psi}_P$, then $W \geq \bar{W}$, and if $\psi_P < \bar{\psi}_P$, then $W < \bar{W}$.

We start by proving $(ii)$. Fund investors' payoff is characterized by their equilibrium rate of return $\lambda$. When $W \geq \bar{W}$, their rate of return is $\lambda = 1$ and is unaffected by $c_A$ or $c_P$. When $W \leq \bar{W}$, $\lambda$ increases with $c_A$ and $c_P$. To see this, recall that $\lambda$ is the solution to

$$W = \frac{c_A}{f_A(\lambda)}\left(R_L(\lambda) - R_M(\lambda)\right)P_L(\lambda) + \frac{c_P}{f_P(\lambda)}\left(2R_M(\lambda) - R_L(\lambda) - R_0\right)P_M(\lambda), \tag{54}$$

where $f_A(\lambda)$, $f_P(\lambda)$, $R_L(\lambda)$, $R_M(\lambda)$, $P_L(\lambda)$, and $P_M(\lambda)$ are given by Proposition 1. By Lemma 1 in the online appendix, the right-hand side decreases with $\lambda$ whenever $\psi_A \geq \psi_P$ and $c_A \leq \frac{\psi_A}{\psi_P}c_P$. Since the right-hand side increases in $c_A$ and $c_P$, it follows that $\lambda$ increases in $c_A$ and $c_P$ (otherwise, if $c_i$ increased, the right-hand side would increase both through the effect of $c_i$ and through the effect of $\lambda$, while the left-hand side would not).

We next prove $(i)$. Consider $R_L$ and $R_M$. If $W \geq \bar{W}$, they do not depend on $c_A$ or $c_P$. If $W \leq \bar{W}$, then $R_L = (1 + \frac{1-\eta}{\psi_A+(\lambda-1)(1-\eta)})Z_L$ and $R_M = (1 + \frac{1-\eta}{\psi_P+(\lambda-1)(1-\eta)})Z_M$. Since $\lambda$ increases with $c_A$ and $c_P$ as shown above, then both $R_L$ and $R_M$ decrease with $c_A$ and $c_P$, and thus $P_L$ and $P_M$ decrease with $c_A$ and $c_P$ as well.

Finally, we prove $(iii)$. Let $e_P$ ($e_{AL}$) denote the passive (active) fund manager's equilibrium effort. Then, the passive fund manager's payoff is given by

$$\begin{gathered} V_P = f_P x_P R_M - \tfrac{c_P}{2}e_P^2 = c_P e_P\left(R_M - \tfrac{1}{2}e_P\right) \\ = c_P\left(2R_M - R_L - R_0\right)\left(R_M - \tfrac{1}{2}\left(2R_M - R_L - R_0\right)\right) = \tfrac{c_P}{2}\left(2R_M - R_L - R_0\right)\left(R_L + R_0\right), \end{gathered} \tag{55}$$

and the active fund manager's payoff is given by

$$\begin{gathered} V_A = \tfrac{1}{2}\left(f_A x_{AL} R_L - \tfrac{c_A}{2}e_{AL}^2\right) = \tfrac{1}{2}c_A e_{AL}\left(R_L - \tfrac{1}{2}e_{AL}\right) \\ = c_A\left(R_L - R_M\right)\left(R_L - \tfrac{1}{2}2\left(R_L - R_M\right)\right) = c_A\left(R_L - R_M\right)R_M. \end{gathered} \tag{56}$$

If $W \geq \bar{W}$, then by Proposition 1, $R_L$ and $R_M$ do not change with $c_A$ and $c_P$. Hence, $V_P$ increases with $c_P$ and $V_A$ increases with $c_A$. ■

**Proof that $\frac{R_L}{P_L}$ decreases more than $\frac{R_M}{P_M}$ upon a decrease in $c_i$.** In this part, we show why the return $\frac{R_L}{P_L}$ declines more than $\frac{R_M}{P_M}$ when either $c_A$ or $c_P$ marginally decreases. Note that under the conditions of Proposition 3, we have $Z_L - Z_H > e_{AL} \Leftrightarrow P_H > P_L$, and hence $P_M > P_L$.

First, consider a marginal decrease in $c_A$ , and suppose that it increases the active fund's effort (in $L$-stocks) by $x$. Then the new returns are, respectively, $\frac{R_L+x}{P_L+x}$ and $\frac{R_M+x/2}{P_M+x/2}$. Then

$$\frac{d}{dx}\frac{R_M+x/2}{P_M+x/2} = \frac{1}{2}\frac{-Z_M}{(P_M+x/2)^2} > \frac{d}{dx}\frac{R_L+x}{P_L+x} = \frac{-Z_L}{(P_L+x)^2} \Leftrightarrow \frac{2Z_L}{Z_M} > \frac{(P_L+x)^2}{(P_M+x/2)^2},$$

which holds because $Z_L > Z_M$ and $P_L + x < P_M + \frac{x}{2}$ for small $x$ because $P_M > P_L$. Thus, the reduction in the return of the passive fund is smaller than the reduction in the return of the active fund.

Second, consider a marginal decrease in $c_P$ , and suppose that it increases the passive fund's effort (in both types of stocks) by $x$. Then the new returns are, respectively, $\frac{R_M+x}{P_M+x}$ and $\frac{R_L+x}{P_L+x}$. Since $Z_L > Z_M > 0$ and $P_M > P_L$, we have $\frac{d}{dx}\frac{R_M+x}{P_M+x} = \frac{-Z_M}{(P_M+x)^2} > \frac{-Z_L}{(P_L+x)^2} = \frac{d}{dx}\frac{R_L+x}{P_L+x}$, i.e., the reduction in the return of the passive fund is smaller than the reduction in the return of the active fund. ■

**Proof of Proposition 5.** Using $f_A\frac{R_L}{P_L} = \eta\left(\frac{R_L}{P_L} - \lambda\right)$ and $f_P\frac{R_M}{P_M} = \eta\left(\frac{R_M}{P_M} - \lambda\right)$, the investors' equilibrium indifference condition (12) can be written as

$$\frac{R_L}{P_L} - \frac{\psi_A}{1-\eta} = \frac{R_M}{P_M} - \frac{\psi_P}{1-\eta} = \lambda.$$

Using (23), we obtain

$$\frac{R_M}{(1-B)\,R_M - A_M} = \lambda + \frac{\psi_P}{1-\eta}. \tag{57}$$

In the region where $\lambda = 1$, the left-hand side of (57) increases in $\psi_P$, and hence a reduction in $\psi_P$ means that the left-hand side must decline. Since it is strictly decreasing in $R_M$, the equilibrium level of $R_M$ increases if $\psi_P$ decreases, proving the first statement of the proposition. To prove the second statement of the proposition, rewrite (57) as

$$R_M = \frac{A_M\left(\lambda + \frac{\psi_P}{1-\eta}\right)}{\left(\lambda + \frac{\psi_P}{1-\eta}\right)(1-B) - 1}, \tag{58}$$

which is equivalent to (24). The cross-partial derivative of (58) in the region where $\lambda = 1$ is

$$\frac{\partial^2 R_M}{\partial\left(1+\frac{\psi_P}{1-\eta}\right)\partial B} = -\frac{2A_M\left(1+\frac{\psi_P}{1-\eta}\right)}{\left(\left(1+\frac{\psi_P}{1-\eta}\right)(1-B) - 1\right)^3} < 0.$$

Hence, an increase in $B$ increases the effect of a reduction in $\psi_P$ on $R_M$. Finally, to see that the trade-off between investor well-being and governance extends to this model, note from (58) that $\frac{dR_M}{d\lambda} < 0$. Hence, for any parameter that does not enter (58), a change in this parameter increases $\lambda$ if and only if it decreases $R_M$. ■

**Proof of Proposition 6.** We first derive (25)-(26). Consider an $L$-stock. If fraction $x_P + x_{AL}$ is owned by the mutual funds, then liquidity investors must own fraction $1 - x_P - x_{AL}$. Since the stock is owned by liquidity investors with the highest valuations (lowest $Z_{kj}$) and given the uniform distribution of $Z_{kj}$ on $[Z_L - \Delta, Z_L + \Delta]$, this implies that $Z^*_{kj}$ of the marginal liquidity investor satisfies

$$1 - x_P - x_{AL} = \Pr\left(Z_{kj} < Z^*_{kj}\right) = \frac{Z^*_{kj} - (Z_L - \Delta)}{2\Delta},$$

or $Z^*_{kj} = Z_L - \Delta\left(2x_P + 2x_{AL} - 1\right)$. Since $P_L = R_L - Z^*_{kj}$, this gives (25). Similarly, consider an $H$-stock. If fraction $x_P$ is owned by the mutual funds, then liquidity investors must own fraction $1 - x_P$. This implies that $Z^*_{kj}$ of the marginal liquidity investor satisfies $1 - x_P = \Pr(Z_{kj} < Z^*_{kj}) = \frac{Z^*_{kj} - (Z_H - \Delta)}{2\Delta}$, which gives $Z^*_{kj} = Z_H - \Delta\left(2x_P - 1\right)$. Then,

$$P_H = R_H - Z_H + \Delta\left(2x_P - 1\right). \tag{59}$$

Using $P_M = \frac{P_L + P_H}{2}$ and combining (59) with (25) gives (26).

We now prove the statement of the proposition. Using the market-clearing condition,

$$\frac{R_M}{P_M} = \frac{R_M}{R_M - Z_M + \Delta\left(2x_P + x_{AL} - 1\right)} = 1 + \frac{Z_M - \Delta\left(2x_P + x_{AL} - 1\right)}{R_M - Z_M + \Delta\left(2x_P + x_{AL} - 1\right)}. \tag{60}$$

On the other hand, (18) combined with (16) for $\lambda = 1$ implies

$$1 - \eta\left(1 - \frac{P_M}{R_M}\right) = \left(1 + \psi_P\right)\frac{P_M}{R_M} \Leftrightarrow \frac{R_M}{P_M} = 1 + \frac{\psi_P}{1 - \eta}. \tag{61}$$

Equating (60) and (61), we get:

$$\frac{\psi_P}{1 - \eta} = \frac{Z_M - \Delta\left(2x_P + x_{AL} - 1\right)}{R_M - Z_M + \Delta\left(2x_P + x_{AL} - 1\right)}$$

A reduction in $\psi_P$ reduces the left-hand side, so the right-hand side must also decline. If $\Delta$ is sufficiently small, $R_M$ must increase, implying an improvement in governance. ■

**Derivation of eq. (29).** Consider the equation linking $\lambda$ and $W$.

$$W = \frac{1}{2} x_{AL} P_L + x_P P_M. \tag{62}$$

Next, consider the effort problem. For the active fund manager:

$$\max_e \phi\left(\frac{R_0+e+e_P}{P_L}, f_A\right) x_{AL} P_L - \frac{c_A}{2} e^2,$$

so the FOC gives:

$$\frac{\partial}{\partial r}\phi\left(\frac{R_0+e_{AL}+e_P}{P_L}, f_A\right) x_{AL} = c_A e_{AL}.$$

Similarly, the FOC for the passive fund manager is:

$$\frac{\partial}{\partial r}\phi\left(\frac{R_0+\frac{1}{2}e_{AL}+e_P}{P_M}, f_P\right) x_P = c_P e_P.$$

Next, by (63)-(64) in the online appendix, $e_{AL} = 2(R_L - R_M)$ and $e_P = 2R_M - R_L - R_0$. Combining these with FOCs gives

$$\begin{aligned} x_{AL} &= \frac{c_A e_{AL}}{\frac{\partial}{\partial r}\phi\left(\frac{R_L}{P_L}, f_A\right)} = \frac{2c_A(R_L - R_M)}{\frac{\partial}{\partial r}\phi\left(\frac{R_L}{P_L}, f_A\right)} \\ x_P &= \frac{c_P e_P}{\frac{\partial}{\partial r}\phi\left(\frac{R_M}{P_M}, f_P\right)} = \frac{c_P(2R_M - R_L - R_0)}{\frac{\partial}{\partial r}\phi\left(\frac{R_M}{P_M}, f_P\right)}. \end{aligned}$$

Plugging these into (62) yields (29). ■