informs
https://pubsonline.informs.org/journal/mnsc

MANAGEMENT SCIENCE
Vol. 71, No. 1, January 2025, pp. 35–58
ISSN 0025-1909 (print), ISSN 1526-5501 (online)

Distortions Caused by Lending Fee Retention

Travis L. Johnson,[a,*] **Gregory Weitzner**[b]

[a] McCombs School of Business, The University of Texas at Austin, Austin, Texas 78712; [b] Desautels Faculty of Management, McGill University, Montreal, Quebec H3A1G5, Canada

*Corresponding author

Contact: travis.johnson@mccombs.utexas.edu, https://orcid.org/0000-0003-4475-6697 (TLJ); gregweitzner@gmail.com, https://orcid.org/0000-0002-1022-3932 (GW)

Received: April 26, 2021
Revised: June 9, 2022; May 4, 2023
Accepted: May 9, 2023
Published Online in Articles in Advance: March 25, 2024

https://doi.org/10.1287/mnsc.2021.01390

Abstract. Some mutual funds retain a fraction of securities lending income by employing in-house lending agents. In a model with heterogeneous investors and endogenous delegation to mutual funds, we show that a subset of funds optimally engages in lending fee retention and as a result, overweights high lending fee stocks that endogenously underperform. We find empirical evidence consistent with our model's predictions; active mutual funds we identify as fee retainers invest more in high-fee stocks and underperform relative to both nonretaining and nonlending funds. We also show that fee retention helps explain the negative relation between lending fees and future fee-inclusive stock returns.

History: Accepted by Lukas Schmid, finance.
Supplemental Material: The online appendix and data files are available at https://doi.org/10.1287/mnsc.2021.01390.

Keywords: finance • asset pricing • financial institutions • investment • short selling • mutual funds

1. Introduction

Expense ratios of mutual funds and exchange traded funds (ETFs) have declined substantially since 2000.[1] Over the same period, other revenue streams increased for asset managers, including from securities lending.[2] For example, we find that active U.S. equity mutual funds generated a total of $609 million in gross securities lending revenue in 2017, equivalent to 7.7% of total management fees. Fund managers allocate a fraction of lending fees to pay the cost of lending programs, including a revenue split with lending agents, and return the rest to fund investors. In some cases, lending agents are affiliated with the fund manager, meaning the revenue split allows fund families to retain a fraction of securities lending income.

Until recently, the extent and effects of fee retention in securities lending programs were difficult to evaluate because fund managers were only required to disclose the net lending revenues they return to investors, not the gross lending revenues they generated. However, this changed when the Securities and Exchange Commission (SEC) imposed the Investment Company Reporting Modernization (ICRM) rules, which require that mutual funds and ETFs disclose gross lending revenues, a cost breakdown, and the identity of their lending agent starting with fiscal year 2017. Using the new ICRM disclosures, we show that fee retention is prevalent. Among active U.S. equity mutual funds, 77.4% of gross lending revenue is returned to investors, with the other 22.6% going to costs. Furthermore, many large asset management companies (including BNY Mellon, BlackRock, Fidelity, and State Street) use affiliated lending agents that collect an average of 8.8% of gross lending revenue.

Motivated by securities lending fee retention that we observe among certain fund managers, we develop a model in which (1) some mutual funds choose to retain a fraction of lending fees so that they can lower their management fees and attract naive investors; (2) funds that retain lending fees endogenously prefer lending fees over dollar-equivalent stock returns, despite future flows being sensitive to fund performance; and 3) these practices distort fund portfolio choice, performance, and asset prices. We then present empirical evidence that as predicted by our model, fee-retaining funds overweight high-fee stocks, underperform, and drive down equilibrium lending fees.

We formally analyze the role of lending fee retention in a model with heterogeneous agents and endogenous asset prices, lending fees, mutual fund management fee schedules, and mutual fund assets under management (AUM). Our model proceeds in three stages. First, mutual fund managers announce their management fees and lending fee retention rates with the goal of maximizing AUM. Second, delegating investors ("delegators") choose which mutual fund to invest in based on their expectations of returns net of management fees and including any lending fees returned to the fund. Third, mutual funds, hedge funds, and retail investors trade in the stock market.

The first main friction is a biased valuation by retail investors that cannot lend their shares. When their valuation is sufficiently optimistic, they hold and do not lend all shares outstanding, the necessary condition in our model and others (e.g., Blocher et al. 2013, Weitzner 2023) for positive lending fees. Without fee retention, any (endogenous) increase in lending fees is exactly offset by a decrease in expected returns.

The second main friction in our model is that some delegators naively believe that mutual funds make the same portfolio choices—and therefore, have the same gross performance—regardless of their lending fee retention rate. A subset of mutual funds, which we refer to as "fee retainers," caters to these naive delegators by offering lower management fees supplemented by higher lending fee retention, whereas the remaining funds cater to rational delegators by offering a higher management fee and no lending fee retention. Naive delegators perceive fee retainers as cheaper without any downside because they incorrectly believe fee retainers will have the same weight in high-fee stocks as nonretainers.

After attracting investments from delegators, fund managers choose portfolios to maximize current retained lending fee income plus the expected continuation value of future AUM, which depends on an exogenous flow-performance sensitivity. When choosing whether to invest in high-fee stocks, fee retainers weigh the benefits of increased revenue today against the costs of future outflows because of poorer performance. We show that under natural parametric restrictions, fee retainers prefer $1 in lending fees to $1 in dividends or capital gains, despite internalizing the effect of their performance on future flows. Fee retainers, therefore, buy stocks with positive lending fees and lend these shares to hedge funds that open short positions. This side transaction between hedge funds and fee retainers drives down equilibrium lending fees and fee-inclusive expected returns.

A natural question is why naive delegators do not understand that fee retention affects portfolio choices. One potential explanation is that naive delegators believe poor performance is from bad luck—the underperformance we document is small relative to the noise in realized returns—instead of fee retention. Another related possibility is the opacity of the stock lending market; until recently, mutual fund managers were not required to disclose how much securities lending income they retained, meaning delegators could only make a noisy inference about which funds were fee retainers. Even after the new disclosures, fee retention information is buried in long annual reports, and thus, it may not be salient to delegators.

Our model makes four main predictions, all of which are supported by empirical evidence presented here and in prior research. First, some mutual funds use retained lending fees to reduce their management fees and cater to naive investors. Consistent with this prediction, we show that there is a strong negative relation between management fees and lending agent fees among funds we identify as fee retainers, namely those funds that pay an affiliated lending agent an above-median fraction of lending income.

Our model's second prediction is that fee retainers overweight stocks with high lending fees ("special stocks"). Consistent with this prediction, we find evidence that fee retainers have higher average portfolio weights in special stocks compared with other funds.[3] Related results from the literature also support our prediction. Prado (2015) finds that institutional investors increase their ownership when a stock's lending fee increases. Similarly, Evans et al. (2017) shows that lending funds increase their positions relative to nonlending funds when lending fees increase, and Blocher and Whaley (2016) shows that ETFs that lend shares tilt their portfolios toward special stocks. Our empirical evidence builds upon these results by showing they only apply to a subset of lending funds—specifically those we identify as fee retainers—and are absent in other active lending funds.

Our third prediction is that lending fees negatively predict future returns, even after returns are adjusted to include lending fees (the "lending fee anomaly"). Jones and Lamont (2002), Ofek et al. (2004), Muravyev et al. (2023), and Drechsler and Drechsler (2021) find empirical evidence supporting this prediction.[4] We propose an explanation for this anomaly: that the incentives of fee retainers drive down equilibrium lending fees and fee-inclusive expected returns. This price impact in securities lending markets is plausible given that the fee-retaining fund management companies we identify, which may be only a subset of all fee retainers, are significant players in these markets. Consistent with this price impact channel, we find some evidence that the negative relation between lending fees and monthly returns is stronger among stocks with higher fee retainer ownership. Compared with alternative explanations, our model has the advantage of jointly explaining the poor fee-inclusive performance of special stocks and the puzzle of why institutional investors choose to own and lend these stocks rather than selling them.

Our fourth main prediction is that fee retainers deliver worse performance to their investors. Consistent with this prediction, we show that fee retainers have lower alphas, net of management fees and including lending income passed back to the fund, although this result has only marginal statistical significance. Our results build upon the evidence in Evans et al. (2017), which shows that lending mutual funds underperform nonlending funds, by showing that the underperformance is concentrated among lenders we identify as fee retainers. The underperformance of fee retainers relative to nonlending funds may initially be surprising because holding portfolio positions constant, securities lending strictly increases the performance of a fund, meaning that nonlending funds appear to be leaving money on the table. However, this underperformance is a natural consequence of fee retainers' distorted portfolio choices in our model.

Overall, our paper offers a unified explanation for several seemingly unrelated puzzles in asset pricing, securities lending, and asset management while also developing and testing new predictions related to our theory.

2. Retention of Securities Lending Income by Asset Managers

In October 2016, the SEC implemented the ICRM reform, which among other things, was designed to increase the transparency of mutual fund securities lending activities.[5] This reform requires that mutual funds and ETFs disclose annual gross securities lending income and expenses in their prospectuses as outlined in Figure 1, starting with fiscal year 2017. While the proposal was being considered, several fund management companies and their legal representatives sent letters to the SEC opposing increased transparency. For instance, Invesco sent a letter to the SEC stating that

> [w]e also believe the proprietary securities lending information required by the proposed changes to Regulation S-X should also remain non-public. We believe public disclosure of any of this information would be confusing to investors and potentially harmful to funds and the interests of their shareholders due to the complex and proprietary nature of this information. Therefore we believe that public disclosure of these items is neither necessary nor appropriate in the public interest or for the protection of investors (Invesco Advisor's comment letter on SEC ICRM File No. S7-08-15, p. 5).

Similarly, Fidelity stated:

> Ultimately, we believe shareholders will evaluate the funds' results through the total incremental income and return from securities lending activities, not the terms of the fee split. We believe that focusing attention on the terms of the revenue split, which funds negotiate with third-party lending agents, could have the unintended consequence of negatively impacting funds' ability to negotiate competitive services and rates (Fidelity Investment's comment letter on SEC ICRM File No. S7-08-15, p. 5).

Interestingly, we find that all Fidelity funds use an affiliated lending agent, Fidelity Services Company, and not a third-party agent.

Our paper takes advantage of the newly available securities lending income data that funds began reporting in their prospectuses for 2017, which were released in 2018. We collect these data by hand from prospectuses obtained via SEC Electronic Data Gathering, Analysis, and Retrieval system (EDGAR) and merge them with the Center for Research in Security Prices (CRSP) mutual fund database, as detailed in Appendix A.

2.1. Securities Lending Data and Summary Statistics

Our sample contains 542 open-end active U.S. equity mutual funds with aggregate summary statistics for their disclosures presented in Table 1. We focus on active U.S. equity mutual funds because they have the

Figure 1. Sample Disclosure from ICRM Reforms

SECURITIES LENDING ACTIVITIES

Gross income from securities lending activities	$ ________
Fees and/or compensation for securities lending activities and related services	
Fees paid to securities lending agent from a revenue split	$ ________
Fees paid for any cash collateral management service (including fees deducted from a pooled cash collateral reinvestment vehicle) that are not included in the revenue split	$ ________
Administrative fees not included in revenue split	$ ________
Indemnification fee not included in revenue split	$ ________
Rebate (paid to borrower)	$ ________
Other fees not included in revenue split (specify)	$ ________
Aggregate fees/compensation for securities lending activities	$ ________
Net income from securities lending activities	$ ________

Note. This figure presents the sample disclosure form provided by the SEC to fund managers as part of the ICRM reforms that requires funds disclose gross income from securities lending activities, the costs associated with those activities, and the net income received by the fund.

Table 1. Aggregate Uses of Lending Income

Line item	$	Gross (%)
Gross income from securities lending	608,542,208.0	
Fees for securities lending agent	53,294,108.0	8.8
Fees for cash collateral management	15,972,773.0	2.6
Administrative fees	729,715.0	0.1
Indemnification fees	0.0	0.0
Other fees	3,527.0	0.0
Rebate	67,774,832.0	11.1
Aggregate fees/compensation for securities lending	137,774,944.0	22.6
Net income to fund	470,767,264.0	77.4

Note. This table contains aggregate values of securities lending revenue, expenses, and net income for 542 active equity mutual funds based on ICRM disclosures for 2017.

most discretion over their portfolio choice, making the potential impact of fee retention more pronounced. These funds generated just over $600 million (mm) in gross income from securities lending during 2017, of which 77.4% is returned to the funds, whereas 8.8% goes to lending agents and 2.6% pays for cash collateral management. These costs are not included in management fees or expense ratios.

The remaining 11.1% of securities lending income is accounted for by "Rebate (paid to borrower)," which represents interest payments returned to borrowers. Lending fees are defined as the difference between short-term interest rates and rebate rates, so high lending fees are by definition negative rebate rates. Some funds appear to account for these as negative "Rebates" as costs, whereas some only report positive rebates as positive costs, and others net everything out and report positive gross lending revenue with zero rebates. We, therefore, use reported gross lending revenue minus reported total rebates as a standardized measure of gross lending income throughout our remaining analysis.

We obtain monthly mutual fund returns, quarterly holdings, and quarterly fund characteristics from CRSP, and we hand collect ICRM securities lending disclosures from fund prospectuses on EDGAR. We also collect historical NSAR filings from EDGAR to determine historical lending behavior of funds.[6] Many funds in CRSP have multiple share classes, so we aggregate fund characteristics and returns by weighting each share class within a fund by its total net assets (TNA). We also obtain stock returns, firm characteristics, and analyst forecasts from CRSP, Compustat, and Institutional Brokers' Estimate System. Finally, we obtain stock-level lending fee data from Markit. See Appendix A for a detailed description of our data collection and variable construction.

Because we only have detailed fund-level securities lending data in 2017, we face a trade-off in extending our sample backward to include years prior to 2017. On one hand, fee retention behavior is likely to be persistent, and additional years increase the power of our tests, which is especially important when examining fund performance. On the other hand, our 2017 identification of fee retainers is likely to be less reliable the more we expand our sample back in time.[7] With this trade-off in mind, the primary sample for our empirical analysis includes data from 2010 to 2017.

In addition to our main sample, which includes only funds making ICRM disclosures in 2017, we also collect and study a broader sample of all CRSP mutual funds. Because our variables of interest come from the recent ICRM disclosures, they condition on survival through 2017. To make our broader sample comparable, we only include funds in CRSP that also survived through 2017.

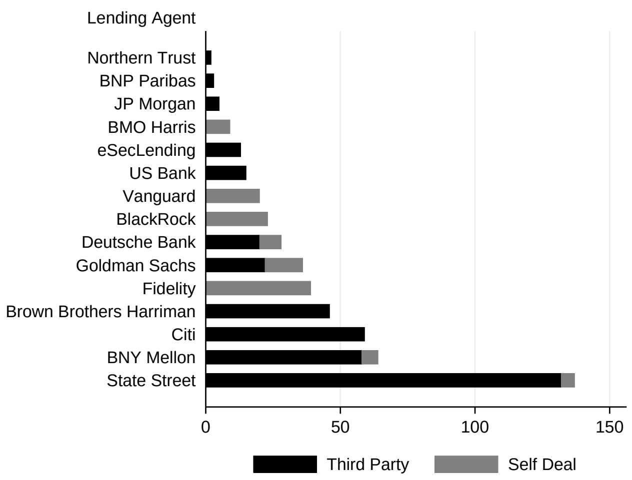
2.2. Evidence of Lending Fee Retention

A critical assumption in our model is that fund management companies are able to capture a fraction of securities lending income if they choose to do so. There are at least four potential channels through which this could occur. The first is by lending shares to an affiliated broker and paying the broker an above-market rebate rate (equivalent to charging a below-market lending fee). The second is by using an affiliated money market fund.[8] Greppmair et al. (2024) and Honkanen (2024) raise an intriguing third possibility: that securities lending programs can generate private information about short-selling activity, which active mutual funds can use to form portfolio decisions.[9]

The fourth channel through which fund management companies can profit from securities lending is by employing an affiliated lending agent and paying that agent an above-cost fraction of lending revenue. Because the new ICRM rules require the disclosure of each fund's lending agent but not their primary share borrowers or cash collateral manager, our empirical measure proxies for this channel of lending fee retention.

Figure 2 presents the lending agents used in our main sample. Several lending agents are purely used as third-party (e.g., Citi) or affiliated (e.g., Fidelity) agents, whereas others act as agents for both third parties and affiliated funds (e.g., State Street). We find that 124 active equity mutual funds, 23% of our sample, employ an affiliated lending agent.

Figure 2. Market for Lending Agents

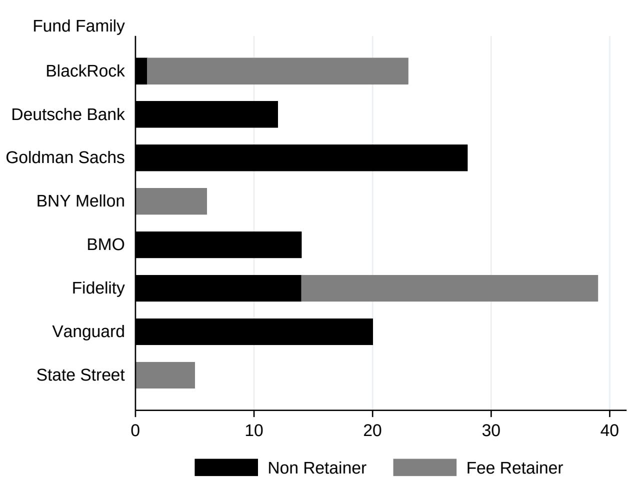


Notes. This figure shows the number of funds using each lending agent, with third-party funds tallied in black and affiliated funds tallied in grey. Our sample includes 542 active U.S. equity mutual funds with 2017 ICRM data.

Using data from ICRM disclosures, we define an indicator "fee retainer" that identifies funds we can cleanly categorize as profiting from fee retention. Fee retainer equals one if the fund uses an affiliated lending agent and its lending agent fees, scaled by gross lending income, exceed the median (10.0%). Figure 3 shows the frequency of fee retainer among funds with available affiliated lending agents. The fund management companies that operate these funds are BNY Mellon, BlackRock, Fidelity, and State Street. Undoubtedly, other asset managers retain and profit from securities lending revenue in and out of our sample, but we focus on this stricter definition to cleanly isolate the effects we study.

Table 2 provides summary statistics for the cross-section of how funds allocate fees from securities

Figure 3. Frequency of Fee Retention by Fund Family



Note. This figure shows the frequency of fee retainers across fund families that have affiliated lending agents, with funds that are nonretainers tallied in black and funds that are fee retainers tallied in grey.

lending. Panel A includes the 542 active equity mutual funds in our main sample. For each fund, we use CRSP holdings data and lending fee rates from Markit (see Appendix A for details) to compute special weight, the percentage of the funds' portfolio allocated to stocks that are "special" on the lending market in that they have an abnormally high lending fee. Markit includes a daily cost to borrow score (DCBS), and we consider any DCBS above one as special.[10] We find that the average special weight in the fourth quarter of 2017 among ICRM funds is 187 basis points (bps), with values above 670 bps for the top 5% of funds.

We also examine cross-sectional variations in the costs of securities lending as a fraction of the gross lending revenue in Table 2. The average fund pays out 17.4% of its gross lending income in fees and expenses. There are also significant differences across funds in cost allocation. Some funds pay lending agents as much as 20% of gross lending revenue, and others have cash collateral management fees totaling 25% of lending revenues.

Panel B of Table 2 includes all fee retainers in our sample. On average, fee retainers have similar age and AUM as our broader sample but are part of larger fund families. They also invest slightly more in special stocks and have lower expense ratios, both of which we revisit later in regressions with controls.

As shown in panel A of Table 2, the average gross income yield and cost of lending in our sample are approximately 6 and 1 bp of TNA, respectively. Although this may appear small, stocks with high lending fees tend to have smaller market capitalizations and lower weights in funds' benchmark portfolios. Funds can, therefore, substantially overweight high lending fee stocks relative to their benchmark (e.g., holding 1.0% of their portfolio in high fee stocks versus 0.5% in the benchmark), even when the retained lending income is a small portion of funds' TNAs. Our mechanism only requires that the marginal trade-off of replacing a low lending fee stock with a high lending fee stock benefits the family as a whole.

Together, Tables 1 and 2 and Figure 2 suggest that lending fee retention is prevalent. We now incorporate this practice into a theoretical model to explore its effect on asset allocation, portfolio choice, fund performance, and asset prices.

3. Model

We model the impact of lending fee retention on equilibrium mutual fund AUM, asset pricing, and fund performance. As an overview, the model proceeds in four stages:

$t = -1$: mutual funds announce management fees and lending fee retention rates;

$t = 0$: delegators choose which mutual funds to invest in;

Table 2. Fund-Level Uses of Lending Fees

Line item	Mean	SD	P5	P25	P50	P75	P95
Panel A: Active U.S. equity mutual funds (N = 542)							
Gross income yield (bps TNA)	5.6	24.8	0.0	0.5	1.7	5.1	16.4
Cost of lending (bps of TNA)	0.9	4.5	0.0	0.1	0.3	0.8	2.5
Net income yield (bps TNA)	4.6	20.4	0.0	0.4	1.5	4.3	13.9
Cost of lending (% gross)	17.4	11.3	6.2	10.5	15.0	20.2	34.3
Lending agent fees (% gross)	11.2	6.7	0.0	8.8	10.0	14.9	20.0
Cash collateral fees (% gross)	5.7	10.9	0.0	0.0	1.2	6.9	24.6
Other fees (% gross)	0.2	0.6	0.0	0.0	0.0	0.0	1.7
Special weight (bps)	187.4	312.0	0.0	10.7	94.2	223.2	670.7
Expense ratio (bps TNA)	91.3	36.6	27.0	67.1	97.0	115.0	148.2
TNA ($mm)	2,684	6,552	15	153	626	2,208	10,896
Family TNA ($bn)	523	1,081	3	24	100	431	2,283
Turnover (%)	60.3	48.7	8.0	24.0	48.0	84.0	152.0
Fund age	16.6	11.4	2.0	8.3	16.7	22.3	34.7
Panel B: Fee retainers (N = 58)							
Gross income yield (bps TNA)	4.2	6.2	0.1	0.6	2.4	5.1	16.8
Cost of lending (bps of TNA)	0.8	1.2	0.0	0.1	0.3	0.8	3.5
Net income yield (bps TNA)	3.5	5.0	0.1	0.4	2.1	4.3	13.3
Cost of lending (% gross)	17.5	6.8	10.4	11.0	17.4	21.2	32.6
Lending agent fees (% gross)	13.7	3.7	10.0	10.0	13.8	15.3	20.0
Cash collateral fees (% gross)	3.3	5.5	0.0	0.0	0.4	5.0	18.9
Other fees (% gross)	0.5	0.7	0.0	0.0	0.0	0.9	2.2
Special weight (bps)	191.3	171.6	0.0	63.7	134.4	319.1	522.7
Expense ratio (bps TNA)	80.9	44.3	3.0	46.1	91.8	116.9	138.1
TNA ($mm)	2,743	6,660	2	180	773	2,279	11,499
Family TNA ($bn)	1,454	812	250	459	1,383	2,283	2,283
Turnover (%)	56.9	43.1	8.0	15.0	48.0	85.0	154.0
Fund age	16.8	11.3	1.9	3.9	18.5	25.4	34.8

Notes. These tables presents fund-level descriptive statistics for the uses of lending fees. Securities lending income data are measured annually, whereas other mutual fund characteristics corresponds to the fourth quarter of 2017. See Appendix A for detailed descriptions of the variables. Our sample for panel A consists of 542 active U.S. equity mutual funds with 2017 ICRM data. Panel B focuses on the subset of funds that use an affiliated lending agent and pay that agent more than the median lending agent (fee retainers). P, percentile; SD, standard deviation.

t = 1: mutual funds, along with hedge funds and retail investors, choose portfolios optimally such that both the stock market and the lending market clear;

$t = 2$: stocks liquidate, and investors receive final payoffs.

Our model features two key trade-offs for fund managers. First, using lending fee retention to reduce management fees makes the fund more attractive to one type of delegator but less attractive to another. Second, if they choose to retain lending fees, overweighting high lending fee stocks directly increases present revenue, but it reduces their expected net performance and because of flow-performance sensitivity, their future AUM.

Our goal is to present the simplest set of assumptions that delivers these two trade-offs while endogenizing mutual fund fee schedules, delegation decisions, portfolio choices, stock prices, and lending fees. Some of these assumptions appear stark, but they are meant to stand in for dynamics or microfoundations that we omit for parsimony.

3.1. Stock Market Structure

Two stocks i = 1, 2 liquidate at t = 2 for $\tilde{V}_1$ and $\tilde{V}_2$, where

$$\begin{bmatrix} \tilde{V}_1 \\ \tilde{V}_2 \end{bmatrix} \sim N\left(\begin{bmatrix} \mu_1 \\ \mu_2 \end{bmatrix}, \begin{bmatrix} \sigma_1^2 & \rho\sigma_1\sigma_2 \\ \rho\sigma_1\sigma_2 & \sigma_2^2 \end{bmatrix}\right). \tag{1}$$

Each stock has quantity $Q_i > 0$ shares outstanding and trades at $t = 1$ for equilibrium prices p_i.

Negative investor demands for shares represent short selling, which requires borrowing shares from investors with long positions. Short sellers pay lending fees to borrow the shares at rates $f_i \geq 0$, where share lenders receive $f_i p_i$ for each share they are long, whereas share borrowers pay $f_i p_i$ for each share they are short. Lending fees are paid at t = 1, making the cash flows from potential positions in Table 3.

Lending fees f_i, like prices p_i, are endogenously determined at $t = 1$.

3.2. Asset Management Market Structure

A continuum of mutual fund managers with mass 1 competes for the business of a continuum of delegators

Table 3. Cash Flows from Available Trades

Trade	Cash flow at $t=1$	Cash flow at $t=2$	Net return
Long without lending	$-p_i$	$\tilde{V}_i$	$\frac{\tilde{V}_i}{p_i}-1$
Long with lending	$-p_i$	$\tilde{V}_i+p_if_i$	$\frac{\tilde{V}_i}{p_i}+f_i-1$
Short	p_i	$-\tilde{V}_i-p_if_i$	$-\frac{\tilde{V}_i}{p_i}-f_i+1$

that allocate a total of D dollars. First, at $t=-1$, each fund manager m announces management fee rate $M_m \in [0,1]$, paid as a proportion of initial AUM, and lending fee retention rate $K_m \in [0,1]$, paid as a proportion of lending income the fund receives. Next, at $t=0$, each delegator d chooses which fund manager to allocate their funds to.

Mutual fund managers choose fees M_m and K_m that maximize their initial AUM given delegators' strategies. There are two types of delegators investing in mutual funds: rational and naive. Rational delegators are aware that fund managers' choice of K_m affects their subsequent portfolio choices, whereas naive delegators incorrectly assume fund managers do not consider retained lending fees when making portfolio choices.[11] Naive delegators manage νD dollars, whereas rational delegators manage $(1-\nu)D$. At $t=0$, each group of delegators allocates their capital equally across all funds (or the single fund) that earn the highest net expected return after management fees M_m and lending fee retention K_m:[12]

$$\text{Net Expected Return}_m = \hat{w}'_m(\bar{r}+(1-K_m)f)-M_m, \quad (2)$$

where $\hat{w}_m$ are the weights the delegator forecasts m will have in each stock, $\bar{r}$ contains expected returns, and f contains each stock's lending fee.

3.3. Types of Stock Market Investors

After delegators allocate funds at $t=0$, stock market investors allocate capital between the two stocks and a risk-free asset paying 0% interest at $t=1$. All groups contain enough investors so that each individual is a price taker. We summarize the key features of these groups in Table 4.

We use subscripts *mf*, *hf*, and *ri* for variables expressing totals across the entire investor group, whereas the subscript m represents an individual mutual fund.

Table 4. Restrictions by Investor Type

Investor type	Lend?	Short?	Biased?
Mutual funds (*mf*)	Yes	No	No
Hedge funds (*hf*)	Yes	Yes	No
Retail investors (*ri*)	No	No	Yes

3.3.1. Mutual Funds. The first group of stock market investors is mutual funds, which together have D in AUM, allocated across funds as described. These funds lend any shares they own with positive lending fees $f_i>0$.[13] These funds are not allowed to short, meaning their portfolio weights must be nonnegative. They have operating costs, also proportional to AUM, equal to $C>0$. Each fund m's final payoff $\Pi_{m,2}$ combines their management fees, retained lending income, operating costs, and a multiple of their final AUM $A_{m,2}$:

$$\Pi_{m,2}(w) = \underbrace{M_m \cdot A_{m,1}}_{\text{Management fees}} + \underbrace{K_m \cdot w'f \cdot A_{m,1}}_{\text{Retained lending fees}} - \underbrace{C \cdot A_{m,1}}_{\text{Costs}} + \underbrace{\psi A_{m,2}(w)}_{\text{Continuation value}}, \quad (3)$$

where $A_{m,1}$ is their initial AUM and ψ is the exogenous continuation value to the mutual fund for each dollar of AUM at $t=2$.[14]

Funds want higher returns because they increase their final AUM both directly and by attracting new inflows. We model delegators' flow-performance sensitivity in reduced form by assuming that each fund's AUM evolves according to

$$A_{m,2}(w) = A_{m,1}[1+\text{Net Return}_m(w)(1+\lambda)] \quad (4)$$

$$\text{Net Return}_m(w) = w'_m(r+(1-K_m)f)-M_m, \quad (5)$$

where r contains realized stock returns and $\lambda>0$ represents flow-performance sensitivity.[15]

When choosing their stock portfolios, mutual funds have constant absolute risk aversion (CARA) preferences over final payoffs normalized by initial AUM $\frac{\Pi_{m,2}}{A_{m,1}}$, meaning that fund m's optimization problem is

$$w_m = \arg\max_w -\mathbb{E}\left(e^{-\gamma\frac{\Pi_{m,2}(w)}{A_{m,1}}}\right), \quad (6)$$

where γ is their risk aversion.[16] We normalize final payoffs by $A_{m,1}$ so that funds with larger $A_{m,1}$ hold larger positions despite having CARA utility and to separate the allocation attraction problem (choosing M_m and K_m to maximize $A_{m,1}$) from the portfolio optimization problem (choosing w_m to maximize expected utility over possible $A_{m,2}$ given $A_{m,1}$).

3.3.2. Hedge Funds. The second group of investors is hedge funds, which as a group, have $A_{hf,1}$ in AUM, lend shares when they are long, and are allowed to short. We assume hedge funds choose portfolio weights w_{hf} to maximize the expected CARA utility of their returns, including the full amount of lending fees:[17]

$$w_{hf} = \arg\max_w -\mathbb{E}(e^{-\gamma(1+w'(r+f))}). \quad (7)$$

3.3.3. Retail Investors. The final group is retail investors, which together manage $A_{ri,1}$ capital and directly trade stocks rather than delegating to asset managers. They do not lend their shares, do not short, and have CARA utility over returns. The unique feature of retail investors is that they believe the mean of $\tilde{V}_1$ is $\mu + b$ rather than μ while being unbiased about $\tilde{V}_2$. Retail investors' optimal portfolio weights, therefore, satisfy

$$w_{ri} = \arg\max_{w} -\mathbb{E}_b(e^{-\gamma(1+w'r)}), \tag{8}$$

where $\mathbb{E}_b$ indicates their biased expectation.

Each group g's portfolio weights translate into quantities of shares demanded as follows:

$$q_{g,i}(p,f) = \frac{A_{g,1} w_{g,i}(p,f)}{p_i}, \tag{9}$$

where $A_{g,1}$ is group g's AUM at $t = 1$ and i is the stock index.

3.4. Equilibrium

Equilibrium at $t = 1$ is defined by stock prices p and lending fees f such that both the stock market and the lending market clear. Equilibrium at $t = 0$ is defined by the allocation choices of rational and naive delegators that maximize their net expected return, as defined in Equation (2), given their beliefs, funds' fee schedules, and anticipated stock prices and lending fees at $t = 1$. Equilibrium at $t = -1$ is defined by the fee schedules M_m and K_m offered by each mutual fund that maximize their initial AUM given delegators' allocations and anticipated stock prices and lending fees at $t = 1$.

At $t = 1$, stock market clearing requires that the sum of demands for all mutual funds, hedge funds, and retail investors equals the number of shares outstanding. Lending market clearing requires that for each stock, either the lending fee f_i equals zero or the sum of negative demands by short sellers equals the sum of positive demands by share lenders. Because hedge funds and mutual funds lend all their shares when $f_i > 0$ and mutual funds cannot short, stock i's total supply of lendable shares when $f_i > 0$ equals

$$\text{Lendable supply}_i = q_{hf,i} \cdot \mathbb{1}(q_{hf,i} > 0) + \int_m q_{m,i}. \tag{10}$$

Because only hedge funds short, demand for share borrowing equals

$$\text{Borrowing demand}_i = -q_{hf,i} \cdot \mathbb{1}(q_{hf,i} < 0). \tag{11}$$

Combining Equations (10) and (11), we have that when lending fees are positive, lending supply equals lending demand when the total positions of hedge funds and mutual funds equal zero, implying that all shares outstanding are held by retail investors. Hence, the market clearing conditions are

$$q_{hf,1} + \int_m q_{m,1} + q_{ri,1} = Q_1, \tag{12}$$

$$q_{hf,2} + \int_m q_{m,2} + q_{ri,2} = Q_2, \tag{13}$$

$$q_{ri,1} = Q_1 \text{ or } f_1 = 0, \tag{14}$$

$$q_{ri,2} = Q_2 \text{ or } f_2 = 0. \tag{15}$$

To simplify notation, we assume $\mu_1 = \mu_2 = \mu$, $\sigma_1 = \sigma_2 = \sigma$, and $\rho = 0$. Our main results hold without these assumptions.

3.4.1. Frictionless Benchmark. We start by computing the equilibrium when the two frictions, retail investors' bias and delegators naivety about fee retention, are shut down ($b = 0$ and $\nu = 0$). In this case, all mutual funds cater to the rational delegators, and we have a standard mean-variance setting with the following solution. Proofs are in Appendix B.

Theorem 1 (Frictionless Equilibrium). *When $b = 0$ and $\nu = 0$, the capital asset pricing model (CAPM) holds, and equilibrium prices are given in Table 5, where $A \equiv A_{hf} + A_{ri} + \frac{D}{\Gamma}$.*

Because all investors agree on the stocks' normally distributed moments and have CARA utility, the CAPM holds. The usual CAPM results, therefore, apply, with investors all holding the market portfolio, which is the maximum Sharpe ratio portfolio. Fee retention policy is irrelevant because lending fees are zero in equilibrium, and so, all mutual funds set management fees equal to costs.

3.4.2. Biased Retail Investors. We next consider the equilibrium when retail investors' bias is nonzero ($b \neq 0$) but no delegators are naive ($\nu = 0$). In this case, stock 2's equilibrium remains unchanged from the frictionless benchmark. However, because of the short sale and lending constraints, a different equilibrium occurs for stock 1 in three distinct regions of b, as described by Theorem 2. The left panels in Figure 4 illustrate this equilibrium for a specific parameterization.

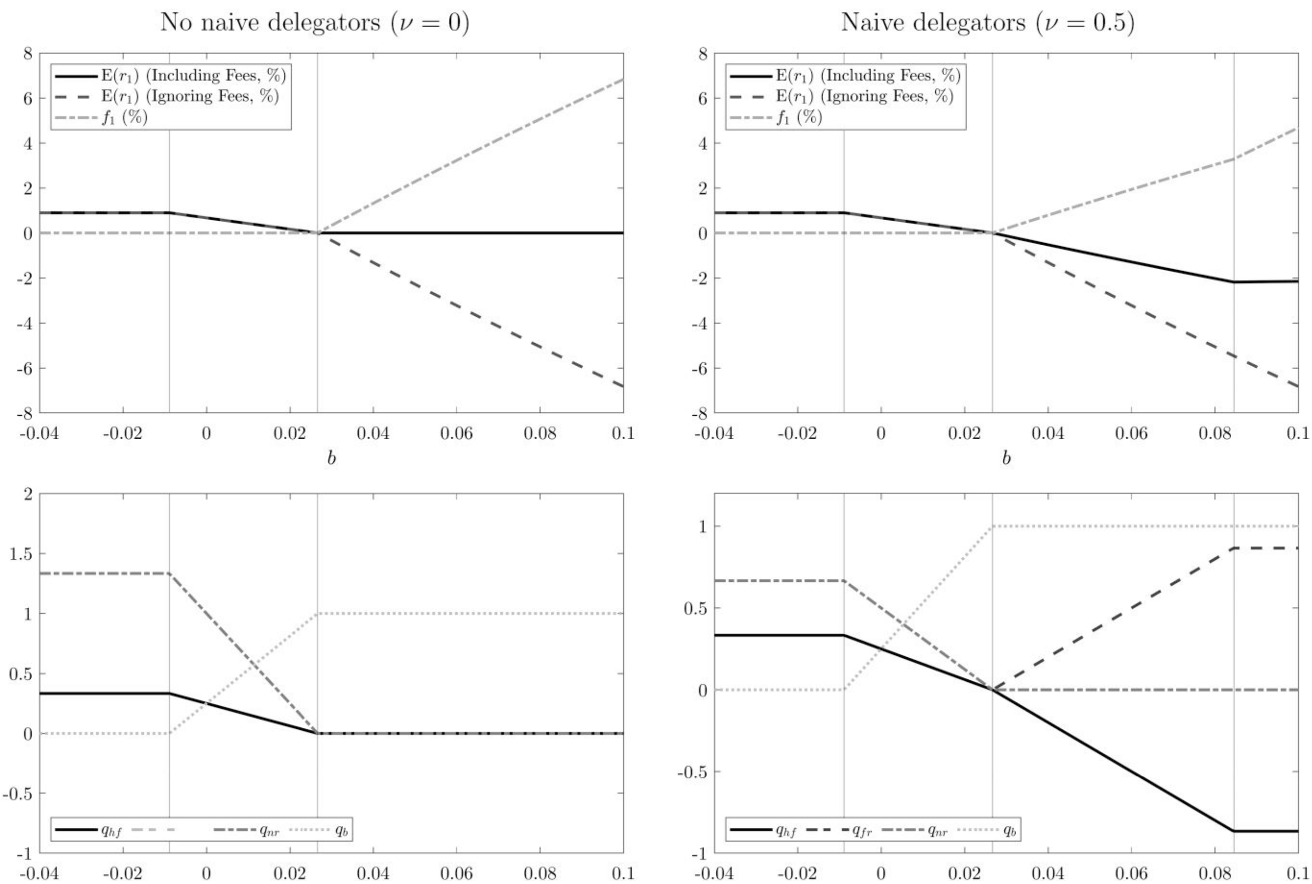
Theorem 2 (Equilibrium with Biased Retail Investors). *When $\nu = 0$, one of three equilibria prevails depending on the value of b (Table 6).*

For moderate b, all four groups of investors are marginal, buying positive quantities of both stocks. However, retail investors have price impact that causes their bias b to affect equilibrium prices proportionally to the fraction of overall assets they control, A_{ri}/A_4.

Table 5. Frictionless Prices

Variable	Frictionless
$p_1 =$	$\mu - \gamma\sigma^2 \frac{Q_1}{A}$
$p_2 =$	$\mu - \gamma\sigma^2 \frac{Q_2}{A}$
$f_1 =$	0
$f_2 =$	0
$M_m =$	C

Figure 4. Equilibrium Prices and Quantities as a Function of Bias



Notes. This figure shows equilibrium prices and quantities in our model as a function of retail investors' bias b. In the left panels, there are no naive delegators ($\nu = 0$), and all mutual funds choose to be nonretainers (nr). In the right panels, half of the delegators are naive ($\nu = 0.5$), and half of mutual funds choose to be fee retainers (fr). The upper panels show the expected return, fee-inclusive expected return, and lending fee rate for stock 1. The lower panels show the equilibrium quantities demanded for each of the four groups of investors. The parameterization we use sets $\mu = 1$, $\sigma = 0.2$, $\gamma = 2$, $\Gamma = 0.5$, $Q_1 = 1$, $Q_2 = 10$, $A_{hf} = A_{ri} = 3$, and $D = 6$. The first two vertical lines indicate the cutoffs between low, moderate, and high b equilibrium regions, and the third indicates the point at which the fee retainers can cover costs purely with lending fees.

As b decreases in the moderate b region, retail investors hold smaller positions until eventually their unconstrained preference would be a negative position in stock 1. Because retail investors do not short, their portfolio choice becomes constrained, and only the other two groups are marginal investors in stock 1.

Table 6. Equilibrium with Biased Retail Investors

Variable	Low b	Moderate b	High b
	$b < -\gamma\sigma^2 \frac{Q_1}{A-A_{ri}}$	$b \in \left[-\gamma\sigma^2 \frac{Q_1}{A-A_{ri}}, \gamma\sigma^2 \frac{Q_1}{A_{ri}}\right]$	$b > \gamma\sigma^2 \frac{Q_1}{A_{ri}}$
$p_1 =$	$\mu - \gamma\sigma^2 \frac{Q_1}{A-A_{ri}}$	$\mu + b\frac{A_{ri}}{A} - \gamma\sigma^2 \frac{Q_1}{A}$	$\mu + b - \gamma\sigma^2 \frac{Q_1}{A_{ri}}$
$f_1 =$	0	0	$\frac{p_1-\mu}{p_1}$
M_m	C	C	C
K_m	0	0	0
$q_{ri,1} =$	0	$\frac{A_{ri}}{A}\left(Q_1 + b\frac{A-A_{ri}}{\gamma\sigma^2}\right)$	Q_1
$q_{hf,1} =$	$\frac{A_{hf}}{A-A_{ri}} Q_1$	$\frac{A_{hf}}{A}\left(Q_1 - b\frac{A_{ri}}{\gamma\sigma^2}\right)$	0
$q_{nr,1} =$	$\frac{\frac{D}{\psi(1+\lambda)}}{(A-A_{ri})} Q_1$	$\frac{\frac{D}{\psi(1+\lambda)}}{A}\left(Q_1 - b\frac{A_{ri}}{\gamma\sigma^2}\right)$	0
$\overline{r}_1 =$	$\frac{1}{A-A_{ri}} \frac{\gamma\sigma^2 Q_1}{p_1}$	$\frac{1}{A} \frac{\gamma\sigma^2 Q_1 - bA_{ri}}{p_1}$	$\frac{1}{A_{ri}} \frac{\gamma\sigma^2 Q_1 - bA_{ri}}{p_1} < 0$
$\overline{r}_1 + f_1 =$	$\frac{1}{A-A_{ri}} \frac{\gamma\sigma^2 Q_1}{p_1}$	$\frac{1}{A} \frac{\gamma\sigma^2 Q_1 - bA_{ri}}{p_1}$	0

In the high b region, retail investors hold all the shares outstanding, and the mutual and hedge funds' unconstrained preference would be a negative position in stock 1. Mutual funds are not allowed to short, so their portfolio has a corner solution of zero shares in stock 1. If hedge funds could borrow shares freely, they would short enough shares for the retail investors to keep buying more shares as b increased. However, this is impossible because retail investors own all the shares and do not lend them. Instead, the high b equilibrium clears the stock and lending markets by using lending fees f_1 as a shadow price that makes hedge funds and mutual funds choose to hold zero shares of stock 1. As a result, stock 1's price equals the equilibrium price that would prevail in a market with only retail investors.

Because $\nu = 0$, all delegators seek the mutual fund with the lowest management fee M_m and realize that any lending fee retention will lead to a positive position in asset 1 and poor average performance. Therefore, all funds choose $M_m = C$ and $K_m = 0$ in equilibrium.

3.4.3. Critical Parametric Restriction. Once we allow both biased retail investors ($b \neq 0$) and naive delegators ($\nu > 0$), our main results depend on a parametric restriction that ensures mutual funds do not prefer a dollar of returns for delegators to a dollar of current revenue. Formally, we require that

$$\Gamma \equiv \psi(1+\lambda) \in (0,1), \tag{16}$$

where Γ is the marginal value of net performance to mutual funds, scaled by initial AUM:

$$\frac{\partial \Pi_{m,2}}{\partial \text{Net Return}} = A_{m,1}(1+\lambda)\psi \tag{17}$$

$$\Rightarrow \frac{\partial \Pi_{m,2}}{\partial \text{Net Return}} \frac{1}{A_{m,1}} = \Gamma. \tag{18}$$

$\Gamma > 0$ follows from funds valuing future AUM and flows being performance sensitive (i.e., $\psi > 0$ and $\lambda > 0$). Although $\Gamma > 1$ is theoretically possible, it is economically implausible because it implies that funds prefer lower management fees even holding initial AUM fixed because they want to maximize net returns to benefit from the increased AUM at $t = 2$. To see this, note that

$$\frac{\partial \Pi_{m,2}}{\partial M_m} = A_{m,1}(1-\Gamma), \tag{19}$$

where the one represents the direct effect of increasing management fees on the asset manager's payoff and $-\Gamma$ represents the indirect effect via worse net returns. When $\Gamma > 1$, for any level of $A_{m,1}$, mutual funds would choose $M_m = 0$ or $M_m < 0$ if they were able, even when doing so has no effect on $A_{m,1}$. This implies that all funds, even those that do not retain lending fees, would choose zero management fees. Our main parametric restriction, $\Gamma < 1$, is equivalent to ruling out this implausible scenario.

3.4.4. Naive Delegators. For low and moderate b, lending fees are zero, and so, $\nu > 0$ has no impact on the equilibrium described. Theorem 3 presents the equilibrium prices and quantities in the high b equilibrium with $\nu > 0$, and the right panels in Figure 4 illustrate this equilibrium for a specific parameterization.

Theorem 3 (Equilibrium with Lending Fee Retention and Biased Retail Investors). *When $\nu > 0, \Gamma \in (0,1)$, and $b > \sigma^2(Q_1/A_{ri})$, a modified high b equilibrium prevails* (*Table 7*).

The high b equilibrium changes when $\nu > 0$ because a fraction ν of mutual funds, "fee retainers," caters to naive delegators by reducing their management fee M_{fr} and retaining a fraction $K_{fr} > 0$ of lending income. The remaining fraction $1 - \nu$ of funds, "nonretainers," caters to rational delegators by choosing $M_{nr} = C$ and $K_{nr} = 0$. Because naive delegators are unaware that fee retention affects portfolio choices, they believe fee retainers will follow nonretainers and hold zero shares of stock 1. Given these beliefs, the higher K_{fr} is irrelevant, and fee retainers are more attractive because their management fees are lower. In equilibrium, fee retainers compete to a corner solution of either zero management fees ($M_{fr} = 0$) when retaining lending income is enough to cover costs ($K_{fr}(f_1 p_1 q_1)/(\nu D) = C$) or 100% fee retention ($K_{fr} = 1, M_{fr} = C - (f_1 p_1 q_1)/(\nu D)$).

Table 7. Equilibrium with Lending Fee Retention

Variable	High b
$p_1 =$	$\mu + b - \gamma\sigma^2 \frac{Q_1}{A_{ri}}$
$f_1 =$	$\frac{p_1 - \mu}{p_1} \frac{A_{hf} + \frac{\nu D}{\Gamma}}{A_{hf} + \frac{\nu D}{\Gamma^2}}$
$M_{nr} =$	C
$K_{nr} =$	0
$M_{fr} =$	$max\left(0, C - f_1 \frac{p_1 q_{fr,1}}{\nu D}\right)$
$K_{fr} =$	$min\left(1, C \frac{\nu D}{f_1 p_1 q_{fr,1}}\right)$
$q_{b,1} =$	Q_1
$q_{hf,1} =$	$-\frac{\nu D/\Gamma}{\gamma\sigma^2}\left(\mu - p_1 + p_1 f_1\left(1 + K_{fr}\frac{1-\Gamma}{\Gamma}\right)\right)$
$q_{fr,1} =$	$\frac{\nu D/\Gamma}{\gamma\sigma^2}\left(\mu - p_1 + p_1 f_1\left(1 + K_{fr}\frac{1-\Gamma}{\Gamma}\right)\right)$
$q_{nr,1} =$	0
$\bar{r}_1 =$	$\frac{1}{A_{ri}} \frac{\gamma\sigma^2 Q_1 - bA_{ri}}{p_1} < 0$
$\bar{r}_1 + f_1 =$	$\bar{r}_1 (1-\Gamma) \frac{\nu D}{A_{hf}\Gamma^2 + \nu D} < 0$

Because $K_{fr} > 0$, fee retainers have an extra incentive to lend shares and therefore, form long positions in stock 1, increasing the lendable supply of shares. For hedge funds to short, they must receive price concessions. These concessions occur in the lending market rather than the stock market because retail investors are marginal in the stock market, whereas fee retainers and hedge funds are marginal in the share lending market. As a result, fee retention affects prices and quantities in the lending market, the portfolio choice of fee retainers, and fee-inclusive expected returns, as summarized by Theorem 3.

3.5. Equilibrium Results

We now turn to the main results of our model. Throughout, we assume that $\nu > 0$, b is large enough that $f_1 > 0$, and $\Gamma \in (0,1)$.

Result 1 (Mutual Fund Fee Schedules). *Fee retainers offer lower management fees than nonretainers, and both groups attract positive AUM. Formally,*

$$M_{fr} < M_{nr} = C \tag{20}$$

$$0 = K_{nr} < K_{fr} \leq 1 \tag{21}$$

$$A_{fr} > 0 \tag{22}$$

$$A_{nr} > 0. \tag{23}$$

Result 1 illustrates that fee retainers and nonretainers coexist in equilibrium. Although all mutual funds are ex ante identical in our model and so, are indifferent between being fee retainers or nonretainers, if we allowed crossfund variation in flow-performance sensitivity λ, funds with lower λ would choose to be fee retainers because the reduced performance would hurt their next-period AUM ($A_{m,2}$) less.

Result 2 (Lending Fee Retention Distorts Portfolio Choice). *Fee retainers hold shares of stock 1, whereas nonretainers hold zero shares, the mean-variance optimal portfolio. Formally,*

$$w_{fr,1} > w_{nr,1} = w_{opt,1} = 0, \tag{24}$$

where $w_{fr,1}$, $w_{nr,1}$, and $w_{opt,1}$ are the equilibrium weights chosen by fee retainers, nonretainers, and a hypothetical mean-variance investor that lends their shares but cannot short.

Result 2 shows that fee retainers overweight stocks with positive lending fees because they keep a fraction K_m directly as revenue and prefer current revenue to dollar-equivalent returns for their investors. The lower right panel in Figure 4 illustrates this pattern.

Result 3 (Lending Fee Anomaly). *If b varies and other parameters are fixed, both the expected return ($\overline{r}_1$) and fee-inclusive expected return ($\overline{r}_1 + f_1$) for stock 1 are negative and decreasing in the equilibrium lending fee, which in turn, is increasing in the bias b. Formally,*

$$\overline{r}_1 < \overline{r}_1 + f_1 < 0, \tag{25}$$

$$\frac{\partial \overline{r}_1}{\partial b} < \frac{\partial(\overline{r}_1 + f_1)}{\partial b} < 0, \tag{26}$$

$$\text{and } \frac{\partial f_1}{\partial b} > 0. \tag{27}$$

Result 3 predicts that stocks with high lending fees subsequently underperform by more than the fee, making their *fee-inclusive* future abnormal returns negative. Other models of stock and lending market equilibrium (for example, in Weitzner 2023 and the appendix model of Blocher et al. 2013) predict that fee-inclusive returns have no alpha relative to the appropriate benchmark. Similarly, our model predicts that without naive delegators, fee-inclusive average returns are independent from lending fees. With them, the added incentive for fee retainers to buy and lend shares drives down equilibrium lending fees, resulting in a negative relation between lending fees and fee-inclusive expected returns.

The upper panels in Figure 4 illustrate the impact of fee retention on fee-inclusive expected returns. As described, when $\nu > 0$, fee retainers bias their portfolios toward stock 1, pushing down f_1 and causing fee-inclusive expected returns to decrease in b.

If the lending fee anomaly does arise from excess holdings of fee retainers, we would expect that the negative relation between lending fees and expected returns is stronger among stocks held by fee retainers.[18]

Result 4 (Underperformance of Fee Retainers). *Fee retainers have portfolios with smaller average net returns and Sharpe ratios than nonretainers. Formally,*

$$w'_{fr}(\overline{r} + (1 - K_{fr})f) - M_{fr} < w'_{nr}(\overline{r} + (1 - K_{nr})f) - M_{nr}, \tag{28}$$

$$\frac{w'_{fr}(\overline{r} + (1 - K_{fr})f) - M_{fr}}{\sqrt{w'_{fr}\Sigma(p)w_{fr}}} < \frac{w'_{nr}(\overline{r} + (1 - K_{nr})f) - M_{nr}}{\sqrt{w'_{nr}\Sigma(p)w_{nr}}}. \tag{29}$$

Result 4 shows that fee retainers' distorted portfolio choice results in worse-performing portfolios than nonretainers. This is caused by the long positions that fee retainers hold in the overpriced stock 1, which result in poor performance relative to nonretainers that put zero weight in stock 1. Management fees and retained lending fees have no effect on relative net performance, outside how they affect portfolio choices, because both types of funds compete with each other so that their total expenses per dollar managed equal costs C.

3.6. Long-Run AUM of Fee Retainers

If fee retainers underperform nonretainers on average, as Result 4 shows, and flows are sensitive to performance, it is natural to wonder why fee retainers still manage a nontrivial fraction of AUM. Although our static model cannot directly address this question, we informally offer two possible answers. The first is that we have not yet reached the long-run steady state. If fee retainers underperform by around 0.5% per year on average, as we find empirically in Section 4.4, and flow-performance sensitivity is three, their relative AUM deteriorates by only 2% per year.[19] It would, therefore, take 35 years for the fee retainers AUM to be half of its original portion of the nonretainers AUM and 114 years to be a tenth.

The second possible reason fee retainers still have nontrivial AUM is that each year some individual funds close and some new ones open. Given this churn, fee retainers will manage a sizable fraction of total AUM even in the long-run steady state because each individual fee retainer has too short of a return history for naive investors to precisely measure average performance without understanding that fee retention distorts portfolio choice. Consistent with this possibility, the mean (median) age for funds in our sample is only 16.6 (16.7) years.[20] We provide detailed analysis on this issue in the online appendix.

4. Empirical Evidence of Distortions Caused by Fee Retention

In this section, we present new empirical evidence and discuss evidence from prior research supporting our model's predictions about the distortions caused by lending fee retention.

4.1. Result 1: Mutual Fund Fee Schedules

As shown in Figure 2, a substantial portion of funds employ affiliated lending agents. Moreover, there are large differences in the fees paid to lending agents (Table 2). We argue that funds paying affiliated agents above the median rate, our empirical fee retainer indicator, are similar to the fee retainers in our model and attract AUM in practice.

Our mechanism suggests that funds with lower flow-performance sensitivity are more likely to be fee retainers. We test this prediction by regressing quarterly fund-level flow on lagged quarterly returns, *Fee Retainer*, and an interaction between the two. Table 8 shows that the interaction effect is negative and economically large, indicating that performance sensitivity is more than 50% weaker for fee retainers, although the *t* statistics vary between −1.76 and −1.41.[21]

Result 1 also predicts that fee retainers use the resulting income to reduce their management fees. Consistent with this prediction, Table 2 shows that fee retainers have a 80.9-bp mean expense ratio compared with a 91.3-bp mean in the full sample. In Table 9, we further test this prediction using regressions of management fees on *Fee Retainer* and the interaction between *Fee Retainer* and *Lending Agent Fees*. We find that there is a weak positive correlation between *Lending Agent Fees* and *Expense Ratio* for most funds but that this relation is significantly negative among fee retainers. This pattern is consistent with fee retainers using retained lending income to reduce their management fees and attract naive delegators.

In column (1) of Table 9, we find a positive coefficient on *Fee Retainer* alone when we exclude fund family fixed effects, indicating that the average fee retainer has a *higher* expense ratio, the opposite of what our model predicts. This suggests that (i) some unobserved characteristic of fund families with fee retainers leads to higher expense ratios and/or (ii) individuals delegating to these funds are attracted by some omitted characteristic (e.g., marketing) that allows the funds to charge higher expense ratios while underperforming on average (as documented).

4.2. Result 2: Distorted Portfolio Choice

We next test Result 2 (that fee retainers overweight special stocks relative to other funds) using both fund-level and stock-level analyses. We also discuss how our

Table 8. Flow Sensitivity and Fee Retainers

	Flow			
Regressor	(1)	(2)	(3)	(4)
Lagged Quarterly Return	0.171***	0.179***	0.179***	0.102
	(3.41)	(3.42)	(3.13)	(1.38)
Fee Retainer × *Lagged Quarterly Return*	−0.099	−0.100	−0.115*	−0.099
	(−1.41)	(−1.46)	(−1.76)	(−1.65)
Fee Retainer	−0.018**	−0.012	0.000	0.000
	(−2.12)	(−1.34)	(0.00)	(0.00)
log(*TNA*)	−0.006***	−0.005***	0.037***	0.039***
	(−9.52)	(−6.84)	(6.73)	(7.31)
log(*Family TNA*)	−0.000	0.007*	−0.027***	−0.027***
	(−0.87)	(1.98)	(−7.17)	(−7.42)
Expense Ratio	−1.916***	−2.532***	−4.210***	−4.678***
	(−4.82)	(−6.20)	(−4.34)	(−4.72)
Turnover	0.001	0.000	0.000	0.000
	(1.47)	(1.10)	(0.36)	(0.40)
Time FE	Yes	Yes	Yes	No
Fund Family FE	No	Yes	Yes	Yes
Fund FE × Factor Realization	No	No	Yes	Yes
Style × Time FE	No	No	No	Yes
Fund-quarters	258,103	253,995	253,578	253,578
R^2	0.007	0.041	0.175	0.200

Notes. This table contains results testing whether fee retainers exhibit lower flow sensitivity than other funds. *Fund* × *Factor FE* means we interact fund fixed effects (FEs) with each of the Carhart four factors. The sample includes fund-quarter observations for all funds in CRSP from 2010 to 2017. See Appendix A for detailed descriptions of the variables. The *t* statistics calculated using robust standard errors are in parentheses.
*Statistical significance at the 10% level; **statistical significance at the 5% level; ***statistical significance at the 1% level.

Table 9. Fee Retainer Expense Ratios

	Expense Ratio (%)			
Regressor	(1)	(2)	(3)	(4)
Fee Retainer	0.133**	−0.027	0.261***	0.061
	(2.41)	(−0.25)	(4.64)	(0.53)
Lending Agent Fees (% TNA)	−1.684	0.918	−0.368	3.678***
	(−1.23)	(0.57)	(−0.32)	(3.87)
Fee Retainer × Lending Agent Fees (% TNA)			−25.352***	−25.415***
			(−3.99)	(−4.04)
log(*TNA*)	−0.032***	−0.020***	−0.037***	−0.025***
	(−3.46)	(−2.61)	(−4.19)	(−3.26)
Turnover	0.099***	0.093**	0.080***	0.064*
	(3.09)	(2.29)	(2.78)	(1.80)
log(*Family TNA*)	−0.062***		−0.061***	
	(−7.82)		(−7.76)	
Style FE	Yes	Yes	Yes	Yes
Fund Family FE	No	Yes	No	Yes
Number of funds	510	510	510	510
R^2	0.378	0.733	0.404	0.754

Notes. This table contains results from regressions of each fund's *Expense Ratio* (as a percentage of TNA) in the fourth quarter of 2017 on *Fee Retainer*, an indicator for whether the fund uses an affiliated lending agent; pays that agent more than the median lending agent fee, *Lending Agent Fees* (as a percentage of TNA); and an interaction between the two. See Appendix A for detailed descriptions of the variables. The *t* statistics calculated using robust standard errors are in parentheses. FE, fixed effect.

*Statistical significance at the 10% level; **statistical significance at the 5% level; ***statistical significance at the 1% level.

work provides a new explanation for results in prior research.

4.2.1. Fund-Level Weights in Special Stocks.

Our first approach is to regress *Special Weight* (the fraction of a fund's portfolio allocated to stocks with high lending fees) on *Fee Retainer* and other controls in a panel of fund-quarters. We use style by time fixed effects throughout to adjust for time trends and style-driven differences in *Special Weight*.

Column (1) of Table 10 shows that fee retainers choose portfolios with *Special Weight* 32.5 bps higher than other lending funds. This effect is economically substantial relative the median fund's *Special Weight* of 94 bps (panel A of Table 2).

Our model assumes fund managers make portfolio choices to maximize profits for their asset management firm, including any retained lending fees, rather than solely maximizing fund performance. Consistent with this assumption, Ibert et al. (2018) and Evans et al. (2020) show that fund managers are compensated based on fund family or parent company performance in addition to fund AUM and performance. However, when funds perform poorly or experience outflows, managers may be less willing to sacrifice performance for securities lending income for two reasons. The first is they face an increased probability of termination, as documented in Khorana (1996) and Chevalier and Ellison (1999). The second is that even conditional on staying on as fund manager, Ibert et al. (2018) shows there is a concave relation between fund manager compensation and AUM, causing fund managers to be more performance sensitive after outflows. We, therefore, predict that funds with poor recent performance or outflows are less likely to trade performance for parent company profits by overweighting special stocks.[22]

To test this prediction, we regress *Special Weight* on interactions between *Fee Retainer* and measures of recent performance and flows. We measure performance using *Rank*, defined as each fund's past-year return percentile within their style group, following Huang et al. (2007). We measure flows using *Flow*, the percentage change in return-adjusted TNA over the past quarter. Table 10 shows significantly positive interaction effects between *Fee Retainer* and both *Rank* and *Flow*, meaning that fee retainers particularly overweight high-fee stocks when past performance is good or when receiving inflows. We also find a positive interaction between funds' lagged annual alpha, *Lagged Alpha*, and *Fee Retainer*; however, it is not statistically significant. These patterns are consistent with career concerns and concave compensation making fund managers less willing to sacrifice performance for lending fees after negative shocks.

In panel B of Table 10, we broaden our sample to include nonlending funds in addition to other ICRM-disclosing lending funds.[23] We find that fee retainers overweight special stocks even more relative to nonlenders, whereas other lenders (i.e., funds in our main sample with *Fee Retainer* = 0) have no significant difference in special stock weights.

Table 10. Retention Policy and Portfolio Choice

	Fund-Level Special Weight (%)			
Regressor	(1)	(2)	(3)	(4)
Panel A				
Fee Retainer	0.325*	−0.172	0.378*	0.325*
	(1.67)	(−0.75)	(1.80)	(1.68)
Fee Retainer × *Rank*		1.028**		
		(2.49)		
Fee Retainer × *Lagged Alpha*			2.120	
			(1.10)	
Fee Retainer × *Flow*				1.334**
				(2.02)
Rank		−0.407*		−0.292
		(−1.77)		(−1.39)
Lagged Alpha			−1.075	
			(−0.74)	
Flow	−0.105	−0.018	−0.048	−0.136
	(−0.63)	(−0.07)	(−0.30)	(−0.53)
log(*TNA*)	−0.003	0.013	−0.006	0.013
	(−0.07)	(0.27)	(−0.13)	(0.27)
log(*Family TNA*)	−0.028	−0.025	−0.026	−0.025
	(−0.71)	(−0.61)	(−0.65)	(−0.63)
Turnover Ratio	−0.010	−0.015	−0.028	−0.014
	(−0.10)	(−0.15)	(−0.27)	(−0.13)
Fund Age	−0.015**	−0.015**	−0.015**	−0.015**
	(−2.47)	(−2.50)	(−2.45)	(−2.49)
Sample	ICRM	ICRM	ICRM	ICRM
Style × Time FE	Yes	Yes	Yes	Yes
Fund-quarters	10,864	10,420	10,819	10,420
R^2	0.268	0.272	0.269	0.271
Panel B				
Fee Retainer	0.526***	−0.011	0.543**	0.518***
	(2.61)	(−0.06)	(2.37)	(2.61)
Fee Retainer × *Rank*		1.103***		
		(2.98)		
Fee Retainer × *Lagged Alpha*			1.075	
			(0.63)	
Fee Retainer × *Flow*				1.177**
				(1.96)
Other Lenders	0.013	−0.058	0.044	0.004
	(0.17)	(−0.51)	(0.56)	(0.05)
Other Lenders × *Rank*		0.143		
		(0.83)		
Other Lenders × *Lagged Alpha*			1.388	
			(1.51)	
Other Lenders × *Flow*				0.199
				(0.97)
Rank		−0.353***		−0.304***
		(−3.34)		(−3.51)
Lagged Alpha			−1.522*	
			(−1.70)	
Sample	All	All	All	All
Fund Controls	Yes	Yes	Yes	Yes
Style × Time FE	Yes	Yes	Yes	Yes
Fund-quarters	89,481	83,107	88,968	83,107
R^2	0.346	0.242	0.301	0.242

Table 10. (Continued)

Panel C						
	Stock-Level Fee Retainer (%)					
Regressor	(1)	(2)	(3)	(4)	(5)	(6)
Lending Fee	0.146***	0.146***	0.146***	0.209***	0.149**	0.154**
	(3.23)	(3.23)	(3.22)	(3.21)	(2.32)	(2.38)
Bid-Ask Spread	−0.055					−0.290
	(−0.19)					(−0.38)
Unexplained Volume		−0.090				−0.203*
		(−1.00)				(−1.95)
Std. Unexplained Volume			0.000			0.000
			(0.07)			(1.02)
Analyst Dispersion 1				0.022***		0.007*
				(5.11)		(1.65)
Analyst Dispersion 2					1.553***	1.434***
					(6.27)	(5.38)
Lagged Quarterly Return	0.001	0.001	0.001	0.001	0.004	0.004
	(0.20)	(0.24)	(0.20)	(0.10)	(0.73)	(0.71)
log(*Market Cap*)	0.027***	0.027***	0.027***	0.025***	0.027***	0.027***
	(16.78)	(17.88)	(17.90)	(13.96)	(14.96)	(14.38)
Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes
Stock-quarters	73,119	73,119	73,119	57,481	57,489	57,481
R^2	0.044	0.044	0.044	0.038	0.042	0.042

Notes. This table contains regressions testing the relationship between retention policy and portfolio choice. Panels A and B contain results from regressions of *Special Weight*, the fraction of the fund's holdings allocated to high lending fee stocks, in percentage points, on *Fee Retainer*, an indicator for whether the fund uses an affiliated lending agent and pays that agent more than the median lending agent fee. In panel A, the sample includes fund-quarter observations from 2010 to 2017 in the ICRM sample. In panel B, the sample includes fund-quarter observations from 2010 to 2017 for all funds in CRSP, corrected for survivorship bias. The *t* statistics calculated using standard errors clustered by fund are in parentheses. Panel C contains stock-level results from regressions of *Fee Retainer* %, the fraction of fee retainer ownership among funds in the ICRM sample, on lending fee. The sample includes stock-quarter observations from 2010 to 2017. The *t* statistics calculated using standard errors clustered by stock are in parentheses. FE, fixed effect.

*Statistical significance at the 10% level; **statistical significance at the 5% level; ***statistical significance at the 1% level.

4.2.2. Stock-Level Ownership by Fee Retainers. One concern with our fund-level analysis is that fee retainers may prefer stocks with high disagreement—which tend to have larger lending fees (e.g., D'Avolio (2002))—relative to nonretainers for reasons unrelated to lending fees. We address this concern using a stock-level analysis that allows us to control for proxies for disagreement as well as other stock characteristics. Specifically, we compute *Fee Retainer* (percentage) for each stock-quarter, defined as the number of shares held by fee retainers divided by the total number of shares held by funds in our sample of lenders, and we regress this on contemporaneous measures of stock-level lending fees; disagreement measures such as bid-ask spread, unexplained volume, and analyst forecast dispersion; and controls for past returns and size. We include quarter fixed effects to control for any time trends in the independent variables and ownership by fee retainers.

Panel C of Table 10 shows a consistent and statistically significant positive relation between stock-level lending fees and ownership by fee retainers. We also find that ownership by fee retainers is increasing in analyst forecast dispersion and size but that stock-level lending fees remain a strong incremental predictor.

4.2.3. Evidence in Prior Research. Our findings in Table 10 confirm and extend prior research. Prado (2015) finds that institutional investors as a whole increase their ownership the quarter after a stock becomes special. Evans et al. (2017) find that when a fund manager simultaneously manages a fund that is able to lend and a fund that is not, the fund able to lend reduces its holdings less after a stock becomes special. Our results differ from those in Prado (2015) and Evans et al. (2017) because we use the ICRM disclosures to show that the overweighting they document does not apply equally to all institutional investors or even all lending funds. Instead, funds that we identify as fee retainers (those that pay above-median rates to affiliated lending agents) overweight special stocks significantly relative to other lending funds, whereas other lenders have no significant difference from nonlenders.

We also differ in our explanation for these findings. Prado (2015) argues that institutional investors increase their positions to profit from the lending fees. Although these investors should incorporate lending fees in their evaluation of potential investments, as discussed, the evidence is high-fee stocks that underperform even when including the lending fee. The Prado (2015) story, unlike our model, does not explain why some institutions value lending fees more than the subsequent underperformance. Evans et al. (2017) argue that funds lend shares in high-fee stocks rather than selling them because fund family restrictions prevent them from selling, leading to the underperformance of lending funds (see Section 4.4). To explain the evidence in our paper, fund family restrictions must tilt more strongly toward high-fee stocks in fee retainer funds, cause these funds to underperform as a category, and bind more strongly when past-year fund-level performance is strong.

The only other paper we are aware of that discusses the potential agency conflict associated with lending fee retention is Blocher and Whaley (2016), which studies the holdings of ETFs that lend their shares. If ETFs were maximizing their performance for investors, they would use any discretion they have in portfolio choice to reduce their exposure to underperforming high lending fee stocks. However, Blocher and Whaley (2016) find the opposite; ETFs slant their holding toward high lending fee stocks. We show that this effect is prevalent in active mutual funds, which have more discretion in their portfolio choice.

Finally, related but distinct evidence in Adams et al. (2014) indicates that funds with affiliated lending agents earn more lending revenue per dollar TNA but less lending revenue per dollar lent. Their explanation is a conflict of interest between the board of directors and the fund manager. However, their study does not consider the potential effect of affiliated lending agents on portfolio choice. In our model, funds with affiliated agents have an incentive to buy high-fee stocks, thus increasing their security lending revenue per dollar TNA, exactly as Adams et al. (2014) finds.

4.3. Result 3: Lending Fee Anomaly

Result 3 predicts that stocks with higher lending fees are overpriced and have abnormally negative future returns relative even on a fee-inclusive basis.

4.3.1. Lending Fee Anomaly in Prior Research. Jones and Lamont (2002), Ofek et al. (2004), Muravyev et al. (2023), and Drechsler and Drechsler (2021) show that high-fee stocks underperform on a fee-inclusive basis across a variety of sample periods and using different measures for lending fees. Models of equilibrium lending fees (for example, in Weitzner 2023 and the appendix of Blocher et al. 2013) predict that lending fees affect equilibrium stock prices in a manner similar to dividends, with expected returns decreasing one for one with higher lending fees. As a result, the fee-exclusive underperformance of high lending fee stocks is unsurprising. As discussed in Drechsler and Drechsler (2021), however, the fee-inclusive underperformance is more surprising and requires an additional mechanism to explain because it suggests that investors with no private information or skill can profitably short a portfolio of all high-fee stocks.[24]

4.3.2. Explaining the Lending Fee Anomaly Using Fee Retainer Holdings. Our model provides a simple explanation for the fee-inclusive underperformance of high lending fee stocks; fee retainers buy and lend high-fee stocks, driving down equilibrium lending fees. Drechsler and Drechsler (2021) offers a different explanation; high-fee stocks hedge systematic risk. However, unlike Drechsler and Drechsler (2021), our model jointly explains the poor fee-inclusive performance of high lending fee stocks and the puzzle of why institutional investors own and lend these stocks rather than selling them.

We test our explanation for the lending fee anomaly by examining whether the negative relation between lending fees and future returns is stronger among stocks with higher ownership by fee retainers. Specifically, we estimate predictive monthly stock return regressions where we include *Fee Retainer* (percentage), *Lending Fee*, and their interaction as predictors.[25] Table 11 shows that, as predicted by Result 3, stock returns are lower for stocks with high lending fees. Moreover, the interaction between L*ending Fee* and *Fee Retainer* (percentage)is consistently negative with marginal statistical significance.[26] Specifically, a one-standard deviation increase in *Fee Retainer* (percentage; 24.3%) increases the magnitude of the relationship between lending fee and returns by about 28% (around −0.14 relative to −0.49 based on column (2)). This result is economically large; however, the power of our tests is limited by our shorter sample period.

A potential concern with fee retention as an explanation for the lending fee anomaly is that the funds we identify as fee retainers make up a small portion of the overall market. However, fee retention is likely far more pervasive than the narrow subset of active mutual funds we identify. For instance, ETFs may also be influencing stock prices by tilting their portfolios toward high lending fee stocks (Blocher and Whaley 2016). Furthermore, there have been several high-profile lawsuits against large fund managers for excessive fee retention in their management of pension funds. It is, therefore, plausible that fee retention and the resulting portfolio choice distortions measurably impact equilibrium lending fees.

The endogenous portfolio choice of fee retainers also provides an explanation for a related phenomenon: the upward-sloping supply curve for share lending

Table 11. Fee Retainer Ownership and Stock Returns

	Next-Month Returns			
Regressor	(1)	(2)	(3)	(4)
Lending Fee × Fee Retainer %	−0.508	−0.565*	−0.584*	−0.521
	(−1.60)	(−1.81)	(−1.75)	(−1.06)
Lending Fee	−0.375**	−0.494***	−0.513***	−0.570***
	(−2.24)	(−3.04)	(−3.14)	(−2.76)
Fee Retainer %	0.044*	0.074***	0.073***	0.054**
	(1.72)	(2.80)	(2.76)	(2.26)
log(*Market Cap*)		−0.024***	−0.024***	−0.021***
		(−3.20)	(−3.17)	(−2.83)
Lagged Return			−0.088	−0.131
			(−0.82)	(−1.22)
Book-to-Market				−0.006
				(−0.48)
Month FE	Yes	Yes	Yes	Yes
Stock-months	268,189	268,187	267,376	236,221
R^2	0.144	0.144	0.145	0.162

Notes. This table contains results from panel regressions of monthly stock returns on *Lending Fee* and *Fee Retainer* %, the fraction of fee retainer ownership among funds in our ICRM sample. See Appendix A for detailed descriptions of the variables. The sample includes stock-month observations from 2010 to 2017. The *t* statistics calculated using robust standard errors double clustered by month and stock are in parentheses. FE, fixed effect.

*Statistical significance at the 10% level; **statistical significance at the 5% level; ***statistical significance at the 1% level.

documented in Kolasinski et al. (2013). Barring some institutional friction or lending cost, shareholders with long positions should be willing to lend all their shares for any positive fee, and therefore, the lending supply curve should be inelastically equal to the supply of shares held by lenders. Kolasinski et al. (2013) find that this is indeed the case whenever lending fees are small but that once a stock has nontrivial lending fees, the slope of the supply schedule becomes positive and steep. Our model offers a potential explanation for this steepness; even if lending institutions inelastically supply all their shares of special stocks to borrowers, an increase in lending fees results in a larger supply of lendable shares because fee retainers endogenously choose to buy and lend more shares.

4.4. Result 4: Underperformance of Fee Retainers

We next test whether fee retainers underperform. Following Evans et al. (2017), we use CRSP return data to calculate monthly Carhart (1997) four-factor alphas based on betas from 36-month rolling regressions. We annualize these monthly alphas and regress them on *Fee Retainer* and other time-varying fund controls, including style by time fixed effects. We find that fee retainers have annualized alphas 51 bps per year lower than other funds in our ICRM sample of lending funds, as presented in column (1) of Table 12. This magnitude is comparable with the crossfund differences associated with trading frequency (Pástor et al. 2017) and tax management (Sialm and Zhang 2020).

Our model predicts that fee retainers underperform relative to funds that do not lend shares at all in addition to lenders that do not retain fees. Consistent with this prediction, Evans et al. (2017) finds that funds that lend their shares have 72-bps-lower per-year alphas than funds that do not.[27] We build upon this result by showing that in our "All" sample, which uses nonlenders as a benchmark, fee retainers have 60-bps-lower annualized alphas, whereas other lenders' alphas are no different than nonlenders. This suggests that securities lending only negatively affects performance when the asset manager retains securities lending income, as suggested by our model.

The magnitude of underperformance by fee retainers in Table 12 (50–60 bps per year) is larger than can be directly explained by the overweighting of high-fee stocks in Table 10. Because we find that fee retainers hold an additional 30–50 bp of their portfolios in special stocks, these stocks would have to underperform by 100% on an annualized basis to fully explain the underperformance in Table 12. One possible explanation for this discrepancy is that fee retainers practice "window dressing" and reduce their exposure to high-fee stocks near quarter end, and so, they hold more special stocks on average than in their filings. Another possible explanation is that these funds engage in other practices that are unfavorable to fund returns beyond just overweighting high lending fee stocks. For example, many of these funds deposit collateral obtained from securities lending in affiliated money market funds or lend shares to clients of affiliated brokers (see Section 2).

Table 12. Retention Policy and Fund Performance

	Alpha (%)			
Regressor	(1)	(2)	(3)	(4)
Fee Retainer	−0.510*	−0.248	−0.606*	−0.443
	(−1.72)	(−0.81)	(−1.89)	(−1.32)
Fee Retainer × *Special Factor*		0.457***		0.287**
		(2.97)		(2.04)
Other Lenders			0.028	
			(0.28)	
Other Lenders × *Special Factor*				−0.036
				(−0.81)
log(*TNA*)	−0.015	−0.015	0.000	0.000
	(−0.22)	(−0.21)	(0.01)	(0.01)
log(*Family TNA*)	0.140**	0.140**	0.093***	0.093***
	(2.30)	(2.30)	(3.28)	(3.31)
Turnover Ratio	−0.387**	−0.382**	−0.027	−0.027
	(−2.06)	(−2.03)	(−0.11)	(−0.11)
Flow	2.079	2.113	−1.981	−1.980
	(1.52)	(1.55)	(−1.06)	(−1.06)
Fund Age	−0.019***	−0.019***	−0.005	−0.005
	(−2.61)	(−2.62)	(−1.21)	(−1.21)
Sample	ICRM	ICRM	All	All
Style × Time FE	Yes	Yes	Yes	Yes
Fund months	31,621	31,621	289,872	289,872
R^2	0.612	0.613	0.211	0.211

Notes. This table contains results from panel regressions of monthly *Alpha*, a fund's Carhart four-factor alpha (annualized in percentage), on *Fee Retainer*, an indicator for whether the fund uses an affiliated lending agent and pays that agent more than the median lending agent fee. *Special Factor* is the contemporaneous return of an equal-weighted portfolio long all special stocks and short all general collateral stocks. *Other Lender* is an indicator for whether the fund lends shares but is not a fee retainer. See Appendix A for detailed descriptions of the variables. Columns (1) and (2) include all available months from 2010 to 2017 for active U.S. equity mutual funds with 2017 ICRM data. Columns (3) and (4) expand the set of funds to include all CRSP funds, corrected for survivorship bias. The *t* statistics calculated using robust standard errors clustered by fund are in parentheses.

*Statistical significance at the 10% level; **statistical significance at the 5% level; ***statistical significance at the 1% level.

To distinguish among explanations for the substantial underperformance of fee retainers, we use contemporaneous excess returns of special stocks as an additional factor. Specifically, we compute "*Special Factor*," the monthly return of an equal-weighted portfolio long all special stocks (those with Markit DCBS greater than one as discussed) and short all general collateral stocks (those with DCBS equal to one). We then include an interaction between *Special Factor* and *Fee Retainer* in our realized alpha regressions to assess whether fee retainers' lower alphas are driven by higher correlations with the returns of special stocks.

We find that fee retainers' realized monthly alphas, unlike other lenders' alphas, are increasing in *Special Factor*, which is consistent with them overweighting these stocks as predicted by Result 2 of our model and documented in Table 10. Controlling for this exposure reduces the relation between *Fee Retainer* and alphas by around half, making them statistically insignificant and indicating that fee retainers' lower alphas are in large part explained by their overweighting high-fee stocks. It is also consistent with this overweighting being underreported in their quarterly filings because of window dressing.

In the online appendix, we show that fee retainers have lower average performance and higher risk across a variety of metrics, both consistent with fee retainers overweighting overpriced high-fee stocks. Average returns, Carhart (1997) four-factor alphas, Sharpe ratios, and information ratios are all lower for fee retainers, whereas market betas, return volatility, and drawdowns are all higher for fee retainers.[28]

Finally, in the online appendix, we also repeat the regressions in Table 12 but with standard errors double clustered by time and fund or with realized returns on the left-hand side and controlling for fund fixed effects interacted with factor realizations. The latter approach allows us to account for estimation error in fund betas, although it imposes that each fund has constant betas. Both alternatives result in nearly identical point estimates but reduced statistical significance (*t* statistics of 1.53 and 2.37 or 1.49 and 2.52 in columns (1) and (2) instead of 1.72 and 2.97 in the main specification).

5. Conclusion

As management fees have fallen for mutual funds, lending fee retention has emerged as an alternative source of revenue for fund management companies. We show that this is not a benign substitution; it leads some funds (i.e., fee retainers) to hold more high lending fee stocks and underperform, and it explains why there is a negative relation between the cross-section of lending fees and future fee-inclusive stock returns (the lending fee anomaly). Our model also disputes conventional wisdom regarding the limits to arbitrage and institutional investor performance; as fee retainers lend more shares, asset price efficiency worsens rather than improves, and allowing fee retainers to lend shares worsens their performance rather than improves it. Going forward, investors and researchers should consider the incentive impact of securities lending fee retention when evaluating or predicting mutual fund performance.

Our paper also has policy implications. Our evidence suggests that mutual funds and ETFs would perform better without the added incentives for fund managers to buy high lending fee stocks. In our model, this could be achieved by requiring funds to remit the full amount of lending fees to investors and pay any costs associated with share lending out of management fees. It could also be achieved by educating investors about the impact of fee retention on portfolio choice and performance. A precursor to such education is transparency about the uses of securities lending income. The ICRM disclosures are a step in this direction; however, they remain unlikely to be salient to investors because they are buried in regulatory filings.[29] Instead, because lending fees are equivalent to capital gains and dividends from investors' perspective, we believe that gross and net securities lending revenue should be reported alongside portfolio returns and at the same frequency and that costs of securities lending should be included in reported expense ratios.

Acknowledgments

The authors thank Andres Almazan, Aydoğan Alti, David Downey, Richard Evans (discussant), John Griffin, John Hatfield, Zack Liu, Jordan Nickerson, Adam Reed (discussant), Garrett Schaller, Lukas Schmid (editor), Avi Schiff, David Schumacher (discussant), Clemens Sialm, Laura Starks, Nathan Swem, Sheridan Titman, Mitch Towner, Haoxiang Zhu, an anonymous associate editor, and two anonymous referees as well as seminar participants at the American Finance Association Meetings, the Review of Corporate Finance Studies/Review of Asset Pricing Studies Bahamas Conference, the National University of Singapore, the Northern Finance Association Meetings, The University of Arizona, The University of Oregon, and The University of Texas at Austin for their helpful comments. The authors also thank Tim Park, Steven Urry, David Xu, and Qifei Zhu for excellent research assistance.

Appendix A. Data Collection and Variable Definitions

A.1. Data Collection

Following Evans et al. (2017), we gather all Semi-Annual Report for Registered Investment Companies for fiscal years (Form NSAR-B, NSAR for short) filings from the SEC's EDGAR database from 2010 to 2017. Mutual funds report their financial information at the CIK or "series" level, which often contains multiple funds. Each fund in EDGAR has a "series ID" associated with it. Within each series, there are multiple tickers that correspond to each share class within the fund. We create a mapping between CIK, series ID, fund name, and ticker by scraping the SEC website and then merging the funds to the CRSP Mutual Fund Database based on ticker. Using the NSAR filings, we identify open-ended funds that lent their shares as those that answer "Y" to Q70N02.

We take the CIK from each fund that engaged in securities lending in 2017 and collect all of their prospectuses (Forms 485APOS or 485BPOS) that correspond to the 2017 calendar year. In the prospectuses, funds generally report a disclosure similar to Figure 1, which includes gross revenue, lending agent fees, rebate, total fees, and net income associated with securities lending. We hand collect each reported item in the prospectus. Within each prospectus, there are often multiple funds within a single reporting entity. We collect the fund name and match these by hand with the possible fund names within each CIK. We then use our mapping to find each ticker for each fund and merge these into CRSP.

We find information for and are able to successfully merge securities lending income for 1,035 funds and ETFs. We exclude 14 funds with negative values of lending agent fees or cash collateral fees or with lending agent fees or cash collateral fees greater than gross income from securities lending because these values are economically implausible. We then limit the sample to active U.S. open-end active equity mutual funds, which reduces our sample size to 542 funds. This compares with 806 open-end active equity funds that engaged in securities lending in 2017 according to our NSAR sample. We define an equity fund as a fund in which the first letter of the crsp_obj_cd is "E" and an active fund as a fund for which the field index_fund_flag is not "D." For our control variables, we use the quarterly CRSP data and use the TNA from that quarter to weight them across share classes of the same fund. For the returns analysis, we use the monthly returns data with monthly TNA, family TNA, and flow, but we use the quarterly data for our other control variables.

In all of our fund family fixed effects regressions, we treat "Goldman Sachs Asset Management LP" and "Goldman Sachs & CO/GSAM" as one family, and we do the same for "BlackRock Inc" and "BlackRock Fund Advisors."

A.2. Variable Definitions

Adjusted Gross Income from Securities Lending. Gross income from securities lending—rebate from the ICRM disclosure.

Aggregate Fees/Compensation for Securities Lending. Total fees and compensation associated with securities lending in 2017 from the ICRM disclosure.

Alpha. Realized alpha in month t from a Carhart four-factor model, with betas estimated in months $t-36$ through $t-1$ (annualized in percentage) from CRSP.

Analyst Dispersion 1. Analyst forecast dispersion scaled by the absolute value of the mean analysts' forecast winsorized at [1%, 99%]. Measure obtained from Garfinkel (2009). Data/code obtained from Wharton Research Data Services (WRDS).

Analyst Dispersion 2. Analyst forecast dispersion scaled by the firm's average monthly stock price winsorized at [1%, 99%]. Measure obtained from Garfinkel (2009). Data/code obtained from WRDS.

Bid-Ask Spread. Bid-ask spread. Data/code obtained from WRDS.

Cash Collateral Fees. Fees paid to manage cash collateral from securities lending in 2017 from the ICRM disclosure.

Cost of Lending. See "*Aggregate Fees/Compensation for Securities Lending*."

Expense Ratio. Average CRSP expense ratio (exp_ratio) across funds' share classes weighted by TNA (crsp_cl_grp) winsorized at [1%, 99%] from CRSP.

Family TNA. Sum of TNA across all funds with the same management code (gmt._cd) winsorized at [1%, 99%] from CRSP.

Fees for Cash Collateral Management. See "*Cash Collateral Fees*."

Fees for Securities Lending Agent. Fees paid to securities lending agent from the ICRM disclosure.

Flow. Net fund flow, equal to $(TNA_t - TNA_{t-1}(1 + Return_t))/(TNA_{t-1})$, winsorized [1%, 99%] from CRSP. Calculated at the same frequency as the regression specification (monthly or quarterly).

Fund Age. Maximum fund age across share classes in years from CRSP.

Fee Retainer. Indicator equal to one when *Self Deal* equals one and *Lending Agent Fees* (percentage adjusted gross) are higher than the median.

Fee Retainer (*Percentage*). The stock-level fraction of fee retainer ownership among funds in our ICRM sample.

Has Passive. A dummy variable that equals one if the fund family offers index funds or ETFs.

Gross Income from Securities Lending. Gross income from securities lending in 2017 from the ICRM disclosure.

Gross Income Yield. Adjusted gross income from securities lending/TNA.

Indemnification Fees. Indemnification fees for securities lending in 2017 from the ICRM disclosure.

Lagged Alpha. Realized annual alpha in over the past year from a Carhart four-factor model from CRSP.

Lagged Return. Trailing one-month stock return from CRSP.

Lagged Quarterly Return. Trailing one-quarter stock return from CRSP.

Lending Agent Fees. See "*Fees for Securities Lending Agent*."

Net Income to Fund. Net income to fund from securities lending in 2017 from the ICRM disclosure.

Net Income Yield. Net income to fund/TNA.

Other Fees. In Table 1, this includes only fees the fund reports as "Other fees not included in revenue split" in 2017. This is expanded in Table 2 to include administrative fees and indemnification fees. From the ICRM disclosure.

Other Lender. Indicator equal to one if the fund lends shares according to NSAR filings but *Fee Retainer* equals zero.

Rank. Fund performance percentile within fund's CRSP investment objective over the past year, continuous from zero to one.

Rebate. Rebate paid to securities borrowers in 2017 from the ICRM disclosure.

Self Deal. Indicator equal to one when at least one listed lending agent shares a parent company with the fund management company in 2017 from the ICRM disclosure.

Special Factor. Equal-weighted portfolio return of special stocks (have a DCBS score above one) minus equal-weighted portfolio return of nonspecial stocks (have a DCBS score equal to one). Returns are excluding lending fees from Markit and CRSP.

Special Weight. Percentage of funds' holdings that are on special (have a DCBS score above one) from Markit and CRSP.

Std. Unexplained Volume. Standardized unexplained volume. Similar to *Unexplained Volume* but calculated using rolling stock-level daily time-series regressions based on trading rather than calendar days. Measure obtained from Garfinkel (2009). Data/code obtained from WRDS.

TNA. Total net assets in all funds share classes (crsp_cl_grp) winsorized at [1%, 99%] from CRSP.

Turnover. Average turnover ratio (turn_ratio) across funds' share classes weighted by TNA (crsp_cl_grp) and winsorized at [1%, 99%] from CRSP.

Unexplained Volume. Firm's daily turnover computed as the firm's daily volume on a given day divided by its shares outstanding detrended by its 180-trading day median. Measure obtained from Garfinkel (2009). Data/code obtained from WRDS.

Appendix B. Proofs

In this appendix, we prove the theorems and results in Section 3. Throughout, we use the assumption that assets 1 and 2 are uncorrelated ($\rho = 0$) and that investors have access to unlimited leverage to separately evaluate the unconstrained optimal weights in the two assets for each group of investors using the following:

$$w^*_{1,g} = \arg\min_w -\mathbb{E}(e^{-\gamma w x_{1,g}}) = \frac{\mathbb{E}(x_{1,g})}{\gamma \mathrm{Var}(x_{1,g})} \tag{B.1}$$

$$w^*_{2,g} = \arg\min_w -\mathbb{E}(e^{-\gamma w x_{g,2}}) = \frac{\mathbb{E}(x_{2,g})}{\gamma \mathrm{Var}(x_{2,g})}, \tag{B.2}$$

where $w^*_{i,g}$ is the optimal weight in assets i for group g and $x_{i,g}$ varies across groups depending on bias, lending behavior, and incentives. In all cases, $x_{i,g}$ has a normal distribution with variance σ^2/p_i^2 and mean specified as follows:

$$x_{i,hf} = \frac{\mu - p_i}{p_i} + f_i, \tag{B.3}$$

$$x_{i,m} = \Gamma\left(\frac{\mu - p_i}{p_i} + f_i\left(1 + K_m \frac{1-\Gamma}{\Gamma}\right)\right), \tag{B.4}$$

$$x_{i,ri} = \frac{\mu + b - p_i}{p_i}. \tag{B.5}$$

Theorem B.1 (Frictionless Prices). *When $b = 0$ and $\nu = 0$, the CAPM holds, and equilibrium prices are given in Table B.1, where $A = A_{hf} + A_{ri} + (D/\gamma)$.*

Table B.1. Frictionless Prices

	Frictionless
$p_1 =$	$\mu - \gamma\sigma^2 \frac{Q_1}{A}$
$p_2 =$	$\mu - \gamma\sigma^2 \frac{Q_2}{A}$
$f_1 =$	0
$f_2 =$	0
$M_m =$	C

Proof. Choosing $M_m = C$ is optimal for all mutual funds because any deviation upward will result in $A_{m,1} = 0$ and any deviation downward will result in negative payoffs.

We show that the quantities presented are optimal for each group given prices presented in Theorem B.1. Because these quantities clear both the share and lending markets, we have an equilibrium (Table B.2).

Given $b = 0$ and prices as in Theorem B.1, hedge funds and retail investors both have $x_{i,g} = (\mu - p_i/p_i)$ in Equations (B.1) and (B.2), making their optimal weights in the two assets

$$w_{g,i} = \frac{\gamma\sigma^2 \frac{Q_i}{A}}{p_i} \frac{p_i^2}{\gamma\sigma^2} = p_i \frac{Q_i}{A} \Rightarrow q_{g,i} = \frac{A_g w_{g,i}}{p_i} = \frac{A_g}{A} Q_i, \tag{B.6}$$

where g is the group's subscript (hf or ri). Mutual funds have $x_{i,mf} = \Gamma \cdot (\mu - p_i/p_i)$, making their optimal weights

$$w_{mf,i} = \frac{\gamma\Gamma\sigma^2 \frac{Q_i}{A}}{p_i} \frac{p_i^2}{\gamma\Gamma^2\sigma^2} = p_i \frac{Q_i}{\Gamma A} \Rightarrow q_{mf,i} = \frac{D w_{mf,i}}{p_i} = \frac{D/\Gamma}{A} Q_i. \tag{B.7}$$

CAPM holds because each investor chooses market portfolio, which has the maximum Sharpe ratio of all risk asset portfolios. □

Theorem B.2 (Equilibrium with Biased Retail Investors). *When $\nu = 0$, one of three equilibria prevails depending on the value of b (Table B.3).*

Proof. Choosing $M_m = C$ is optimal for all mutual funds because any deviation upward will result in $A_{m,1} = 0$ and any deviation downward will result in negative payoffs.

We show that the quantities presented in Theorem B.2 are optimal for each agent given prices presented in Theorem B.2. Because these quantities clear both the share and lending markets, we have an equilibrium.

We prove that the low and moderate b equilibria quantities are optimal here and leave the high b equilibrium to the proof of Theorem B.3, of which this is a special case with $\kappa = 0$.

In the low b region, given the equilibrium prices in Theorem B.2, retail investors' optimal weight in asset 1 satisfies

Table B.2. Frictionless Quantities and Expected Returns

	Asset 1	Asset 2
$q_{hf} =$	$\frac{A_{hf}}{A} Q_1$	$\frac{A_{hf}}{A} Q_2$
$q_{mf} =$	$\frac{D/\Gamma}{A} Q_1$	$\frac{D/\Gamma}{A} Q_2$
$q_{ri} =$	$\frac{A_{ri}}{A} Q_1$	$\frac{A_{ri}}{A} Q_2$
$\bar{r}_i =$	$\frac{\gamma\sigma^2 \frac{Q_1}{A}}{p_1}$	$\frac{\gamma\sigma^2 \frac{Q_2}{A}}{p_2}$

Table B.3. Prices, Quantities, and Expected Returns with Biased Retail Investors

	Low b	Moderate b	High b
	$b < -\gamma\sigma^2 \frac{Q_1}{A - A_{ri}}$	$b \in \left[-\gamma\sigma^2 \frac{Q_1}{A - A_{ri}}, \gamma\sigma^2 \frac{Q_1}{A_{ri}}\right]$	$b > \gamma\sigma^2 \frac{Q_1}{A_{ri}}$
$p_1 =$	$\mu - \gamma\sigma^2 \frac{Q_1}{A - A_{ri}}$	$\mu + b\frac{A_{ri}}{A} - \gamma\sigma^2 \frac{Q_1}{A}$	$\mu + b - \gamma\sigma^2 \frac{Q_1}{A_{ri}}$
$f_1 =$	0	0	$\frac{p_1 - \mu}{p_1}$
$M_m =$	C	C	C
$K_m =$	0	0	0
$q_{ri,1} =$	0	$\frac{A_{ri}}{A}\left(Q_1 + b\frac{A - A_{ri}}{\gamma\sigma^2}\right)$	Q_1
$q_{hf,1} =$	$\frac{A_{hf}}{A - A_{ri}} Q_1$	$\frac{A_{hf}}{A}\left(Q_1 - b\frac{A_{ri}}{\gamma\sigma^2}\right)$	0
$q_{mf,1} =$	$\frac{\frac{D}{\Gamma}}{(A - A_{ri})} Q_1$	$\frac{\frac{D}{\Gamma}}{A}\left(Q_1 - b\frac{A_{ri}}{\gamma\sigma^2}\right)$	0
$\bar{r}_1 =$	$\frac{1}{A - A_{ri}} \frac{\gamma\sigma^2 Q_1}{p_1}$	$\frac{1}{A} \frac{\gamma\sigma^2 Q_1 - bA_{ri}}{p_1}$	$\frac{1}{A_{ri}} \frac{\gamma\sigma^2 Q_1 - bA_{ri}}{p_1} < 0$
$\bar{r}_1 + f_1 =$	$\frac{1}{A - A_{ri}} \frac{\gamma\sigma^2 Q_1}{p_1}$	$\frac{1}{A} \frac{\gamma\sigma^2 Q_1 - bA_{ri}}{p_1}$	0

$$w^*_{ri,1} = \left(\frac{1}{A - A_{ri}} \frac{\gamma\sigma^2 Q_1}{p_1} + \frac{b}{p_1}\right) \frac{p_1^2}{\gamma\sigma^2} = \frac{p_1 Q_1}{A - A_{ri}} + b\frac{p_1}{\gamma\sigma^2} \tag{B.8}$$

$$< \frac{p_1 Q_1}{A - A_{ri}} - \left(\gamma\sigma^2 \frac{Q_1}{A - A_{ri}}\right) \frac{p_1}{\gamma\sigma^2} = 0, \tag{B.9}$$

meaning that the retail investors would like to short asset 1 but cannot and instead, are at a corner solution of $w^*_{ri,1} = 0$. Similarly, hedge funds' and mutual funds' optimal weights and quantities in asset 1 satisfy

$$w^*_{hf,1} = \left(\frac{1}{A - A_{ri}} \frac{\gamma\sigma^2 Q_1}{p_1}\right) \frac{p_1^2}{\gamma\sigma^2} = \frac{p_1 Q_1}{A - A_{ri}} \Rightarrow q_{hf,1} = \frac{A_{hf}}{A - A_{hf}} Q_1, \tag{B.10}$$

$$w^*_{mf,1} = \left(\frac{1}{A - A_{ri}} \frac{\gamma\Gamma\sigma^2 Q_1}{p_1}\right) \frac{p_1^2}{\gamma\Gamma^2\sigma^2} = \frac{p_1 Q_1}{\Gamma(A - A_{ri})} \Rightarrow q_{mf,1} = \frac{D/\Gamma}{A - A_{hf}} Q_1. \tag{B.11}$$

In the moderate b region, retail investors' optimal weight in asset 1 satisfies

$$w^*_{ri,1} = \left(\frac{1}{A} \frac{\gamma\sigma^2 Q_1 - bA_{ri}}{p_1} + \frac{b}{p_1}\right) \frac{p_1^2}{\gamma\sigma^2} = \frac{p_1 Q_1}{A} + b\left(1 - \frac{A_{ri}}{A}\right) \frac{p_1}{\gamma\sigma^2} \tag{B.12}$$

$$\Rightarrow q_{ri,1} = \frac{A_{ri}}{A}\left(Q_1 + b\frac{A - A_{ri}}{\gamma\sigma^2}\right). \tag{B.13}$$

For moderate b, the other groups' optimal weight satisfies

$$w^*_{hf,1} = \left(\frac{1}{A} \frac{\gamma\sigma^2 Q_1 - bA_{ri}}{p_1}\right) \frac{p_1^2}{\gamma\sigma^2} \Rightarrow q_{hf,1} = \frac{A_{hf}}{A}\left(Q_1 - b\frac{A_{ri}}{\gamma\sigma^2}\right), \tag{B.14}$$

$$w^*_{mf,1} = \left(\frac{1}{A} \frac{\gamma\Gamma\sigma^2 Q_1 - bA_{ri}}{p_1}\right) \frac{p_1^2}{\gamma\Gamma^2\sigma^2} \Rightarrow q_{mf,1} = \frac{D/\Gamma}{A}\left(Q_1 - b\frac{A_{ri}}{\gamma\sigma^2}\right), \tag{B.15}$$

as specified by Theorem B.2. □

Theorem B.3 (Equilibrium with Lending Fee Retention and Biased Retail Investors). *When $\nu > 0$, $\Gamma \in (0, 1)$, and $b > \sigma^2 (Q_1/A_{ri})$, a modified high b equilibrium prevails (Table B.4)*

Table B.4. Prices, Quantities, and Expected Returns with Lending Fee Retention and Biased Retail Investors

	High b
$p_1 =$	$\mu + b - \gamma\sigma^2 \frac{Q_1}{A_{ri}}$
$f_1 =$	$\frac{p_1-\mu}{p_1} \frac{A_{hf}+\frac{\nu D}{\Gamma}}{A_{hf}+\frac{\nu D}{\Gamma^2}}$
$M_{nr} =$	C
$K_{nr} =$	0
$M_{fr} =$	$max\left(0, C - f_1 \frac{p_1 q_{fr,1}}{\nu D}\right)$
$K_{fr} =$	$min\left(1, C\frac{\nu D}{f_1 p_1 q_{fr,1}}\right)$
$q_{ri,1} =$	Q_1
$q_{hf,1} =$	$-(1-\Gamma)\frac{\nu D}{A_{hf}\Gamma^2+\nu D}(p_1-\mu)\frac{A_{hf}}{\gamma\sigma^2}$
$q_{fr,1} =$	$(1-\Gamma)\frac{\nu D}{A_{hf}\Gamma^2+\nu D}(p_1-\mu)\frac{A_{hf}}{\gamma\sigma^2}$
$q_{nr,1} =$	0
$\overline{r}_1 =$	$\frac{1}{A_{ri}}\frac{\gamma\sigma^2 Q_1 - bA_{ri}}{p_1} < 0$
$\overline{r}_1 + f_1 =$	$\overline{r}_1(1-\Gamma)\frac{\nu D}{A_{hf}\Gamma^2+\nu D} < 0$

Proof. We begin by proving that the equilibrium at $t = -1$ has the following properties. A fraction ν of mutual funds choose to be fee retainers with $K_{fr} > 0$ and $M_{fr} <= C$. The remaining fraction $1-\nu$ choose to be nonretainers and set $K_{nr} = 0$ and $M_{nr} = C$. Given these fee schedules, subsequent portfolio choices, and expected returns specified in Theorem B.3, expected net returns for the two funds are

$$\text{Net Expected Return}_{fr} = w^*_{1,fr}(\overline{r}_1 + (1-K_{fr}f_1)) + w^*_{2,fr}\overline{r}_2 - M_{fr} \tag{B.16}$$

$$\text{Net Expected Return}_{nr} = w^*_{1,nr}(\overline{r}_1 + (1-K_{nr}f_1)) + w^*_{2,nr}\overline{r}_2 - M_{nr}. \tag{B.17}$$

Using $w_{1,nr} = 0$, $w^*_{1,fr}K_{fr}f_1 + m_{nr} = m_{nr} = C$, and $w^*_{2,fr} = w^*_{2,nr}$, we have that

$$\text{Net Expected Return}_{nr} - \text{Net Expected Return}_{fr} = -w^*_{1,fr}(\overline{r}_1 + f_1) > 0. \tag{B.18}$$

Rational delegators, therefore, strictly prefer nonretainers to fee retainers.

Naive delegators incorrectly assume $w^*_{1,fr} = w^*_{1,nr} = 0$, meaning

$$\text{Net Expected Return}_{nr} - \text{Net Expected Return}_{fr} = M_{fr} - M_{nr} < 0. \tag{B.19}$$

Naive delegators, therefore, strictly prefer fee retainers to nonretainers.

Mutual funds are ex ante indifferent between the two fee schedules because they both attract the same AUM per fund in each group and earn revenues equal to costs. Any deviation to higher fees will result in zero AUM, and deviations to lower fees result in revenues smaller than costs. All alternative fee schedules with the same total costs per unit of AUM C have fee retention and management fees between the *fr* and *nr* extremes, making it less attractive to both types and again resulting in zero AUM.

Next, we show that the quantities presented in Theorem B.3 are optimal for each agent given prices presented in Theorem B.3 and taking mutual fund fee schedules as given. Because these quantities clear both the share and lending markets, we have an equilibrium.

Given equilibrium prices in Theorem B.3, retail investors choose weights

$$w^*_{ri,1} = \left(\frac{1}{A_{ri}}\frac{\gamma\sigma^2 Q_1 - bA_{ri}}{p_1} + \frac{b}{p_1}\right)\frac{p_1^2}{\gamma\sigma^2} = \frac{p_1 Q_1}{A_{ri}} \Rightarrow q_{ri,1} = Q_1. \tag{B.20}$$

Before computing hedge funds' optimal weights, we show that the formula for $\overline{r}_1 + f_1$ given in Theorem B.3 follows from the prices in Theorem B.3:

$$\overline{r}_1 + f_1 = \overline{r}_1 + \frac{p_1-\mu}{p_1}\frac{A_{hf}+\frac{\nu D}{\Gamma}}{A_{hf}+\frac{\nu D}{\Gamma^2}} = \overline{r}_1 - \overline{r}_1\frac{A_{hf}+\frac{\nu D}{\Gamma}}{A_{hf}+\frac{\nu D}{\Gamma^2}} \tag{B.21}$$

$$= \overline{r}_1(1-\Gamma)\frac{\nu D}{A_{hf}\Gamma^2+\nu D}, \tag{B.22}$$

which is negative because $b > \sigma^2(Q_1/A_{ri})$ assures $\overline{r} < 0$. Using this expression for $\overline{r}_1 + f_1$, we have that hedge funds choose weights

$$w^*_{hf,1} = (\overline{r}_1 + f_1)\frac{p_1^2}{\gamma\sigma^2} = \left((1-\Gamma)\frac{\nu D}{A_{hf}\Gamma^2+\nu D}\frac{\mu-p_1}{p_1}\right)\frac{p_1^2}{\gamma\sigma^2} \tag{B.23}$$

$$= -(1-\Gamma)\frac{\nu D}{A_{hf}\Gamma^2+\nu D}(p_1-\mu)\frac{p_1}{\gamma\sigma^2} \tag{B.24}$$

$$\Rightarrow q_{hf,1} = -(1-\Gamma)\frac{\nu D}{A_{hf}\Gamma^2+\nu D}(p_1-\mu)\frac{A_{hf}}{\gamma\sigma^2}. \tag{B.25}$$

Fee retainers choose weights

$$w^*_{fr,1} = \Gamma\left(\overline{r}_1 + f_1\left(1 + K_m\frac{1-\Gamma}{\Gamma}\right)\right)\frac{p_1^2}{\gamma\Gamma^2\sigma^2} \tag{B.26}$$

$$= \left(\overline{r}_1 - \overline{r}\frac{A_{hf}+\frac{\nu D}{\Gamma}}{A_{hf}+\frac{\nu D}{\Gamma^2}}\left(1 + K_m\frac{1-\Gamma}{\Gamma}\right)\right)\frac{p_1^2}{\gamma\Gamma\sigma^2} \tag{B.27}$$

$$= \overline{r}_1\frac{A_{hf}\Gamma^2 - A_{hf}\Gamma}{A_{hf}\Gamma^2+\nu D}\frac{p_1^2}{\gamma\Gamma\sigma^2} = \frac{A_{hf}(1-\Gamma)}{A_{hf}\Gamma^2+\nu D}(p_1-\mu)\frac{p_1}{\gamma\sigma^2} \tag{B.28}$$

$$\Rightarrow q_{fr,1} = (1-\Gamma)\frac{\nu D}{A_{hf}\Gamma^2+\nu D}(p_1-\mu)\frac{A_{hf}}{\gamma\sigma^2}. \tag{B.29}$$

Finally, nonretainers choose $q_{n,1} = 0$ because asset 1 has negative expected return, and they cannot short, as discussed. □

Results 1–4 all follow directly from Theorem B.3.

Endnotes

[1] See the Investment Company Institute Report on Trends in the Expenses and Fees of Funds, 2017.

[2] See Information Handling Services (IHS) Markit's Securities Finance 2018 Year in Review.

[3] A reverse causality story whereby lending mutual funds overweight special stocks for other reasons and thereby, cause them to have high fees is unlikely given that an exogenous increase in share lending should reduce rather than increase equilibrium lending fees.

[4] Standard models of equilibrium lending fees, such as Blocher et al. (2013), imply that lending fees negatively predict fee-exclusive returns. However, explaining why prices of high-lending fee stocks decline more than the amount of the lending fee requires an additional mechanism.

[5] See https://www.sec.gov/rules/final/2016/33-10231.pdf.

[6] See Evans et al. (2017) for further description of NSAR filings.

[7] To mitigate this potential downside as much as possible, we use historical NSAR filings, which indicate whether the fund lends, to include only years in which funds lent throughout our historical sample.

[8] For example, Dimensional Fund Advisors (DFA) invests cash collateral from share lending in the DFA Short Term Investment Fund, meaning the $1,687,679 that the DFA U.S. Small Cap Fund paid for cash collateral management in 2017 was revenue for another branch of DFA (DFA Form N-1A).

[9] Greppmair et al. (2024) uses stock-level trading decisions of German mutual funds to show that they have better timing for their sells on the specific stocks they lend relative to stocks they do not lend.

[10] This generally corresponds to a lending fee of 1.5% or higher (Blocher and Whaley 2016).

[11] Our model's results are identical if we assume naive delegators believe $K_m = 0$ for all funds or are entirely unaware of securities lending.

[12] For simplicity, we assume delegators are risk neutral. Risk aversion would not change our model's qualitative results because naive delegators believe portfolio choices—and therefore, risk and expected return levels—are unaffected by lending fee retention.

[13] We assume funds lend all of their shares when lending fees are positive. The Investment Company Act of 1940 prohibits funds from lending more than one third of their portfolio at a given time, which would only be binding in our model if funds' weight in special stocks exceeded one third, which is unlikely in practice given the small market capitalization of special stocks.

[14] To keep the model parsimonious, we assume the per-dollar continuation value of AUM ψ to be exogenous rather than modeling the full dynamics of the problem.

[15] This reduced form flow-performance sensitivity is meant to capture investors' learning about the manager's skill over time, which we do not directly model.

[16] Risk aversion is necessary to prevent funds from levering up infinitely or assuming we added a leverage constraint, fixating on undiversified corner-solution portfolios. It is also a stand-in for the omitted risk aversion of delegators.

[17] Our main results hold when hedge funds retain a fraction of lending fees as long as their added incentive to lend is smaller than retaining mutual funds. Consistent with this, evidence in D'Avolio (2002), Boehmer et al. (2008), and Engelberg et al. (2012) suggests that hedge funds tend to borrow and short special stocks rather than long and lend them.

[18] This variation is not present in our two-stock model but would arise in a richer setting with heterogeneous tastes or different investment universes across mutual funds.

[19] Flow-performance sensitivity of three is on the upper end of estimates in the literature (Gil-Bazo and Ruiz-Verdú 2009, Mazur et al. 2017).

[20] Following the example in which fee retainers relative AUM decreases by 2% per year, after 16.6 years, fee retainers will still have 71.5% of the relative AUM they have for newly created funds.

[21] In the online appendix, we use a linear probability model and logit specification to show that fund-level flow-performance sensitivity estimates are a negative predictor of whether the fund is a fee retainer, although the statistical significant remains marginal.

[22] In the language of the model, we view poor past returns or flows as increasing ψ, the continuation value per dollar of AUM, which decreases the extent of overweighting by fee retainers.

[23] To control for the survivorship bias because of ICRM funds all surviving through 2017, we only include fund-quarters if the fund survived through 2017.

[24] Shorting these stocks would be generate alpha unless high lending fee stocks are exposed to a source of systematic risk (Drechsler and Drechsler 2021).

[25] *Fee Retainer* (percentage) is only calculated at the quarterly level because it is based on the CRSP holdings data. We assume it stays constant throughout the quarter so that we can still analyze monthly returns. If anything, we would expect this noise to attenuate our results.

[26] In the online appendix, we re-estimate this relation using a characteristic pure play approach adapted from Back et al. (2013). We again find a negative interaction effect between *Fee Retainer* (percentage) and *Lending Fees* when predicting future returns, although the *t* statistic drops to around 1.4.

[27] Similarly, Rizova (2011) hand collects securities lending data for mutual funds and finds that net returns to investors and returns from securities lending are negatively correlated, a confirmation of the Evans et al. (2017) result in panel data.

[28] Given our short sample period, many of these differences are not statistically significant.

[29] Barber et al. (2005) and Edelen et al. (2012) show that flows to mutual funds depend on how mutual fund fees and commissions are disclosed in addition to their magnitudes.

References

Adams JC, Mansi SA, Nishikawa T (2014) Affiliated agents, boards of directors, and mutual fund securities lending returns. *J. Financial Res.* 37(4):461–494.

Back K, Kapadia N, Ostdiek B (2013) Slopes as factors: Characteristic pure plays. Working paper, S&P Global Market Intelligence, New York.

Barber BM, Odean T, Zheng L (2005) Out of sight, out of mind: The effects of expenses on mutual fund flows. *J. Bus.* 78(6):2095–2120.

Blocher J, Whaley RE (2016) Two-sided markets in asset management: Exchange-traded funds and securities lending. Working paper, Vanderbilt University, Nashville, TN.

Blocher J, Reed AV, Van Wesep ED (2013) Connecting two markets: An equilibrium framework for shorts, longs, and stock loans. *J. Financial Econom.* 108(2):302–322.

Boehmer E, Jones CM, Zhang X (2008) Which shorts are informed? *J. Finance* 63(2):491–527.

Carhart MM (1997) On persistence in mutual fund performance. *J. Finance* 52(1):57–82.

Chevalier J, Ellison G (1999) Career concerns of mutual fund managers. *Quart. J. Econom.* 114(2):389–432.

D'Avolio G (2002) The market for borrowing stock. *J. Financial Econom.* 66(2):271–306.

Drechsler I, Drechsler QF (2021) The shorting premium and asset pricing anomalies. Working paper, New York University, New York.

Edelen RM, Evans RB, Kadlec GB (2012) Disclosure and agency conflict: Evidence from mutual fund commission bundling. *J. Financial Econom.* 103(2):308–326.

Engelberg JE, Reed AV, Ringgenberg MC (2012) How are shorts informed?: Short sellers, news, and information processing. *J. Financial Econom.* 105(2):260–278.

Evans R, Ferreira MA, Prado M (2017) Fund performance and equity lending: Why lend what you can sell? *Rev. Finance* 21(3): 1093–1121.

Evans RB, Prado MP, Zambrana R (2020) Competition and cooperation in mutual fund families. *J. Financial Econom.* 136(1):168–188.

Garfinkel JA (2009) Measuring investors' opinion divergence. *J. Accounting Res.* 47(5):1317–1348.

Gil-Bazo J, Ruiz-Verdú P (2009) The relation between price and performance in the mutual fund industry. *J. Finance* 64(5):2153–2183.

Greppmair S, Jank S, Saffi P, Sturgess J (2024) Securities lending and information acquisition. Working paper, Deutsche Bundesbank, Frankfurt, Germany.

Honkanen P (2024) Securities lending and trading by active and passive funds. *J. Financial Quant. Anal.* Forthcoming.

Huang J, Wei KD, Yan H (2007) Participation costs and the sensitivity of fund flows to past performance. *J. Finance* 62(3):1273–1311.

Ibert M, Kaniel R, Van Nieuwerburgh S, Vestman R (2018) Are mutual fund managers paid for investment skill? *Rev. Financial Stud.* 31(2):715–772.

Jones CM, Lamont OA (2002) Short-sale constraints and stock returns. *J. Financial Econom.* 66(2):207–239.

Khorana A (1996) Top management turnover an empirical investigation of mutual fund managers. *J. Financial Econom.* 40(3):403–427.

Kolasinski AC, Reed AV, Ringgenberg MC (2013) A multiple lender approach to understanding supply and search in the equity lending market. *J. Finance* 68(2):559–595.

Mazur M, Salganik-Shoshan G, Zagonov M (2017) Comparing performance sensitivity of retail and institutional mutual funds' investment flows. *Finance Res. Lett.* 22:66–73.

Muravyev D, Pearson ND, Pollet JM (2023) Anomalies and their short-sale costs. Working paper, Michigan State University, East Lansing, MI.

Ofek E, Richardson M, Whitelaw RF (2004) Limited arbitrage and short sales restrictions: Evidence from the options markets. *J. Financial Econom.* 74:305–342.

Pástor L, Stambaugh RF, Taylor LA (2017) Do funds make more when they trade more? *J. Finance* 72(4):1483–1528.

Prado MP (2015) Future lending income and security value. *J. Financial Quant. Anal.* 50(4):869–902.

Rizova S (2011) Securities lending by mutual funds. Working paper, University of Chicago, Chicago.

Sialm C, Zhang H (2020) Tax-efficient asset management: Evidence from equity mutual funds. *J. Finance* 75(2):735–777.

Weitzner G (2023) The term structure of short selling costs. *Rev. Finance* 27(6):2125–2161.