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Securities Lending and Trading by Active and Passive Funds

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Abstract

U.S. mutual funds in the securities lending market extract information from stock borrowing. Active funds exploit this information, rebalancing away from borrowed stocks whose prices tend to decrease, whereas passive funds do not. Information spillovers within fund families are stronger when the lender is a passive fund and when the family is more cooperative (less competitive). Active funds trade more aggressively on stocks with more negative future returns, suggesting that they are able to identify informed borrowing. Finally, passive funds charge higher lending fees than active funds, consistent with short sellers paying a premium to lower recall risk.

I. Introduction

At the end of 2018, U.S. mutual funds had $740 billion of outstanding stock loans, representing almost 85% of all outstanding short interest.[1] Mutual funds earned more than $2 billion in lending fees during the year, with 28% of active funds and 61% of index funds lending some of their portfolio securities. Importantly, by participating in the securities lending market, mutual funds can gain real-time information about short selling. This information may be valuable given that short interest has been shown to predict stock price declines.[2] These observations raise the question of whether lender funds exploit this information for trading.

This article is, to the best of my knowledge, the first to use stock-loan-level data to study the securities lending practices of U.S. mutual funds. I find that mutual funds acquire information through stock lending and use this information to trade and rebalance their portfolios. Active mutual funds reduce the portfolio weight of

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[1]The total value of short interest on 12/31/2018 was $872 billion. Source: Compustat supplemental short interest file. The total value of securities loans for mutual funds was approximately $740 billion according to SEC N-CEN filings.

[2]See, for example, Boehmer, Jones, and Zhang (2008), Engelberg, Reed, and Ringgenberg (2012), and Jones, Reed, and Waller (2016).

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stocks that are borrowed by approximately 1.04 percentage points of their net assets in the 2 quarters after a loan compared to similar funds that own but do not lend the stock, whereas there is a small positive effect for passive funds. The effect for active funds is highly economically significant, as the average portfolio weight of a stock is 1.45%. Moreover, the effect persists, and there is no reversal in trading: Eight quarters after a loan, the effect has grown further, to 1.93 percentage points.

This finding closely relates to Evans, Ferreira, and Porras Prado (2017), who raise the idea that stock lenders gain not only lending fees but also information through the lending markets. However, Evans et al. (2017) find that stock lending leads to annualized underperformance of approximately 0.5%, which they attribute to *overinvestment* in the stocks that they lend relative to their peer groups. Greppmair, Jank, Saffi, and Sturgess (2020) and Palia and Sokolinski (2024) find evidence that supports the findings in this article. Greppmair et al. (2020) test the same hypothesis of information acquisition through securities lending on German regulatory data and, like this article, find that mutual funds avoid capital losses by exiting the stocks that are borrowed. Greppmair et al. (2020) thus confirm the key findings in this article. Palia and Sokolinski (2024) study how passive investing impacts securities lending and market efficiency. They find that only lending by passive investors improves price efficiency in the financial markets and that passive investment is associated with higher lending fees and more short selling. These findings are attributed to short sellers preferring to borrow from passive investors. Their results are in line with the findings in this paper, in particular regarding higher lending fees.

I also find strong evidence of information spillovers within mutual fund families from lender funds to non-lenders. I consider stock lending events by both active and passive funds and examine whether funds that do not lend the stock trade it, indicating that information is transmitted from lenders to non-lenders within mutual fund families. I find, again, that passive funds do not react to other funds' lending but that active funds do. Moreover, active funds react more strongly to loans than passive funds. Evans et al. (2017) find a similar information spillover channel by employing a test on fund pairs with the same manager, in which one fund is allowed to lend securities while the other is not and identify stock lending signals that fund managers may receive by looking at stocks with high short interest.

Evans et al. (2017) also suggest that fund family organization is a driver of why funds participate in the securities lending market, and there is a broad literature on cross-fund subsidization and collaboration within fund families: Gaspar, Massa, and Matos (2006), for example, show that fund families transfer performance across funds to maximize family profits; Bhattacharya, Lee, and Pool (2013) show that affiliated funds can protect mutual funds against liquidity shocks, although investors in the funds may bear the costs of this hedging; and Agarwal and Zhao (2019) show that funds in families that have inter-fund lending programs invest more in illiquid assets, have mitigated fire-sales after large redemptions. Dannhauser and Spilker (2023) show that active funds in families with a greater share of index fund presence generate higher category-adjusted returns, and Chaudhuri, Ivković, and Trzcinka (2017) show that large funds in a family may subsidize small funds with strong recent performance. I focus on the incentive structures as in Evans, Porras Prado, and Zambrana (2020) and fund characteristics of size and performance as suggested in Chaudhuri et al. (2017) to study information spillovers within fund families in more detail. Active funds in more collaborative—that is, less

competitive, more cooperative, and with higher net cooperation—fund families trade more in response to lending by other funds in their fund families, and the effect is particularly strong when the lender is a passive fund. However, there is no apparent connection between fund size or recent past performance and information spillover trading.

Given that fund families can engage in cross-subsidization through the information acquisition channel, it is clear that entering and engaging in the stock lending markets is always strictly positive for the family as a whole, and is very unlikely to have a net negative effect. A fund that lends securities that it holds in its portfolio is always strictly better off than without lending: Even if the fund does not trade on the information it acquires through lending (as index funds do not), the fund will earn lending fees. If the fund additionally trades on the information by selling some or all of the borrowed position, it can avoid capital losses on depreciating holdings. Fund families that encourage information sharing between funds can realize an additional benefit by lending through one fund to earn additional revenue and trading through another fund to avoid capital losses. This improves the performance of both funds without imposing costs on either; especially if the lender is a passive fund that may not deviate from its target index by trading anyway. Moreover, this can avoid having to recall loans and risk alienating borrowing clients if the trading fund liquidates its entire position.

Stocks borrowed from either active or passive funds earn negative cumulative returns of approximately 3.6% (7.8%–8.8%) in the 2 (8) quarters after a loan, and there is no evidence of a reversal in returns even 12 quarters after a loan. This finding is in line with prior literature on short interest: Rapach, Ringgenberg, and Zhou (2016), for example, argue that aggregate short interest is the strongest predictor of stock returns. Boehmer et al. (2008) find that heavily shorted stocks underperform by nearly 16% annually, and Jones et al. (2016) show that disclosures of large short sale positions lead to negative long-term abnormal returns of more than 5%.

I also find evidence consistent with the ability of active funds to distinguish between informed and uninformed short selling. Separating stocks borrowed from active funds into two groups based on the change in the number of shares held by lender funds in the quarters following a loan, I find that stocks with a larger reduction in fund holdings experience risk-adjusted cumulative returns of approximately −5% (−8%) in the 2 (8) quarters after a loan, whereas stocks with a smaller reduction in fund holdings earn risk-adjusted returns of approximately −1.9% (−4.8%). The absence of a reversal in returns in either group indicates that the effect is not due to price pressure caused by more aggressive trading by mutual funds, thus affirming the information-based explanation.

Finally, I present supporting evidence that the market is aware that lender funds may use the information revealed by stock borrowing to trade. Passive funds earn higher lending fees than active funds, but there is no evidence of the fee differences being due to risk-taking by the lenders. This suggests that borrowers may be aware of a lending quality difference and hence prefer passive funds as lenders. It is also consistent with a trade-off between lending revenue and profits gained from trading.

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The analysis relies on a novel data set on securities lending for approximately 3500 U.S. mutual funds belonging to a sample of the 10 largest mutual fund families constructed by using regulatory filings submitted to the Securities and Exchange Commission (SEC). The top 10 mutual fund families in the sample accounted for roughly 50% of all U.S. equity mutual fund assets at the end of the sample period.[3] The final data set contains approximately 22,000 fund-quarter and 456,000 fund-stock-quarter observations from 2003 to 2017. Most importantly, the data identifies for each fund the list of securities that are on loan on the reporting date. This information enables me to study in detail the securities lending and trading practices of mutual funds; specifically, whether funds trade the stocks that are borrowed from them. The data also reveal fund-level information on securities lending: The value of securities on loan, the amount of collateral held against the loans, and the fee income earned from securities lending.

The main hypothesis in this article is that mutual funds gain real-time information on short selling by lending stocks and then use this information to rebalance their portfolios away from borrowed stocks. This hypothesis relies on three assumptions. First, it must be that borrowing indicates short selling. Second, short selling must predict negative returns. Third, funds must be allowed and able to trade on the information they gain from lending securities.

The first condition is easily satisfied, as short sellers must borrow shares to settle the trades if they keep the positions open for more than 1 trading day. This requirement necessarily ties short selling to securities borrowing. Second, short selling has also been established as a good predictor of future stock returns.[4] Therefore, whenever a mutual fund observes stock loan demand, it can infer that such demand is likely to come from short sellers needing to settle trades and that these trades tend to be informed.

The third assumption holds only to the extent that funds have discretion in their holdings and portfolio allocation. Active funds generally have few explicit constraints on their portfolio composition and can—or are even expected to—trade on information to improve performance relative to their benchmarks. Passive funds, in contrast, have relatively little discretion in their portfolio allocations and are normally restricted to holding securities in their target indices. As a result, passive funds have much less scope to shift their holdings away from borrowed stocks. I take advantage of this distinction by separating funds based on whether they are active or passive and use this categorization as a proxy for the degree of discretion they have in portfolio allocation.

The identification strategy in this paper relies on stock loans being allocated randomly between lenders; in other words, for example, more sophisticated funds that would also otherwise trade in response to high short-selling activity are not favored when stock loan demand is allocated between funds by securities lending agents. I confirm this with data from SEC N-PORT filings that are available for all U.S. mutual funds as of the third quarter of 2019 and report all portfolio holdings. These filings also report the value of lending for each holding. I confirm that both the probability of being allocated new loans and the amount of lending are driven

[3]Based on the CRSP Mutual Fund database.

[4]See, for example, Boehmer et al. (2008), Engelberg et al. (2012), Jones et al. (2016).

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mainly by the lendable market share of the fund within the fund family or securities lending agent. These findings indicate, crucially, that loans are not allocated based on fund strategy, relationships, or other factors, but that two funds with similar holdings and outstanding loans are equally likely to be allocated a stock loan.

II. Securities Lending Market

A. Regulatory Framework

The regulatory framework that governs securities lending by U.S. mutual funds is established in a series of no-action letters between the SEC and fund management companies.[5] The current rules stipulate that funds i) may lend at most one third of their total assets, ii) must receive collateral at least equal to 100% of the value of securities on loan, iii) must be able to terminate the loan at any time, and iv) should earn a reasonable return on the loan. Additionally, funds should invest cash collateral in securities that offer maximum liquidity and a reasonable return. In practice, mutual funds hold nearly all collateral as money market fund shares or T-bills. The ability to terminate the loans at will means that the loans are effective daily and rolled over until either party terminates them.

When entering a stock loan, lenders transfer ownership of the shares and the attached voting rights to the borrower. However, both the loaned securities and the collateral are recorded in the holdings and balance sheet of the lender fund.[6] Consequently, securities lending inflates the lender funds' *total* assets, as the collateral is also recorded in fund holdings and liabilities. The mandatory high collateralization rate on securities loans (at least 100% of loan value), in turn, protects lender funds against borrower default in normal market circumstances; lenders incur losses only in borrower defaults where the security on loan has increased in value by more than the over-collateralization rate, which is 4.69% and 4.28% for active and passive funds, respectively, in the sample. Borrower defaults are, moreover, rare: Only 12 U.S. mutual funds report having liquidated stock loan collateral in 2019, with no fund reporting losses from their securities lending programs in that year. Between 2018 and 2022, only one U.S. mutual fund has reported an adverse impact from stock lending.[7]

B. Market and Information Structure

A typical securities lending transaction involves four parties. At either end of the loan are the lender and the short seller, with the transaction typically being intermediated by a lending agent and the borrower's broker. The lending agent can, additionally, be either internal to the fund issuer or an external third-party agent acting on behalf of multiple clients.

[5]SEC "no-action letters" can be requested by regulated entities to certify that, e.g., a product or service does not constitute a violation of securities law for which the SEC would pursue enforcement action.

[6]The availability of this information is crucial to the data collection, as it enables me to identify the securities that each fund has on loan using the regulatory filings.

[7]Source: SEC N-CEN filings.

The loans are generally sought by the short seller's broker after a short sale is initiated: The broker sends a "locate request" to lending agents, asking for available quantities and fees. Typically, the broker hides the intended target of short selling by requesting available quantities and fees for a number of different securities to prevent potential lenders from extracting information from loan demand without genuinely participating in the stock lending market. Upon receiving a request to borrow securities, the lending agent makes an offer on quantities and fees, fully aware that the broker only intends to borrow a subset of the requested securities.

The loan allocation mechanism within lending agents is crucial to the identification in this paper. In private interviews, lending agents affirm that a lender's position in the lending "queue" is determined by their holdings in the stock relative to other potential lenders, their stock-specific utilization rate (the percentage of the stock position currently on loan), their time of arrival in the queue, or a combination of these factors. The loans are generally allocated to the fund with the lowest utilization rate, highest holdings, and earliest arrival in the queue, all else equal. The allocation of a loan is thus random within a lending agent when controlling for position size and existing lending. Importantly, this approach ensures that loans are allocated without giving an informational advantage to, for example, more sophisticated funds or funds that trade more intensively. Such allocation is crucial to the identification mechanism in this article, which relies on lender funds being similar to other funds in their comparison groups and assumes that the only difference in information between lenders and non-lenders at the stock level is due to the random allocation of loans. Section V examines this aspect in detail.

III. Hypothesis Development

This paper focuses on the information that mutual funds can extract from stock loans. The unique data set collected for this article enables me to examine multiple aspects of the securities lending and borrowing ecosystem. I analyze the trading behavior of mutual funds around stock loans, the information content of stock loans, and the trade-off between information revelation and securities lending fees that the borrowers face.

A large literature has studied short interest and stock price predictability, with many articles establishing that short interest is a strong predictor of stock returns. Given that short selling is tied to securities lending due to the requirement to deliver the stock to the buyer on the settlement day, it is natural to presume that securities *borrowing* reveals information to lenders, especially since lender funds acquire this information in real-time (i.e., before short interest statistics are made public).

Moreover, lenders know, at a minimum, the identity of the short seller's prime broker, and may receive additional information that helps them distinguish between informed short selling and market-making or hedging activities that may not contain information about stock values. All of the above suggests that the information that mutual funds can gain from stock lending is valuable and that lender funds should react to it by reducing their holdings of the stocks that are borrowed.

Formally, to test this hypothesis, I test whether funds that lend a stock change their holdings in that stock by more than funds that do not lend the stock.

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Hypothesis 1a (information in stock loans). Lenders' reaction to stock borrowing hinges on new information being revealed to them through the loans. Given the established connection between short interest and stock returns, stock borrowing is also likely to be a predictor of negative future stock returns. This connection is also important to establish that lender funds reducing their holdings in the stocks that are borrowed is a rational reaction to the signal they receive.

Hypothesis 1b (precision of information). If lender funds can distinguish between informed and uninformed borrowing, we should expect more aggressive trading around loans of stocks that experience larger negative ex post returns.

To test for the information content in stock loans, I run a forward-looking event study on the returns of stocks that are borrowed from mutual funds to test whether stock loans can be used to predict stock returns unconditionally.

Hypothesis 2 (the value of information and stock lending fees). Sophisticated traders produce information about companies and may short sell stocks to benefit from the information they produce. If lenders can extract this information from stock borrowing and use it to trade, short sellers should demand compensation for this. Similarly, if lender funds are aware that stock loan demand is a source of tradable information, they should charge lower lending fees to attract borrowing demand from informed short sellers. Both the supply and demand sides of stock loans thus combine to reduce stock lending fees for lenders that may seek to trade the stocks that are borrowed compared to funds that cannot trade using the information that is revealed by stock borrowing.

To test this hypothesis, I test whether funds that have few explicit restrictions in their trading—namely, active funds—charge lower stock lending fees than passive funds.

IV. Data and Variables

A. Data

The main data sources for this article are mandatory filings that U.S. mutual funds must submit to the SEC under the Investment Company Act of 1940. The quarterly N-Q and semi-annual N-CSR filings contain all portfolio holdings of mutual funds and are accessible on SEC EDGAR. One previously overlooked feature in the statements is the information they contain regarding securities lending: In particular, they identify the individual securities on loan by each fund as well as the loan collateral aggregated at the fund level. Additionally, the semi-annual filings generally disclose the total value of outstanding stock loans as well as the securities lending fee income at the fund level in the statements of operations and the statements of assets and liabilities.

I hand-collect information for the 10 largest mutual fund issuers in the U.S. as measured by the total assets under management at the end of 2017: Blackrock/

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iShares, FirstTrust, Wisdomtree, Fidelity, Statestreet/SPDR, Vanguard, VanEck, Dimensional Fund Advisors, Invesco/Powershares, and Franklin Templeton Investments. The fund issuers together comprised roughly 50% of total mutual fund assets at the end of 2017.[89] The 10 fund issuers in the sample also accounted on average for 53% of the value of securities lending by U.S. mutual funds in the time period from 2018 to 2021.[10] The fund issuers studied in this article thus account for the majority of both mutual fund assets and the majority of securities lending by mutual funds.

The key advantage of the data set described above is that it is fund-stock-specific, whereas other data widely used in the literature—such as short interest or stock lending fees (e.g., through Markit)—are less granular at the stock level. This important distinction enables me to study information acquisition and trading at the fund-stock level, specifically analyzing how mutual funds trade the stocks that are borrowed from them. This source of information may be more concrete than market-level variables for fund managers and traders. Moreover, the identification strategy in this article, discussed in detail in Section VI.A, will eliminate effects driven by public or market-level variables that fund managers could observe.

Additionally, I collect information from N-SAR filings for the universe of U.S. mutual funds. Specifically, I extract items 66A (is the fund an equity fund), 66B (investment style), and 69 (is the fund an index fund).

I collect item 69 from SEC N-SAR filings to identify index funds and use this item as a proxy for passive funds in this article. The results are robust to different definitions of passive funds, such as using ETFs, the intersection of ETFs and index funds, or the union of ETFs and index funds.[11] I do not seek to exclude so-called "active index funds" or "active ETFs" from the "passive funds" category in the sample. I also do not seek to identify "closet indexers" in the "active funds" category in the analyses. Any such misidentification will bias the results *against* finding i) any effect for active funds if passive funds do not trade and ii) differing effects for passive and active funds, assuming that the first hypothesis discussed in Section III holds.

I merged the data collected from SEC EDGAR with the CRSP Mutual Fund database. CRSP Mutual Fund data contain descriptive variables and portfolio holdings for the majority of U.S. mutual funds. I exclude fixed-income funds, retaining only funds that are identified as equity or mixed-strategy funds in CRSP Mutual Fund data. I also exclude funds that hold only foreign stocks, but I do not require the funds to be exclusively focused on the U.S. market: For example, the SPDR S&P Global Dividend ETF and the Invesco International Growth Fund, which hold both international and U.S. equities, remain in the data.

To better understand fund family level dynamics in securities lending practices and market participation across fund families, I use the data constructed by

[8]Based on CRSP Mutual Fund data.

[9]The data collection from EDGAR filings in the sample period is complicated by the lack of standardization in filing format between companies or even within companies over time.

[10]SEC N-PORT and N-CEN filings.

[11]Tables are available from the author.

Evans et al. (2020).[12] These data contain two indices that describe fund manager incentives by how competitive or cooperative they are, as well as a third net cooperative/competitive index that is computed by taking the difference of the two.

Finally, I use the Markit Securities Finance database to obtain market-level average loan fees at the stock level.

The final sample that is matched to the CRSP Mutual Fund database and used in the main analyses covers the period from the third quarter of 2003 to the fourth quarter of 2017 and contains approximately 22,000 fund-quarter observations on lending data and approximately 456,000 fund-stock-quarter observations for stocks on loan.

In additional tests in Section V, I use SEC N-PORT filings from Sept. 2019 to Dec. 2020 to validate the identification strategy. The N-PORT filings are standardized and machine-readable, enabling me to collect information on the universe of U.S. mutual funds. In addition to the data available in the N-Q and N-CSR filings, the N-PORT filings also reveal the value of stock lending at the position level and the securities lending agent for each fund. I use these data to demonstrate that securities loans are allocated randomly between mutual funds, with the main determinants of loan allocation between funds being a fund's market share in the requested stock within the mutual fund family and the fund's utilization rate in the stock. These data contain 39,000 funds and 4,800,000 fund-stock observations.

Stock prices, trading volumes, and other standard controls are obtained from CRSP and Compustat.

B. Variable Construction

I obtain from the SEC N-Q and N-CSR filings the main variable of interest: The stocks that are at least partially on loan by a fund. I thus obtain the $loan_{f,s,t}$ indicator variable, which identifies, at the quarterly frequency, that fund f is lending stock s at time t.

The SEC filings also provide information on funds' broader securities lending practices. Total collateral on securities loans, the total value of securities on loan, and total net asset values ($collateral_{f,t}, loanvalue_{f,t}, TNA_{f,t}$) are measured at the fund-quarter level, while securities lending fee income ($lending\,income_{f,t}$) is measured semi-annually.

To measure the intensity or "aggressiveness" of funds' lending strategies, I compute multiple variables: $loanvalue_{f,t}$ scaled by total net assets measures the share of its portfolio that a fund lends; the number of securities on loan ($numloan_{f,t}$) scaled by the total number of different securities held by the fund measures the lending intensity at the extensive margin; $loanvalue_{f,t}$ divided by the total value owned of securities at least partially on loan measures the intensive margin of lending at the fund level. $Overcollateral_{f,t}$ measures the over-collateralization or haircut that a lender fund holds and is constructed by dividing the value of collateral by the loan value and subtracting 1 from the ratio ($collateral_{f,t}/loanvalue_{f,t} - 1$).

[12] I am extremely grateful to Richard Evans, Melissa Porras Prado, and Rafael Zambrana for sharing their data with me.

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For the main tests on portfolio rebalancing around stock loans in Section VI.A, I construct a variable to measure funds' stock-level trading relative to comparison groups of similar funds. This approach eliminates concerns arising from confounding factors, such as news that could be observed by all investors or stock-specific effects that would affect the portfolio allocations of all funds. To measure the changes in comparison group holdings, I first separate funds according to their index fund status (Passive vs. Active funds). Within these, I group funds according to their total net asset tercile and CRSP Investment Objective Code (IOC). This process assigns funds into groups with similar access to information (based on fund size) and similar investment mandates and strategies (based on their investment objective and whether they are active or passive). In short, this ensures that active funds are compared to other active funds of similar size and with a similar investment objective.

For each of these groups g, I compute the average holding in stock s in time t. The comparison group average holding $\widehat{w_{g,s,t}}$ is thus given by

$$\widehat{w_{g,s,t}} = \frac{1}{N_{g,t}} \sum_{k \in g} w_{k,s,t}, \tag{1}$$

where $N_{g,t}$ is the number of funds in group g in time t, and $w_{k,s,t}$ is the holding of fund k in stock s in time t, for each fund k in group g in time t.

Finally, I compute a fund-stock level measure of trading by subtracting the comparison group trading activity in stock s for each fund's trading:

$$\Delta\text{Trading}_{f,s,t} = \left(w_{f,s,t} - w_{f,s,t-1}\right) - \left(\widehat{w_{g,s,t}} - \widehat{w_{g,s,t-1}}\right) \tag{2}$$

Examining the differences in trading between lenders and their comparison group highlights the trading driven by information acquired from lending.

I construct a proxy for stock lending fees, as the regulatory filings for mutual funds do not directly reveal the fees paid by borrowers. The N-CSR filings show the *lending income* a lender receives net of collateral reinvestment income and the share of income retained by the lending agent. The data thus identify the left-hand side of the equation

$$\text{lending income}_{f,t} = \sum_{b} \left[\text{net fee}_{f,b,t} - \text{agent fees}_{f,b,t} + \text{collateral reinv.income}_{f,b,t}\right] \tag{3}$$

$$= \text{net fees}_{f,t} - \text{agent fees}_{f,t} + \text{collateral reinv.income}_{f,t} \tag{4}$$

The lending income above consists of the net fees paid for each loan b, less the fees the lender pays to the lending agent, plus the collateral reinvestment income. Rearranging this equation and dividing by the value of securities on loan yields the average lending rate charged by the lender:

$$\frac{\text{net fees}_{f,t}}{\text{loanvalue}_{f,t}} = \frac{\text{lending income}_{f,t} - \text{collateral reinv.income}_{f,t}}{\text{loanvalue}_{f,t}} + \frac{\text{agent fees}_{f,t}}{\text{loanvalue}_{f,t}} \tag{5}$$

Using the collateral value, and knowing that it is generally invested in money market funds, I can create a proxy collateral reinvestment income by multipyling

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the collateral value by the average contemporaneous money market fund yield.[13] I compute the yield on money market funds by taking the average return on all U.S. money market funds in each quarter. I use CRSP Mutual Fund data to identify money market funds and to obtain their returns. Fund issuers generally have fixed lending agent fees (paid as a share of stock lending income) across all their funds, although this share may vary over time.[14] I account for the agent fee share of lending income using fund issuer-quarter fixed effects, as these will account for the fixed share of lending income within a fund issuer-quarter. The identification in the lending fee and collateral regressions thus comes from the variation between active and passive funds within mutual fund families.

I create the $\widehat{\text{lendingfee}}_{f,t}$ proxy for stock loan fee rates by dividing the difference of lending income and collateral reinvestment income by the value of outstanding securities loans and adjusting this figure for the number of quarters in which the fund has outstanding securities loans in the half-year period to which the N-CSR report refers. Finally, I annualize the lending fee rate by multiplying by 2.

$$\widehat{\text{lendingfee}}_{f,t} = \frac{\text{lending income}_{f,t} - \text{collateral}_{f,t} * r_{MMF,t}}{\text{loanvalue}_{f,t}} \times \frac{2}{q_{f,t}} \times 2 \tag{6}$$

To account for the omission of agent fees, I include fund issuer fixed effects in all regressions on lending fees and collateral levels to account for any systematic differences in agent fees across fund issuers as well as address any differences in securities lending strategies between fund issuers. Implicitly, this approach assumes that the lending agent's share of lending revenue does not vary between funds within a given issuer and time.

I use the Markit Securities Finance database to construct an imputed fund-level average fee ($\text{avgfee}_{f,t}$) that a fund would earn based on the stocks it lends if it earned a market average fee (as published by Markit) on each stock: $\text{avgfee}_{f,t} = \frac{1}{N}\sum_{s=1}^{N} \text{mktfee}_{s,t} \times \mathbb{1}_{f,s,t}$, where $\mathbb{1}_{f,s,t}$ is an indicator variable that takes a value of 1 if stock s is on loan by fund f in quarter t and $\text{mktfee}_{s,t}$ is the average Markit stock loan fee for stock s in quarter t.

Lending yield ($\text{lendyield}_{f,t}$) is computed by dividing lending income by total net assets. The fund-level indicator variable $\text{lending}_{f,t}$ is equal to 1 if the collateral or value on loan is nonzero, and set to 0 otherwise. In regressions that include the universe of U.S. mutual funds, I use the indicator variable obtained from N-SAR or N-CEN filings.

I impute fund flow by using a fund's returns in the current quarter and the reported total net assets in the current and previous quarters: $\text{fundflow}_{f,t} = \left(\text{TNA}_{f,t} - \left(1 + r_{f,t}\right) \times \text{TNA}_{f,t-1}\right)/\text{TNA}_{f,t-1}$.

Stock-level variables are computed at the highest available frequency[15] and averaged at the quarterly frequency. Market capitalization is computed as the product of CRSP shares outstanding and the closing price at the quarter end. The high-low ratio is computed as $(\text{high} - \text{low})/(1/2 \times (\text{high} + \text{low}))$, and the bid–ask

[13]Practically all securities lending collateral is invested in money market funds or U.S. treasuries.

[14]See, for example, McCullough (2018).

[15]CRSP, short transactions, and fails to deliver are measured daily; mutual fund flows monthly; and Compustat and securities lending data are measured quarterly.

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TABLE 1

Descriptive Statistics on Securities Lending by Investment Funds

Table 1 presents summary statistics on funds in the SEC EDGAR lending fund sample that is matched to CRSP Mutual Fund data for active and passive funds, respectively. I retain all non-fixed income funds that hold at least some U.S. securities. All variables except Total Net Assets (TNA) and Loan Avg.Mcap. are in percentage points. Lending fee is a proxy for the stock lending fee earned by mutual funds and is computed by subtracting the product of the average money market fund yield in a quarter and the fund-level value of collateral from the income the fund earns from stock lending and then dividing the result by the value of securities on loan. Mkt. Lending fee is the market average lending fee based on data from Markit Securities Finance, and averaged at the fund level. Lending yield is the lending income divided by total net assets of the fund. Loanvalue/TNA is value on loan divided by total net assets. Overcollateralization is the difference of the value of collateral and the value of securities on loan, divided by the value of securities on loan. Num. loan/Num. hold is the number of securities on loan divided by the total number of securities held by the fund. Loanvalue/TS is the value of securities on loan divided by the total value of holdings in the securities that are on loan. Avg. position (pct) is the average percentage weight in a security held by the fund and measures portfolio concentration. Avg. position in loans measures the average portfolio weight of the stocks that are on loan. Loan Avg.Shortint, Loan Avg.Bid-Ask, Loan Avg.Hi-Lo and Loan Avg.Mcap are, respectively, the average short interest, bid–ask spread, high-low ratio, and market capitalization for the stocks that are on loan by each fund type. Competition and Cooperation indices measure the collaborative incentives in mutual fund families (Evans et al. (2020)). $^{***}p<0.01, ^{**}p<0.05, ^{*}p<0.1$.

	Active		Passive		(Passive - Active)	
	Mean	SD	Mean	SD	*b*	*t*
TNA (Million)	4,059	10,037	3,617	11,036	−442**	(−2.58)
Mgmt fee	0.30	0.41	0.29	0.26	−0.01	(−1.79)
Lending fee	1.10	4.95	2.20	4.84	1.10***	(7.29)
Mkt. Lending fee	0.66	1.25	0.42	0.80	−0.24***	(−11.42)
Lending yield	0.01	0.02	0.02	0.04	0.01***	(10.95)
Loanvalue/TNA	2.91	4.84	5.52	6.65	2.60***	(17.25)
Overcollateralization	4.69	6.24	4.28	6.12	−0.41*	(−2.55)
Num. loan/Num. hold	9.93	13.32	14.47	15.52	4.54***	(12.65)
Loanvalue/TS	41.50	134.90	89.40	205.23	47.90***	(11.41)
Avg. position (pct)	1.45	2.07	1.20	1.59	−0.25***	(−8.25)
Avg. position in loans (pct)	0.74	1.02	0.84	1.05	0.10***	(4.03)
Loan Avg.Short interest	12.26	6.46	11.06	6.26	−1.20***	(−8.51)
Loan Avg.Bid-Ask	0.15	0.16	0.14	0.17	−0.01***	(−3.43)
Loan Avg.Hi-Lo	3.87	1.86	3.68	1.83	−0.19***	(−4.63)
Loan Avg.Mcap.	6,273	12,679	7,019	15,785	745*	(2.23)
Competition index	0.32	0.10	0.26	0.10	−0.07***	(−31.95)
Cooperation index	0.45	0.08	0.39	0.07	−0.06***	(−38.14)
Observations	16,718		5,226		21,944	

ratio is computed as $(\text{ask}-\text{bid})/(1/2\times(\text{ask}+\text{bid}))$ using daily CRSP data and averaged at the quarterly level for each stock. $\text{Volatility}_{s,t}$ is the average daily absolute value of return of stock s over quarter t. All variable definitions are collected in Appendix A of the Supplementary Material.

C. Descriptive Statistics

Table 1 presents descriptive statistics for the funds in the sample. On average, active funds are significantly larger than passive funds but earn lower lending fees and lending yields. The Loanvalue/TNA measure shows that passive funds lend a larger share of their portfolios (5.5% vs. 2.9%) but that over-collateralization is slightly higher for active funds in the unconditional average (4.7% vs. 4.3%). This difference, however, disappears in a regression setting when controlling for time and issuer and fund characteristics (see Table 7). The lending intensity measures show that passive funds lend their portfolio securities more widely as a share of holdings (14% vs. 10% of individual stocks are on loan by count) and more intensively as a share of the total holdings of the stocks on loan (89% vs. 42%).

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This difference indicates that passive funds lend both more widely (more stocks) and more intensively (a larger proportion of their lendable supply) than active funds.

Passive funds also hold slightly more diversified portfolios than active funds, with the average portfolio weight of a stock in a passive portfolio being 1.2% compared to 1.5% for active funds.[16] In contrast, the average portfolio weight of a stock on loan is slightly higher for passive funds than active funds (0.81% vs. 0.74%).

The average short interest for stocks on loan is lower for passive funds (11.6% vs. 12.3%). The bid–ask spread and high-low ratios are slightly lower for stocks on loan from passive funds than from active funds, indicating that stocks borrowed from them are somewhat more liquid than those borrowed from active funds. There is no difference in the market capitalization of the stocks on loan. These differences may be attributable to index effects, as passive funds are more likely to hold stocks that are included in major indices and are, as a result, more liquid and may have lower short interest.

V. Identification

This article examines the signals and information that can be extracted from stock loan demand. The identification strategy thus relies on the allocation of a stock loan being random between similar lender candidates.

To establish this, I examine how new loans are allocated in two ways using data on the universe of U.S. mutual funds from N-PORT filings for the period of 2019–2020. First, I look at new stock loans at the fund family (securities lending agent) level by restricting the analysis to observations where no fund within the family (lending agent) was lending the stock in the previous reporting period. Any stock loans observed at the end of a reporting period must therefore have been initiated within that reporting period. For these fund-stock observations, I regress an indicator variable that takes a value of 1 if a fund is lending a stock on the fund's market share in that stock at the family (lending agent) level. Second, I study the proportion of new loans[17] being allocated to a specific fund as a function of that fund's share of holdings in the stock within the fund family (securities lending agent) and the fund's loan utilization rate in the previous reporting period.

In both settings, I include fixed effects to control for fund, fund family, securities lending agent, stock, and time factors. If stock loans are allocated randomly among potential lender funds, both the likelihood of being allocated a loan and the proportion of new loans that are allocated to a fund should be positively related to the fund's relative holdings of the stock, and negatively related to the utilization rate: Loans should, according to industry practice, be allocated to the fund with the lowest utilization rate.

[16]These numbers correspond to 83 and 71 stocks in their portfolios, respectively.

[17]I measure new stock loan demand at the mutual fund family level by identifying the difference in the total number of shares of a stock on loan by all funds in the family between two consecutive reporting dates. An increase in the number of shares on loan means that there has been a net increase in stock borrowing from the family. However, a decrease in the number of shares does not necessarily mean that there has not been new loan demand, as it is possible that some loans were terminated and new ones were engaged.

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Formally, I estimate the following regression:

$$Y_{f,s,t} = \beta_1 \text{holdshare}_{f,s,t} + \beta_2 \text{utilization}_{f,s,t-1} + X_{f,s,t}, \quad (7)$$

where the dependent variable is $\text{Newloans}_{f,s,t}$, an indicator variable that takes a value of 1 if fund f has new loans in stock s in quarter t, in Panel A of Table 2, and the percentage increase in new loans in stock s allocated to fund f in quarter t in Panel B. $\text{holdshare}_{f,s,t}$ is the market share the fund holds in stock s at time t, and $\text{utilization}_{f,s,t-1}$ is the fund's previous quarter utilization rate in stock s. $X_{f,s,t}$ represents a vector of fixed effects that captures unobserved variation for fund family, fund, stock, time, and securities lending agent.

The estimates in Panel A confirm the hypothesis that the probability of being allocated a new loan increases with the proportion of holdings of a fund within the fund family (securities lending agent). The main determinant of loan likelihood is the market share a fund holds in the security: A higher proportion of holdings in a security increases the likelihood of being allocated a loan. The coefficients for family-level holding share range from 0.25 to 0.47: A 1-percentage-point increase in the stock-lending market share of a fund increases the likelihood of being allocated a loan by 0.25–0.47 percentage points. The results remain qualitatively unchanged when performing the analysis at the securities lending agent level. Second, I focus on the *amount* of new stock loans instead of a dummy variable. Panel B of Table 2 presents the results. The share of new lending increases by 0.78–0.89 percentage points for every percentage-point increase in the holding's share of a fund, and decreases by approximately 0.30 percentage points for every percentage-point increase in the utilization rate at the fund level. The results are qualitatively similar at the securities lending agent level, although they are no longer significant when controlling for the holding share at the fund family level.

These results support the idea that stock lending is allocated randomly between funds within a fund family based on the holdings of the funds (available lending capacity) and the utilization rate, with the funds with the highest proportion of holdings and the lowest utilization rate being prioritized.

VI. Empirical Analysis

A. Trading on Lending Signals

Section VI.A presents the main tests and results. I identify stock-loan-induced trading by comparing the evolution of trading by mutual funds that lend specific stocks to trading in those stocks by groups of similar funds.

The identification strategy in this article builds on the assumption that similar funds—defined by their index fund status, investment objective, and total net asset group—only differ in that some funds lend a specific stock while others do not. In short, I assume that funds within a group have access to similar information and that loans are allocated randomly at the stock level between funds. Since stock lending transpires through a lending agent, it is reasonable to assume that the allocation of a loan is relatively random for funds within any given lending agent. Section V

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TABLE 2

Loan Allocation

Table 2 analyzes how stock loans are allocated between mutual funds using hand-collected data from SEC N-PORT filings. Panel A reports the results from regressing an indicator variable $\text{newloans}_{f,s,t}$ on fund-level holdings share in a stock. Panel B reports results from regressing the share of new loans ($\text{newloanshare}_{f,s,t}$) on fund-level holdings share and utilization rate. $\text{newloans}_{f,s,t}$ takes the value 1 if any new stock lending in stock within the fund family or securities lending agent s between times $t-1$ and t is allocated to fund f. $\text{newloanshare}_{f,s,t}$ is the ratio of new lending that is allocated to the fund and is computed as the proportion of new stock lending between times $t-1$ and t that is allocated to fund f. Holdshare is measured at the fund family (securities lending agent) level and measures the share of holdings in stock s by the fund relative to total holdings at the fund family (securities lending agent) level. Standard errors are clustered by fund family and time. $^{***}p<0.01$, $^{**}p<0.05$, $^{*}p<0.1$.

Panel A. Probability of Being Assigned a New Loan

	1	2	3	4	5	6
Holdshare (f.family)	0.473***	0.266***			0.465***	0.252***
	(11.86)	(9.19)			(6.35)	(10.35)
Holdshare (agent)			0.498***	0.270***	0.170**	0.022
			(13.00)	(14.71)	(2.25)	(0.71)
Fund family × Stock × Month FE	Yes	Yes	No	No	Yes	Yes
Fund × Month FE	No	Yes	No	Yes	No	Yes
Seclend agent × Stock × Month FE	No	No	Yes	Yes	Yes	Yes
Observations	157,237	154,877	221,987	220,528	78,810	77,211
Adjusted R^2	0.295	0.465	0.386	0.553	0.024	0.246

Panel B. Share of New Loans Assigned to Fund

	1	2	3	4	5	6
Holdshare (f.family)	0.875***	0.784***			0.888***	0.779***
	(43.05)	(20.22)			(35.42)	(16.66)
Holdshare (agent)			0.561***	0.396***	−0.050	−0.021
			(14.20)	(6.26)	(−0.92)	(−0.34)
Utilization	−0.299***	−0.313***	−0.155***	−0.178***	−0.273***	−0.293***
	(−7.56)	(−7.31)	(−12.78)	(−6.03)	(−6.98)	(−6.69)
Fund family × Stock × Month FE	Yes	Yes	No	No	Yes	Yes
Fund × Month FE	No	Yes	No	Yes	No	Yes
Seclend agent × Stock × Month FE	No	No	Yes	Yes	Yes	Yes
Observations	57,959	55,606	56,106	53,916	41,642	39,899
Adjusted R^2	0.482	0.508	0.335	0.624	0.009	−0.041

presents tests that show that loan allocation within a fund family and securities lending agent is mostly determined by the position size.

I estimate the following regression:

$$\begin{aligned}(8)\qquad \Delta\text{Trading}_{f,s,t} &= \sum_{k=-8}^{8}\beta_k \text{loan}_{f,s,t+k} + \beta_9 \text{loan}_{f,s,t\geq 9} + \gamma \text{Active}_f \\ &+ \sum_{k=-8}^{8}\phi_k \text{loan}_{f,s,t+k}\times \text{Active}_f + \phi_9 \text{loan}_{f,s,t\geq 9}\times \text{Active}_f \\ &+ X_{f,s,t} + \epsilon_{f,s,t},\end{aligned}$$

where the dummy $\text{loan}_{f,s,t}$ takes a value of 1 when stock s is on loan by fund f at time t, Active_f is an indicator variable for active funds, and $X_{f,s,t}$ represents fixed effects controls. The coefficients β_k on the leads and lags of the $\text{loan}_{f,s,t}$ dummy estimate the event-time variation in $\Delta\text{Trading}_{f,s,t}$ for passive funds, comparing the portfolio weight changes of stocks on loan to those of passive non-lender funds in the same category group (TNA group, IOC). The coefficients ϕ_k similarly estimate the portfolio weight changes of stocks on loan compared to other active funds that

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are in the same size and style group but do not lend the stock. Finally, the sum of the β_k and ϕ_k coefficients give the total effect for active lenders.

Importantly, this estimation methodology enables a like-for-like comparison of funds within a category, where the variation is due to one fund lending a specific stock and the comparison group not lending it. In short, the estimation compares active (passive) funds that lend a specific stock to other similar active (passive) funds that hold the same stock but do not lend it.

I control for time-varying stock-level effects by incorporating stock × quarter fixed effects. The stock-time fixed effects will capture transitional stock-specific effects that can affect mutual fund holdings, such as interest, index adjustments, or news.[18] The stock-time fixed effect also absorbs portfolio weight changes that are due to stock returns, as these would affect the stock's average portfolio weight in all funds holding it.

Fund-stock fixed effects control for fund-stock-level average effects in the deviation from the comparison group holdings, thus helping to isolate portfolio weight changes specifically driven by lending, and the IOC-Quarter fixed effects absorb time-varying IOC-Level effects relating to portfolio weights in specific stocks. One such factor could, for example, be that a stock becomes (in)eligible for environmental, social, and governance (ESG)-Focused funds or exits an index used by funds in the IOC as a benchmark. Fund family – stock – time fixed effects control for any remaining time-varying fund-family level decisions regarding stock (e.g., a family-level decision to divest from a company or relating to the lending of specific stocks by funds in the family).

Table 3 presents the results. For brevity, I omit coefficients for leads exceeding 2 quarters and lags exceeding 6 quarters.[19] The baseline coefficients (column 1, Passive section) for active funds show that they react to stock borrowing by reducing their holdings *by more than otherwise similar active funds*, that is, that they react to any signals they gain from stock lending. In contrast, passive funds do not adjust their holdings in reaction to stock loans (column 1, Active section). The inclusion of progressively more fixed effects (columns 2–6) does not change the results qualitatively.

Figure 1 presents the cumulative trading compared to the peer group average active and passive funds, respectively. Active funds sharply decrease their holdings relative to otherwise similar active non-lenders as a reaction to the stock loans. There is no indication of a reversal in the holdings even after 8 quarters. In contrast, passive funds slightly *increase* their holdings leading up to the loan relative to similar non-lenders, after which there is little change in their positions through the event window. At 8 quarters after the loan, the difference between lender funds and the comparison groups is no longer statistically significant. The cumulative effects for all specifications are presented in Figure A1 and Table A2 of the Supplementary Material.

The fund–stock (specifications (4)–(6)) and fund family–stock–time fixed effects reveal a small pre-loan increase in portfolio weight beyond the comparison group. This is consistent with stock loans being allocated to funds with the largest lendable positions, as discussed in Section V and Table 2. However, active lender

[18]See, for example, Appel, Gormley, and Keim (2016), (2025).

[19]The full regression tables are available on request.

TABLE 3

Portfolio Rebalancing Around Stock Lending

Table 3 analyzes mutual funds' trading around stock lending events. The dependent variable $\Delta\text{Trading}_{f,s,t}$ measures the difference in trading in stock s between a fund and the fund's comparison group. The comparison groups are defined according to Active/Passive status, CRSP Investment Objective Code and Total Net Asset tercile. The leads and lags of the indicator variables for lending measure the deviation from the comparison group average portfolio weight change for the stock in event-time, where an event is the observation of a stock loan. The baseline coefficients are the event-time dummy variables for Passive funds. The Active fund event-time dummies measure trading relative to their benchmark groups *and* passive funds. For brevity, the table only reports leads up to two quarters and lags up to 6 quarters; the regression specification has leads and lags up to 8 quarters. The coefficient on fund flow in specification (2) is −0.000 (*t*-stat = −1.04). Standard errors are clustered at the stock, fund and quarter levels. $^{***}p<0.01, ^{**}p<0.05, ^{*}p<0.1$.

	1	2	3	4	5	6
Passive						
−2	0.002	0.002	0.002*	0.000	0.001	0.001
	(1.66)	(1.60)	(1.95)	(0.28)	(0.57)	(1.31)
−1	0.004**	0.004**	0.004***	0.004***	0.002*	0.002
	(2.64)	(2.65)	(2.95)	(2.70)	(1.83)	(1.29)
0	0.003*	0.003*	0.003**	−0.001	−0.001	−0.002
	(1.83)	(1.77)	(2.22)	(−0.52)	(−0.77)	(−1.41)
1	−0.002	−0.002	−0.001	−0.004***	−0.003**	−0.004***
	(−1.16)	(−1.21)	(−0.53)	(−2.75)	(−2.39)	(−2.97)
2	−0.000	−0.000	−0.000	−0.002	−0.002	−0.001
	(−0.19)	(−0.18)	(−0.28)	(−1.19)	(−1.28)	(−0.87)
3	0.001	0.001	0.002	0.001	0.001	0.000
	(0.89)	(0.83)	(1.42)	(0.90)	(1.51)	(0.56)
4	0.000	0.000	0.000	0.000	−0.001	−0.001
	(0.12)	(0.08)	(0.24)	(0.28)	(−0.81)	(−1.19)
5	−0.000	−0.001	−0.000	−0.000	−0.000	−0.002*
	(−0.65)	(−0.69)	(−0.18)	(−0.34)	(−0.39)	(−1.89)
6	−0.001	−0.001	−0.001	−0.001	−0.001	−0.001
	(−0.75)	(−0.72)	(−0.81)	(−0.62)	(−0.79)	(−1.34)
Active						
−2	−0.001	−0.001	−0.001	0.002	0.002	0.003*
	(−0.71)	(−0.74)	(−0.82)	(1.45)	(1.40)	(1.88)
−1	−0.001	−0.001	−0.001	−0.000	0.002	0.002
	(−0.49)	(−0.36)	(−0.45)	(−0.20)	(1.23)	(0.79)
0	−0.006***	−0.006***	−0.006***	−0.001	−0.001	−0.000
	(−3.17)	(−3.17)	(−3.11)	(−0.34)	(−0.69)	(−0.11)
1	−0.006**	−0.006**	−0.006***	−0.003	−0.004*	−0.003**
	(−2.46)	(−2.44)	(−2.71)	(−1.60)	(−2.00)	(−2.05)
2	−0.005***	−0.005***	−0.004***	−0.002	−0.002	−0.004**
	(−3.02)	(−3.03)	(−2.75)	(−1.21)	(−1.40)	(−2.31)
3	−0.003*	−0.003*	−0.003**	−0.002	−0.003**	−0.002**
	(−1.95)	(−1.95)	(−2.01)	(−1.23)	(−2.16)	(−2.28)
4	−0.003***	−0.003***	−0.002*	−0.001	0.000	−0.001
	(−2.86)	(−2.77)	(−1.88)	(−0.68)	(0.09)	(−0.54)
5	−0.002**	−0.002*	−0.002*	−0.001	−0.001	0.000
	(−2.03)	(−1.98)	(−1.79)	(−0.86)	(−0.95)	(0.20)
6	−0.001	−0.001	−0.001	0.000	0.001	0.001
	(−0.85)	(−0.88)	(−0.50)	(0.21)	(0.77)	(0.72)
Fund flow control	No	Yes	No	No	No	No
Stock × Quarter FE	No	No	Yes	Yes	Yes	Yes
Stock × Fund FE	No	No	No	Yes	Yes	Yes
IOC × Quarter FE	No	No	No	No	Yes	Yes
F.Family × Stock × Quarter FE	No	No	No	No	No	Yes
Observations	31,356,250	30,837,398	31,326,947	30,759,547	28,251,261	16,660,066
Adjusted R^2	0.000	0.000	−0.005	0.068	0.096	0.281

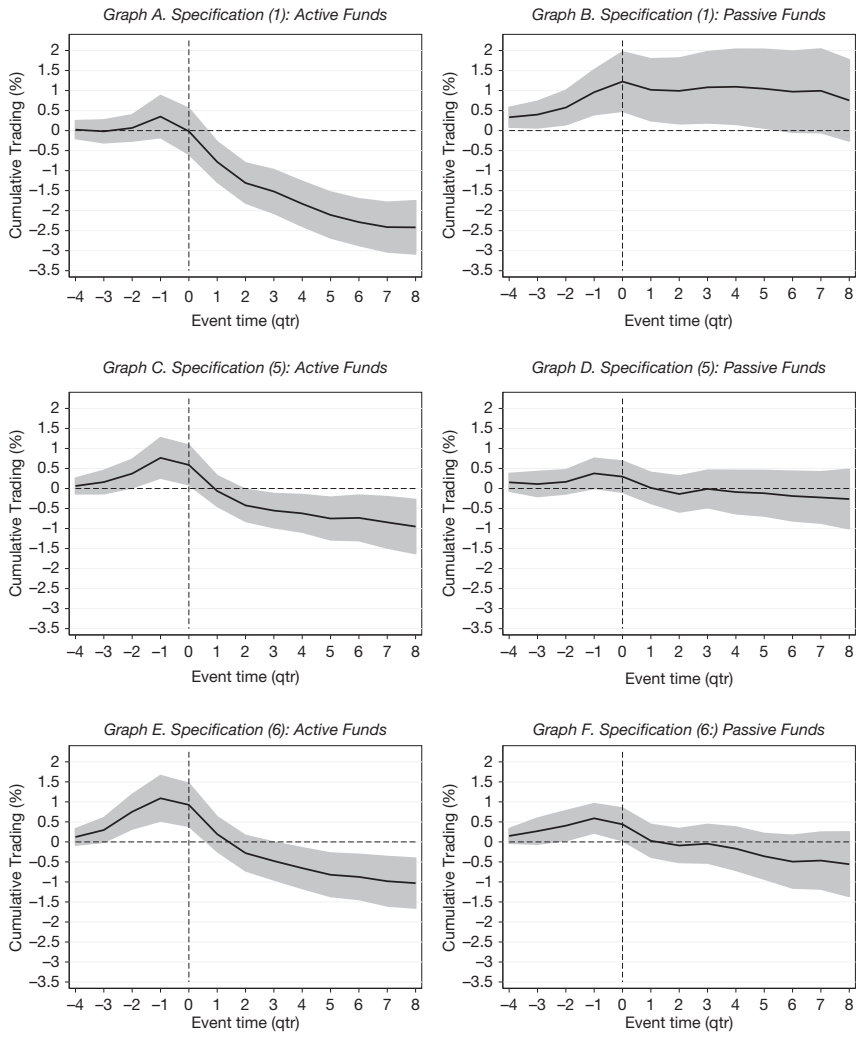
funds do not merely revert to peer-group average holdings levels, but reduce their portfolio weights in the lent stocks by approximately 1 percentage point relative to their peers. Moreover, the more stringent controls—if anything—reduce any indication of excess accumulation of the lent stocks by passive funds relative to the baseline specification with no controls. Specification (6) with fund family–stock–time fixed effects reveals any trading *net of fund family* funds, accounting for, for example, trading by multiple similar funds within the family. While the effect is

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FIGURE 1

Trading – Rebalancing

Figure 1 presents the cumulative deviation in trading when comparing Active and Passive lender funds to non-lender funds of the same type. The graphs plot the estimates for cumulative trading for specifications (1), (5), and (6) from Table 3. The numerical coefficients are tabulated in Table A2 in the Supplementary Material. The graphs display the period from 4 quarters before an observed loan to 8 quarters after a loan. The grey bands show the 95% confidence interval.



somewhat dampened and displays a stronger pre-loan accumulation of the stock, the total reduction in holdings after a loan is of a similar magnitude of approximately 2% for active funds. Any effect for passive funds is, if anything, reduced.

One concern is that stock borrowing might coincide with some unrelated factor that leads to a subsequent reduction in holdings. However, it is difficult to imagine a factor that would consistently affect only funds that are lending a specific stock over all other funds in the comparison group that also owns the stock,

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especially when controlling for stock-time and IOC-Time fixed effects. If some such exogenous factor caused an increase in a fund's position in a stock, the fund might become more likely to lend the stock (as it now has a larger supply of the stock and presumably a lower utilization rate). The fund might then reduce its weight in the stock to return to its "target allocation." In such a case, we should observe an increase in holdings before a loan, followed by a decrease in holdings of similar magnitude so that the fund returns to its target allocation. There is a small increase in holdings prior to lending for active funds. However, the magnitude of this increase is economically small (and statistically insignificant in specifications (1)–(3)), and the decrease relative to the group average holding is considerably larger after the loan (see the cumulative effects in Figure 1). These results make explanations based on a reversal to the mean improbable.

It could also be that active funds react to high short interest, and that lending simply coincides with this reaction. This concern is mitigated in two ways. First, the difference-in-differences regression method addresses this possibility, as short interest is observable to all funds regardless of whether they are lending securities. Were the effects due to short interest—observable by all market participants—the loan lead and lag coefficients would not be different from zero in the difference-in-differences methodology. Second, the stock-quarter fixed effects in all regression specifications absorb any time-varying effects for stocks, including changes in short interest.

Another possible alternative explanation is that funds position themselves strategically in stocks where they expect to earn higher lending income (Porras Prado (2015)). However, this explanation is contradicted by funds reducing their holdings after engaging in new stock loans. It is unlikely that lender funds would increase their investments in stocks that they expect to lend only to aggressively reduce their holdings of the same stocks once they are lending them.

In summary, active funds reduce their holdings in stocks that are borrowed from them. However, there is no such effect for passive funds. This suggests that stock lending is a salient signal that provides fund managers with something more than publicly available signals such as short interest.

The low and negative adjusted R^2 in Table 3 reflect the low explanatory power of the loan indicator variables and, in particular, the stock × quarter fixed effects in specification (3), which are heavily penalized. Specifications (4)–(6), on the other hand, have higher explanatory power thanks to the stock × fund, IOC × quarter, and fund family × stock × quarter fixed effects.

The Supplementary Material presents results for separate estimations for active and passive funds in Table A1. The effect on trading after stock lending is qualitatively unchanged.

B. Information Spillovers

Section VI.A shows that active funds trade on the information they gain from securities lending, while passive funds do not. One natural question that arises from this result is whether there are information spillovers between funds within a fund family: Do active funds trade on information that is extracted from lending by passive funds? To test this, I identify stock lending by each fund type and examine whether funds that do not lend a security trade it.

I estimate model (8) using the same regression specifications as in Section VI.A for these events. Table 4 Panel A shows the results when the lender is a passive fund and information is passed to other, non-lender funds in the family, while Panel B shows the results when the lender is an active fund. In both settings, there is no evidence of passive funds trading when other funds in the family lend securities. However, active funds trade more aggressively when passive funds in the family lend security than when they lend themselves (compared to the coefficients found in Section VI.A).

This result suggests that there is an information spillover within fund families. Fund families seem both to extract higher lending fees from short sellers by lending through their passive funds and to use the information they gain from lending by subsequently trading through their active funds. This finding is in line with those of Evans et al. (2017) that mutual fund managers who manage multiple funds can lend through one fund and trade through another. Figure 2 displays the cumulative trading coeffcient for specification (1) in Table 4.

C. Cross-Sectional Effects on Trading and Information Spillovers

It is important to understand the dynamics of information usage between and spillovers within fund families cross-sectionally. First, I split fund families into high and low groups within each calendar quarter based on the competition, cooperation, and composite net cooperation indices from Evans et al. (2020), and estimate model (8) on the groups separately. Panel A of Table 5 presents the results. Trading by funds in families characterized by low inter-fund competition, high cooperation, and high net cooperation is statistically significant, while that of funds in less collaborative families is not.[20]

Panel B of Table 5 presents the results from a similar sample split regression, where I group funds within a fund family based on their returns in the previous 4 quarters, flow, and size. To further measure the importance of a fund within the family, I split funds into four groups based on past flows and past returns; Table 5 presents the comparison between low return – low flow and high return – high flow funds. Finally, I split funds based on their returns in the previous 4 quarters within their investment objective code. Although the point estimates vary slightly, the difference between the high and low groups is not statistically significant in either case.

Next, I study the cross-sectional dynamics of information spillovers—lending through one fund, and trading through another—in the same setting as Section VI.B. Table 6 presents the results for information spillovers originating from passive funds' lending. Again, I group funds based on fund family characteristics in Panel A and fund characteristics in Panel B. Since mutual funds react little to information spillovers from active funds' lending,[21] I present the spillover effects originating from active funds in Table A5 in the Supplementary Material.

Passive funds do not react to signals derived from other funds' lending regardless of whether it is by passive or active funds, whereas active funds

[20]Unreported analyses show that the difference between the two is not statistically significant.

[21]See Section VI.B.

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TABLE 4

Information Spillovers from Lending

Table 4 analyzes information spillovers within fund families: Panel A studies lending by passive funds within a fund family; Panel B studies lending by Active funds. The dependent variable $\Delta\text{Trading}_{f,s,t}$ measures the difference in trading in stock s between a fund and the fund's comparison group. The comparison groups are defined according to active/passive fund status, CRSP Investment Objective Code and Total Net Asset tercile. The leads and lags of the indicator variables for lending measure the deviation from the comparison group average portfolio weight change for the stock in event-time, where an event is the observation of a stock loan. The baseline coefficients are the event-time dummies for passive funds. The Active fund event-time dummies measure trading relative to their benchmark groups *and* passive funds. For brevity, the table only reports leads up to 2 quarters and lags up to 6 quarters; the regression specification has leads and lags up to 8 quarters. The coefficient on fund flow in specification (2) in Panel A is −0.000 (*t*-stat = −1.01); Panel B: −0.000 (−0.97). Standard errors are clustered at the stock, fund and quarter levels. Fund-stock observations that are on loan themselves are excluded from the analysis. $^{***}p<0.01$, $^{**}p<0.05$, $^{*}p<0.1$.

Panel A. Lending by Passive Funds

	1	2	3	4	5	6
Passive						
−2	0.003**	0.003**	0.003***	0.002*	0.001	0.011***
	(2.30)	(2.26)	(2.68)	(1.96)	(1.39)	(3.85)
−1	0.002	0.002	0.001	0.003**	0.003*	0.023***
	(1.58)	(1.54)	(0.94)	(2.14)	(1.95)	(5.47)
0	0.005***	0.005***	0.006***	0.003***	0.002***	0.000
	(3.50)	(3.44)	(4.07)	(3.06)	(2.66)	(0.00)
1	−0.003**	−0.003**	−0.002	−0.004***	−0.004***	−0.005***
	(−2.11)	(−2.15)	(−1.22)	(−3.54)	(−3.15)	(−3.45)
2	−0.001	−0.000	−0.001	−0.002	−0.002	−0.001
	(−0.42)	(−0.39)	(−0.46)	(−1.31)	(−1.40)	(−1.07)
3	0.001	0.001	0.001	0.001	0.001	0.000
	(0.65)	(0.62)	(1.20)	(0.67)	(1.26)	(0.12)
4	0.000	0.000	0.000	0.000	−0.001	−0.002
	(0.15)	(0.11)	(0.35)	(0.38)	(−0.77)	(−1.46)
5	−0.001	−0.001	−0.000	−0.000	−0.000	−0.002**
	(−0.82)	(−0.85)	(−0.39)	(−0.58)	(−0.44)	(−2.15)
6	−0.001	−0.001	−0.001	−0.001	−0.001	−0.002
	(−0.65)	(−0.62)	(−0.63)	(−0.51)	(−0.58)	(−1.57)
Active						
−2	−0.002	−0.002	−0.003*	0.002	0.003*	0.003*
	(−1.22)	(−1.20)	(−1.80)	(1.48)	(1.69)	(1.77)
−1	−0.001	−0.001	−0.000	0.001	0.002	0.005***
	(−0.76)	(−0.59)	(−0.28)	(0.87)	(1.27)	(2.89)
0	−0.009***	−0.009***	−0.010***	−0.003**	−0.002*	−0.005***
	(−4.34)	(−4.30)	(−5.17)	(−2.44)	(−1.79)	(−3.77)
1	−0.005**	−0.005**	−0.004**	−0.002	−0.003	−0.002
	(−2.54)	(−2.54)	(−2.36)	(−1.19)	(−1.52)	(−1.39)
2	−0.006***	−0.006***	−0.004***	−0.003*	−0.003*	−0.004**
	(−3.43)	(−3.47)	(−2.99)	(−1.77)	(−1.94)	(−2.45)
3	−0.003	−0.003	−0.002	−0.001	−0.002	−0.002*
	(−1.53)	(−1.53)	(−1.33)	(−0.82)	(−1.60)	(−1.83)
4	−0.004***	−0.004***	−0.002**	−0.001	−0.000	−0.000
	(−3.15)	(−3.08)	(−2.14)	(−1.12)	(−0.34)	(−0.48)
5	−0.002	−0.002	−0.001	−0.000	−0.000	0.001
	(−1.52)	(−1.48)	(−1.12)	(−0.40)	(−0.46)	(0.51)
6	−0.002	−0.002	−0.001	−0.000	0.000	0.001
	(−1.16)	(−1.18)	(−0.74)	(−0.08)	(0.40)	(0.74)
Fund flow control	No	Yes	No	No	No	No
Stock × Quarter FE	No	No	Yes	Yes	Yes	Yes
Stock × Fund FE	No	No	No	Yes	Yes	Yes
IOC × Quarter FE	No	No	No	No	Yes	Yes
F.Family × Stock × Quarter FE	No	No	No	No	No	Yes
Observations	31,356,250	30,837,398	31,326,947	30,759,547	28,251,261	16,660,066
Adjusted R^2	0.000	0.000	−0.005	0.068	0.096	0.281

Panel B. Lending by Active Funds

	1	2	3	4	5	6
Passive						
−2	0.002**	0.002**	0.002**	0.001	0.001	0.010***
	(2.19)	(2.17)	(2.57)	(1.50)	(1.18)	(3.50)
−1	0.001	0.001	0.001	0.002*	0.001	0.014***
	(1.48)	(1.45)	(1.37)	(1.96)	(1.61)	(3.64)
0	0.004***	0.004***	0.005***	0.003**	0.002*	0.000
	(2.74)	(2.67)	(3.27)	(2.29)	(1.93)	(0.00)

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TABLE 4 (continued)

Information Spillovers from Lending

Panel B. Lending by Active Funds (continued)

	1	2	3	4	5	6
1	−0.003**	−0.003**	−0.002	−0.004***	−0.004***	−0.005***
	(−2.13)	(−2.16)	(−1.24)	(−3.51)	(−3.06)	(−3.32)
2	−0.000	−0.000	−0.000	−0.002	−0.002*	−0.001
	(−0.25)	(−0.23)	(−0.28)	(−1.54)	(−1.75)	(−0.99)
3	0.001	0.001	0.001	0.001	0.001	0.000
	(0.59)	(0.56)	(1.13)	(0.83)	(1.45)	(0.33)
4	0.000	0.000	0.000	0.000	−0.001	−0.002
	(0.10)	(0.06)	(0.31)	(0.11)	(−1.08)	(−1.51)
5	−0.001	−0.001	−0.000	−0.000	−0.000	−0.002**
	(−0.88)	(−0.91)	(−0.50)	(−0.43)	(−0.41)	(−2.19)
6	−0.001	−0.001	−0.001	−0.001	−0.001	−0.002
	(−0.83)	(−0.80)	(−0.85)	(−0.87)	(−1.07)	(−1.62)
Active						
−2	−0.000	−0.000	−0.001	0.003*	0.003*	0.005*
	(−0.08)	(−0.21)	(−0.37)	(1.98)	(1.84)	(1.99)
−1	−0.001	−0.000	−0.000	0.002	0.003**	0.005**
	(−0.36)	(−0.22)	(−0.19)	(1.54)	(2.16)	(2.37)
0	−0.008***	−0.008***	−0.009***	−0.004***	−0.003***	−0.006***
	(−4.19)	(−4.16)	(−4.40)	(−2.85)	(−2.88)	(−3.96)
1	−0.002	−0.002	−0.003	−0.003	−0.003*	−0.002
	(−1.13)	(−1.14)	(−1.32)	(−1.49)	(−1.70)	(−1.59)
2	−0.003**	−0.003**	−0.003*	−0.002	−0.002	−0.004**
	(−2.17)	(−2.17)	(−1.88)	(−1.53)	(−1.53)	(−2.37)
3	−0.001	−0.001	−0.001	−0.002	−0.002**	−0.002**
	(−0.86)	(−0.88)	(−0.83)	(−1.14)	(−2.07)	(−2.03)
4	−0.002**	−0.002*	−0.001	−0.001	0.000	−0.000
	(−2.02)	(−1.92)	(−1.15)	(−0.75)	(0.15)	(−0.39)
5	−0.001	−0.001	−0.001	−0.001	−0.001	0.001
	(−0.82)	(−0.79)	(−0.63)	(−0.73)	(−0.82)	(0.44)
6	0.000	0.000	0.000	0.000	0.001	0.001
	(0.04)	(0.02)	(0.31)	(0.32)	(0.95)	(0.92)
Fund flow control	No	Yes	No	No	No	No
Stock × Quarter FE	No	No	Yes	Yes	Yes	Yes
Stock × Fund FE	No	No	No	Yes	Yes	Yes
IOC × Quarter FE	No	No	No	No	Yes	Yes
F.Family × Stock × Quarter FE	No	No	No	No	No	Yes
Observations	31,356,250	30,837,398	31,326,947	30,759,547	28,251,261	16,660,066
Adjusted R^2	0.000	0.000	−0.005	0.068	0.096	0.281

do. In Panel A, we see that Active funds react more strongly to lending by passive peer funds in less competitive (column 1), more cooperative (column 4), and higher net-cooperation fund families (column 6). Based on fund characteristics in Panel B, active funds react somewhat more strongly to information spillovers from passive funds' lending when they have experienced lower fund flows (column 3), have lower TNA (column 5), have lower returns and flows (column 7), and have lower returns within their IOC group (column 9). Since there is little difference in active funds' trading based solely on returns, it seems that fund families instead channel information toward funds with low flows (columns 3 and 7), and toward funds that are "weak" among their comparison group (column 9).

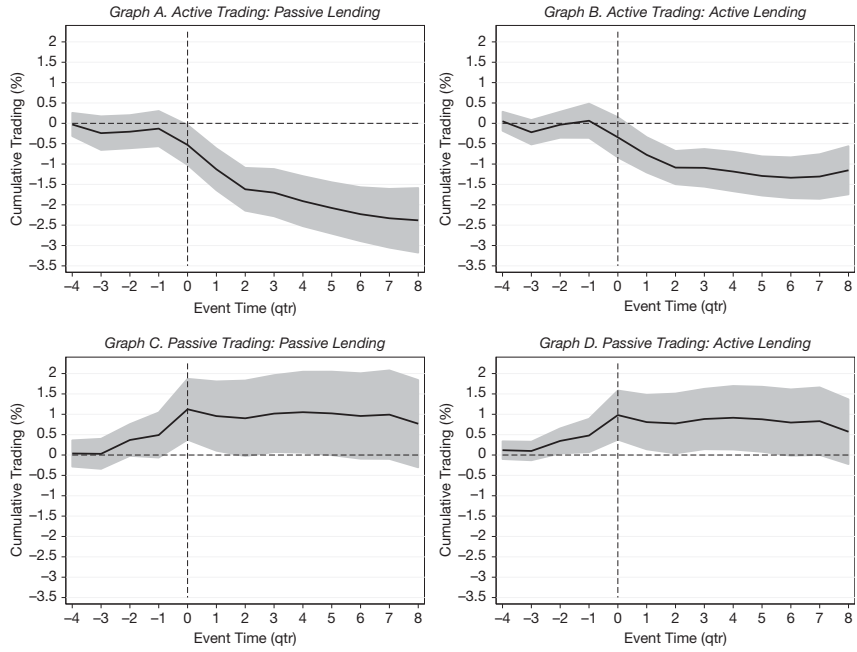
These cross-sectional findings suggest that funds in more collaborative families trade in general more on the information obtained from stock lending—consistent with more efficient or open information sharing across the organization between fund managers and traders.

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FIGURE 2

Trading – Information Spillovers

Figure 2 presents the cumulative deviation in trading in an information spillover setting, where lender funds within a fund family can pass information to non-lenders. Graphs A and B show results for Active funds when the lenders in the fund family are Passive and Active, respectively. Graphs C and D display the same for passive funds. The graphs are based on cumulated coefficient estimates from Table 4. The grey bands show the 95% confidence interval.



D. Stock Returns

Under the hypothesis that stock loans contain negative information similar to short interest, stock prices should decrease when a stock is borrowed from a mutual fund. Such a decrease in stock prices following loans from mutual funds also confirms that fund managers have an incentive to reduce their holdings in borrowed stocks to avoid capital losses, assuming that they are able to do so.

To test this, I perform forward-looking event studies on stock returns for stocks borrowed from active and passive funds. This test reveals whether there is a difference in post-loan stock performance between active and passive lenders. Using standard event study methodology, I compute CAPM, Fama and French (1993) 3-factor, and Carhart (1997) 4-factor risk-adjusted abnormal returns and cumulate them over the event window from the observed loan ($t = 0$) to 12 quarters after the loan ($t = 12$). Figure 3 presents the results for Carhart's 4-factor alphas.[22]

Stocks borrowed from either lender type earn cumulative risk-adjusted returns of approximately −3.6% (−8%) in the 2 (8) quarters following a loan. Importantly, there is no indication of a reversal even 12 quarters after a loan. This result confirms that stock loan demand contains information that lender funds can use to trade even

[22]The tabulated returns can be found in Table A3 in the Supplementary Material.

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TABLE 5

Cross Sectional Effects on Trading

In Table 5, the dependent variable $\Delta\text{Trading}_{f,s,t}$ measures the difference in trading in stock *s* between a fund and the fund's comparison group. The comparison groups are defined according to Active/Passive fund status, CRSP Investment Objective Code and Total Net Asset tercile. The leads and lags of the indicator variables for lending measure the deviation from the comparison group average portfolio weight change for the stock in event-time, where an event is the observation of a stock loan. The baseline coefficients are the event-time dummies for Passive funds. The Active fund event-time dummies measure trading relative to their benchmark groups *and* passive funds. For brevity, the table only reports leads up to 2 quarters and lags up to 6 quarters; the regression specification has leads and lags up to 8 quarters. Standard errors are clustered at the stock, fund and quarter levels. Panel A shows sample splits based on fund family competition, cooperation, and net cooperation following Evans et al. (2020). Panel B shows sample splits based on past fund returns, imputed fund flow, total net assets, the combination of past returns and fund flow, and past returns within the CRSP investment objective code group. $^{***}p<0.01, ^{**}p<0.05, ^{*}p<0.1$.

Panel A. Fund Family Competition and Cooperation

	Competition		Cooperation		Net Cooperation	
	Low	High	Low	High	Low	High
	1	2	3	4	5	6
Passive						
−2	0.002	−0.002	0.007	0.002	−0.001	0.002
	(1.41)	(−0.36)	(1.10)	(1.29)	(−0.05)	(1.41)
−1	0.003	0.010	0.005	0.003*	0.022	0.003*
	(1.65)	(1.48)	(0.68)	(1.84)	(0.67)	(1.96)
0	0.003	0.012	0.017	0.003	0.044	0.003
	(1.46)	(1.29)	(1.48)	(1.42)	(0.81)	(1.57)
1	0.003	−0.006	−0.004	0.002	−0.040	0.002
	(0.93)	(−0.46)	(−0.35)	(0.53)	(−0.82)	(0.80)
2	0.003	−0.015	−0.011	0.003	−0.072	0.002
	(1.29)	(−1.46)	(−1.20)	(1.35)	(−1.53)	(1.22)
3	0.003	−0.008	−0.007	0.002	−0.001	0.002
	(1.58)	(−1.63)	(−1.20)	(1.00)	(−0.05)	(1.07)
4	0.003	0.001	0.002	0.001	0.013	0.001
	(0.79)	(0.31)	(0.30)	(0.40)	(0.91)	(0.30)
5	0.002	−0.004	0.010**	−0.000	0.021	0.001
	(0.80)	(−0.85)	(2.31)	(−0.02)	(0.83)	(0.66)
6	−0.002	0.002	−0.010	−0.001	−0.013	−0.002
	(−0.90)	(0.54)	(−1.19)	(−0.80)	(−1.38)	(−1.19)
Active						
−2	−0.001	−0.014	0.004	−0.001	0.035	−0.001
	(−0.70)	(−0.92)	(0.38)	(−0.43)	(1.11)	(−0.42)
−1	−0.001	0.026	0.008	0.001	0.005	0.001
	(−0.43)	(1.30)	(0.70)	(0.43)	(0.09)	(0.53)

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TABLE 5 (continued)

Cross Sectional Effects on Trading

Panel A. Fund Family Competition and Cooperation (continued)

	Competition		Cooperation		Net Cooperation	
	Low	High	Low	High	Low	High
	1	2	3	4	5	6
0	−0.006*	−0.022*	−0.032	−0.005**	0.020	−0.006**
	(−1.84)	(−1.98)	(−1.66)	(−2.05)	(0.30)	(−2.15)
1	−0.010***	−0.018	−0.020	−0.011***	−0.026	−0.011***
	(−3.32)	(−1.09)	(−1.23)	(−2.92)	(−0.45)	(−3.38)
2	−0.008***	0.003	0.003	−0.009***	0.049	−0.008***
	(−3.40)	(0.18)	(0.33)	(−3.50)	(1.10)	(−3.61)
3	−0.006***	0.004	0.010	−0.006**	−0.005	−0.005**
	(−2.81)	(0.76)	(1.15)	(−2.57)	(−0.18)	(−2.59)
4	−0.006*	−0.004	−0.006	−0.004	−0.061*	−0.004
	(−1.68)	(−0.88)	(−0.75)	(−1.53)	(−1.70)	(−1.40)
5	−0.005	0.003	−0.019*	−0.001	−0.012	−0.003
	(−1.19)	(0.48)	(−1.92)	(−0.49)	(−0.61)	(−1.21)
6	0.002	−0.006	0.003	0.001	0.004	0.002
	(0.78)	(−1.27)	(0.30)	(0.54)	(0.19)	(0.98)
Stock × Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	11,342,979	3,030,342	2,129,836	12,240,191	1,565,060	12,801,537
Adjusted R^2	−0.002	0.000	0.011	−0.003	−0.002	−0.003

Panel B. Fund Characteristics

	Past Returns		Fund Flow		TNA		Past Returns & Flow		Past Obj.Cd. Returns	
	Low	High	Low	High	Low	High	Low-Low	High-High	Low	High
	1	2	3	4	5	6	7	8	9	10
Passive										
−2	0.001	0.002	0.004**	0.001	0.004**	0.002	0.002	−0.000	0.001	0.001
	(0.51)	(1.36)	(2.17)	(0.56)	(2.16)	(1.43)	(1.42)	(−0.17)	(0.48)	(1.38)
−1	0.002	0.004**	0.004*	0.002	0.005**	0.001	0.005*	0.003***	0.006**	0.002**
	(1.02)	(2.63)	(1.89)	(1.35)	(2.09)	(0.72)	(1.95)	(2.99)	(2.66)	(2.04)
0	0.003	0.002	0.003	0.002	−0.001	0.004***	0.002	0.002*	0.002	0.002**
	(1.58)	(1.66)	(1.53)	(1.54)	(−0.53)	(3.10)	(0.58)	(1.77)	(0.77)	(2.08)
1	−0.003	−0.001	−0.001	0.001	0.002	−0.002	−0.002	−0.001	−0.003	−0.001
	(−1.12)	(−0.83)	(−0.67)	(0.29)	(0.69)	(−1.20)	(−0.60)	(−0.79)	(−1.34)	(−0.94)

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TABLE 5 (continued)

Cross Sectional Effects on Trading

Panel B. Fund Characteristics (continued)

	Past Returns		Fund Flow		TNA		Past Returns & Flow		Past Obj.Cd. Returns	
	Low	High	Low	High	Low	High	Low-Low	High-High	Low	High
	1	2	3	4	5	6	7	8	9	10
2	−0.002	−0.001	−0.001	0.001	0.005	−0.002	−0.001	0.000	−0.000	−0.002
	(−1.09)	(−1.18)	(−0.64)	(0.38)	(1.66)	(−1.43)	(−0.42)	(0.37)	(−0.19)	(−1.62)
3	0.000	0.003***	0.003***	0.001	−0.001	0.003***	−0.000	0.001	0.001	0.002**
	(0.29)	(2.92)	(2.88)	(0.49)	(−0.33)	(3.57)	(−0.12)	(1.24)	(0.72)	(2.49)
4	−0.002	0.000	−0.000	−0.002	−0.001	−0.000	0.001	−0.001	−0.000	−0.001
	(−0.69)	(0.04)	(−0.21)	(−1.30)	(−0.60)	(−0.40)	(0.44)	(−0.58)	(−0.03)	(−0.74)
5	0.000	−0.000	−0.000	0.000	0.001	−0.001	0.001	0.000	0.001	−0.001
	(0.02)	(−0.33)	(−0.05)	(0.28)	(0.87)	(−0.83)	(0.55)	(0.17)	(0.43)	(−0.83)
6	−0.002	0.000	−0.001	−0.000	−0.000	−0.001	−0.004	−0.000	−0.001	−0.000
	(−1.11)	(0.02)	(−1.24)	(−0.25)	(−0.37)	(−0.62)	(−1.50)	(−0.28)	(−0.52)	(−0.57)
Active										
−2	0.000	−0.001	−0.002	−0.000	−0.001	−0.001	0.000	−0.000	0.002	−0.001
	(0.06)	(−0.71)	(−0.76)	(−0.29)	(−0.59)	(−0.80)	(0.07)	(−0.07)	(0.71)	(−0.85)
−1	0.005	0.001	0.001	0.002	−0.000	0.003	0.002	0.001	0.001	0.002
	(1.32)	(0.40)	(0.27)	(0.82)	(−0.13)	(1.52)	(0.56)	(0.66)	(0.23)	(1.01)
0	−0.007**	−0.004**	−0.004*	−0.005***	−0.003	−0.006***	−0.003	−0.004**	−0.004	−0.004***
	(−2.46)	(−2.15)	(−1.94)	(−2.95)	(−1.01)	(−3.53)	(−0.86)	(−2.51)	(−1.39)	(−2.77)
1	−0.005*	−0.005**	−0.008***	−0.007**	−0.009**	−0.006***	−0.009**	−0.004**	−0.005*	−0.004**
	(−1.72)	(−2.37)	(−2.98)	(−2.43)	(−2.40)	(−2.68)	(−2.29)	(−2.10)	(−1.87)	(−2.07)
2	−0.002	−0.004***	−0.004**	−0.005**	−0.009***	−0.003*	−0.005	−0.005***	−0.005*	−0.004***
	(−0.90)	(−3.69)	(−2.23)	(−2.65)	(−2.71)	(−1.68)	(−1.48)	(−3.55)	(−1.98)	(−2.73)
3	−0.004**	−0.004***	−0.005***	−0.003*	−0.002	−0.005***	−0.003	−0.003**	−0.004**	−0.004***
	(−2.07)	(−3.30)	(−3.36)	(−1.77)	(−0.74)	(−3.61)	(−1.23)	(−2.22)	(−2.61)	(−2.81)
4	−0.003	−0.001	−0.003*	0.000	−0.001	−0.002	−0.007***	−0.001	−0.004	−0.001
	(−1.27)	(−1.16)	(−1.81)	(0.05)	(−0.71)	(−1.18)	(−2.94)	(−0.63)	(−1.55)	(−0.88)
5	−0.002	−0.002*	−0.003	−0.002	−0.003	−0.001	−0.004	−0.002*	−0.004	−0.002*
	(−0.79)	(−1.97)	(−1.53)	(−1.32)	(−1.60)	(−0.98)	(−1.25)	(−1.73)	(−1.63)	(−1.87)
6	0.001	−0.001	−0.001	0.000	−0.000	−0.000	0.001	0.000	0.001	−0.001
	(0.39)	(−0.60)	(−0.35)	(0.31)	(−0.04)	(−0.25)	(0.47)	(0.42)	(0.43)	(−0.62)
Stock × Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9,723,889	15,121,487	14,873,599	12,619,003	12,174,804	15,971,120	5,742,114	7,405,957	10,256,298	14,591,018
Adjusted R^2	−0.002	0.012	0.003	0.003	−0.004	0.002	0.003	0.021	0.003	0.009

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TABLE 6

Cross-Sectional Spillover Effects on Trading

Table 6 examines cross-sectional information spillover events when the lender is a passive fund. The dependent variable $\Delta\text{Trading}_{f,s,t}$ measures the difference in trading in stock *s* between a fund and the fund's comparison group. The comparison groups are defined according to Active/Passive fund status, CRSP Investment Objective Code and Total Net Asset tercile. The leads and lags of the indicator variables for lending measure the deviation from the comparison group average portfolio weight change for the stock in event-time, where an event is the observation of a stock loan. The baseline coefficients are the event-time dummies for Passive funds. The Active fund event-time dummies measure trading relative to their benchmark groups *and* passive funds. For brevity, the table only reports leads up to two quarters and lags up to 6 quarters; the regression specification has leads and lags up to 8 quarters. Standard errors are clustered at the stock, fund and quarter levels. Shows sample splits based on fund family competition, cooperation, and net cooperation following Evans et al. (2020). Panel B shows sample splits based on past fund returns, imputed fund flow, total net assets, the combination of past returns and fund flow, and past returns within the investment objective code group. $^{***}p<0.01$, $^{**}p<0.05$, $^{*}p<0.1$.

Panel A. Lending by Passive Funds

	Competition		Cooperation		Net Cooperation	
	Low	High	Low	High	Low	High
	1	2	3	4	5	6
Passive						
−2	0.003**	0.002	0.008	0.004**	0.026	0.003**
	(2.28)	(0.25)	(1.42)	(2.44)	(0.70)	(2.17)
−1	0.002	0.005	−0.009	0.003	−0.013	0.002
	(0.99)	(0.93)	(−1.04)	(1.57)	(−0.56)	(1.34)
0	0.008***	0.012*	0.019**	0.007***	0.042	0.007***
	(3.17)	(1.86)	(2.41)	(2.91)	(1.10)	(3.22)
1	0.001	0.002	−0.001	0.000	−0.016	0.001
	(0.37)	(0.25)	(−0.20)	(0.17)	(−0.58)	(0.39)
2	0.001	−0.010	−0.007	0.001	−0.054	0.001
	(0.63)	(−1.59)	(−1.11)	(0.80)	(−1.59)	(0.64)
3	0.002	−0.006	−0.004	0.001	−0.004	0.001
	(1.35)	(−1.58)	(−1.05)	(0.69)	(−0.23)	(0.77)
4	0.002	0.004	0.005	0.001	0.013	0.001
	(0.68)	(1.35)	(1.19)	(0.24)	(0.87)	(0.20)
5	0.002	−0.006	0.008*	−0.000	0.025	0.001
	(0.67)	(−1.36)	(1.87)	(−0.04)	(0.85)	(0.40)
6	−0.002	0.001	−0.004	−0.002	−0.004	−0.002
	(−0.82)	(0.19)	(−0.52)	(−0.89)	(−0.34)	(−1.10)
Active						
−2	−0.003	−0.004	−0.009	−0.003	−0.015	−0.003
	(−1.13)	(−0.42)	(−1.11)	(−1.23)	(−0.45)	(−1.12)
−1	−0.004*	0.014	0.005	−0.002	0.038	−0.001
	(−1.81)	(1.65)	(0.44)	(−0.79)	(0.75)	(−0.57)

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TABLE 6 (continued)

Cross-Sectional Spillover Effects on Trading

Panel A. Lending by Passive Funds (continued)

	Competition		Cooperation		Net Cooperation	
	Low	High	Low	High	Low	High
	1	2	3	4	5	6
0	−0.012***	−0.013	−0.035***	−0.010***	−0.032	−0.010***
	(−4.22)	(−1.30)	(−2.99)	(−3.07)	(−0.90)	(−3.34)
1	−0.006***	−0.018*	−0.016	−0.007***	−0.019	−0.008***
	(−2.96)	(−1.70)	(−1.25)	(−2.74)	(−0.66)	(−3.11)
2	−0.007***	−0.002	0.005	−0.008***	0.043	−0.007***
	(−3.31)	(−0.16)	(0.71)	(−3.56)	(1.35)	(−3.54)
3	−0.005**	0.007*	0.013*	−0.004*	−0.000	−0.003*
	(−2.31)	(1.69)	(1.83)	(−1.81)	(−0.02)	(−1.70)
4	−0.006*	−0.007	−0.006	−0.004	−0.042	−0.004
	(−1.68)	(−1.39)	(−0.89)	(−1.60)	(−1.47)	(−1.43)
5	−0.004	0.007	−0.011	−0.000	−0.010	−0.002
	(−0.95)	(1.17)	(−1.15)	(−0.07)	(−0.45)	(−0.69)
6	0.002	−0.004	0.003	0.001	−0.010	0.002
	(0.63)	(−0.86)	(0.32)	(0.40)	(−0.48)	(0.79)
Stock × Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	11,342,979	3,030,342	2,129,836	12,240,191	1,565,060	12,801,537
Adjusted R^2	−0.002	0.000	0.011	−0.003	−0.002	−0.003

Panel B. Lending by Passive Funds

	Past Returns		Fund Flow		TNA		Past Returns & Flow		Past Obj.Cd. Returns	
	Low	High	Low	High	Low	High	Low–Low	High-High	Low	High
	1	2	3	4	5	6	7	8	9	10
Passive										
−2	−0.000	0.002*	0.004***	0.002	0.005***	0.002	0.001	0.001	0.001	0.002
	(−0.03)	(1.85)	(2.88)	(1.24)	(3.22)	(1.25)	(0.34)	(0.59)	(0.64)	(1.58)
−1	0.002	0.002	0.001	0.002	0.004	0.001	0.003	0.003	0.004*	0.001
	(1.13)	(1.57)	(0.60)	(1.08)	(1.56)	(0.58)	(1.01)	(1.37)	(1.68)	(0.92)
0	0.006***	0.005***	0.007***	0.005***	0.007***	0.005***	0.008**	0.004***	0.007***	0.004***
	(2.71)	(3.47)	(3.56)	(2.91)	(2.84)	(3.10)	(2.47)	(2.96)	(3.28)	(3.24)
1	−0.004*	−0.002	−0.002	−0.001	−0.001	−0.002*	−0.004	−0.002	−0.005**	−0.002
	(−1.96)	(−1.56)	(−1.57)	(−0.40)	(−0.26)	(−1.93)	(−1.51)	(−1.46)	(−2.47)	(−1.50)

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TABLE 6 (continued)

Cross-Sectional Spillover Effects on Trading

Panel B. Lending by Passive Funds (continued)

	Past Returns		Fund Flow		TNA		Past Returns & Flow		Past Obj.Cd. Returns	
	Low	High	Low	High	Low	High	Low–Low	High-High	Low	High
	1	2	3	4	5	6	7	8	9	10
2	−0.003	−0.001*	−0.002	0.000	0.003	−0.002	−0.002	0.000	−0.001	−0.002*
	(−1.52)	(−1.75)	(−1.15)	(0.19)	(1.37)	(−1.50)	(−0.89)	(0.11)	(−0.52)	(−1.95)
3	0.000	0.003***	0.003***	0.000	−0.001	0.003***	−0.001	0.001	0.001	0.002**
	(0.30)	(2.80)	(2.82)	(0.19)	(−0.57)	(3.80)	(−0.29)	(1.23)	(0.57)	(2.50)
4	−0.002	−0.000	−0.000	−0.002	−0.001	−0.000	0.000	−0.001	−0.000	−0.001
	(−0.79)	(−0.06)	(−0.16)	(−1.50)	(−0.94)	(−0.17)	(0.01)	(−0.92)	(−0.02)	(−0.76)
5	0.000	−0.000	−0.000	0.000	0.001	−0.001	0.002	−0.000	0.001	−0.001
	(0.05)	(−0.51)	(−0.17)	(0.07)	(0.70)	(−1.06)	(0.60)	(−0.03)	(0.36)	(−1.01)
6	−0.002	0.000	−0.001	−0.000	−0.001	−0.000	−0.004	−0.000	−0.001	−0.000
	(−1.05)	(0.13)	(−1.09)	(−0.25)	(−0.85)	(−0.29)	(−1.46)	(−0.33)	(−0.56)	(−0.37)
Active										
−2	−0.001	−0.002	−0.002	−0.003	−0.006***	−0.001	−0.002	−0.002	−0.001	−0.002
	(−0.28)	(−1.33)	(−1.01)	(−1.32)	(−2.69)	(−0.32)	(−0.43)	(−0.99)	(−0.23)	(−1.51)
−1	−0.000	0.001	0.003	−0.002	−0.003	0.001	0.001	−0.001	0.000	0.001
	(−0.05)	(0.42)	(0.95)	(−0.88)	(−0.89)	(0.63)	(0.20)	(−0.47)	(0.16)	(0.47)
0	−0.010***	−0.007***	−0.010***	−0.009***	−0.012***	−0.007***	−0.011***	−0.008***	−0.012***	−0.006**
	(−3.18)	(−3.45)	(−3.66)	(−3.63)	(−3.39)	(−3.38)	(−2.71)	(−3.20)	(−4.17)	(−2.66)
1	−0.002	−0.003*	−0.006***	−0.004	−0.005	−0.004**	−0.005*	−0.002	−0.002	−0.002
	(−1.01)	(−1.69)	(−2.96)	(−1.67)	(−1.66)	(−2.45)	(−1.92)	(−1.13)	(−0.75)	(−1.56)
2	−0.003	−0.004***	−0.003*	−0.005***	−0.008**	−0.003*	−0.003	−0.005***	−0.004*	−0.004**
	(−1.25)	(−3.45)	(−1.76)	(−2.68)	(−2.57)	(−1.91)	(−1.18)	(−3.15)	(−1.96)	(−2.60)
3	−0.003	−0.004**	−0.004***	−0.002	−0.000	−0.004***	−0.002	−0.003	−0.003**	−0.003**
	(−1.60)	(−2.57)	(−2.90)	(−0.99)	(−0.11)	(−3.18)	(−0.90)	(−1.63)	(−2.12)	(−2.18)
4	−0.003	−0.001	−0.003	−0.000	−0.001	−0.002	−0.006**	−0.001	−0.004	−0.001
	(−1.36)	(−1.11)	(−1.63)	(−0.11)	(−0.34)	(−1.56)	(−2.42)	(−0.48)	(−1.62)	(−0.89)
5	−0.002	−0.002	−0.003	−0.000	−0.002	−0.001	−0.004	−0.001	−0.003	−0.001
	(−0.57)	(−1.42)	(−1.39)	(−0.33)	(−1.02)	(−0.39)	(−1.25)	(−0.92)	(−1.40)	(−1.11)
6	0.001	−0.001	−0.001	0.000	0.001	−0.001	0.001	0.001	0.001	−0.001
	(0.43)	(−0.78)	(−0.62)	(0.26)	(0.34)	(−0.65)	(0.57)	(0.50)	(0.32)	(−0.70)
Stock × Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9,723,889	15,121,487	14,873,599	12,619,003	12,174,804	15,971,120	5,742,114	7,405,957	10,256,298	14,591,018
Adjusted R^2	−0.002	0.012	0.003	0.003	−0.004	0.002	0.003	0.021	0.003	0.009

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TABLE 7

Lending Fees and Collaterals

Table 7 analyzes lending fees and stock loan collateralization levels between active and passive funds. The dependent variable in columns 1–4 is the lending fee proxy computed according to equation 6. The dependent variable in columns 5–8 is Overcollateral, which measures the excess collateral the funds hold against the securities they lend. The main regressor is the Passive fund indicator variable. In specifications (2) and (6), I control for (log) total net assets at the fund level. Specifications (3) and (7) control for the lending intensity at the fund level. Specifications (4) and (8) include average loan stock short interest, average loan stock market capitalization, and lending intensity, measured by the proportion of securities on loan by a fund in addition to the aforementioned variables. $^{***}p<0.01, ^{**}p<0.05, ^{*}p<0.1$.

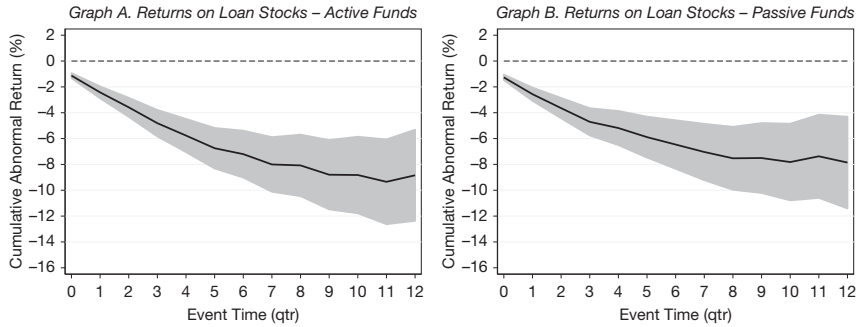
	Lendingfee	Lendingfee	Lendingfee	Lendingfee	Overcollateral	Overcollateral	Overcollateral	Overcollateral
	1	2	3	4	5	6	7	8
Passive	0.570***	0.687***	0.749***	0.679***	0.029	0.186	−0.147	0.016
	(3.16)	(3.74)	(3.86)	(3.62)	(0.15)	(0.95)	(−0.75)	(0.08)
ln(TNA)		−0.116***		−0.052		−0.212***		−0.131***
		(−3.36)		(−1.39)		(−4.90)		(−2.73)
Loanvalue/TS			0.000	−0.000			0.001*	−0.000
			(1.29)	(−1.15)			(1.83)	(−0.44)
ln(Loan Avg.Shortint)				0.144				−0.550***
				(1.32)				(−3.95)
ln(Loan Avg.Mcap)				−0.794***				−1.125***
				(−11.73)				(−12.67)
Num. loan/Num. hold				−0.022***				−0.054***
				(−3.56)				(−6.45)
Issuer × Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
CRSP Obj Cd FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4,189	4,174	3,449	3,096	6,114	6,086	4,928	4,417
Adjusted R^2	0.464	0.465	0.521	0.547	0.210	0.213	0.254	0.294

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FIGURE 3

Returns on Loan Stocks

Figure 3 shows cumulative abnormal returns adjusted for the Carhart 4-factor model for stocks with observed loans from Active (Graph A) and Passive (Graph B) funds in event-time where 0 is the quarter of an observed loan (at the quarter end). The graphs illustrate the results from an event study that includes all observed loan events in the sample. The coefficient estimates are presented in Table A3 in the Supplementary Material. The grey bands show the 95% confidence interval.



in the absence of any other signals such as short interest. That stocks borrowed from passive funds decrease similarly to those borrowed from active funds indicates that also passive lenders could use this information in trading. However, they seem to refrain from doing so, consistent with their index tracking objective.

We also see that the cumulative returns are very similar between stocks that are borrowed from active and passive funds. This suggests that there are no systematic differences in the characteristics of the stock borrowers between the different lender types. Perhaps more significantly, it also indicates that active funds do not depress stock prices by their own trading (since the returns are similar to those for stocks borrowed from passive funds, and there is no sign of reversals).

The finding in Section VI.A that active funds sell the stocks that they lend raises another question: Can stock lenders differentiate between informed short selling and other trading that does not contain information about the fundamental value of the borrowed stocks (e.g., market making)? To test this, I consider active funds' rebalancing after observed loans: I split lending events into two groups based on the change in the number of shares held in the 4 quarters starting with an observed loan ($t = 0$ to $t = 3$). The hypothesis is that stocks from which lender funds rebalance away to a greater extent after a loan experience more negative returns than stocks that see less selling by lender funds.

I employ the same event study methodology described above to test and analyze the returns on the two groups of stocks. Figure 4 presents the results.[23]

The stocks in the bottom rebalancing group by active funds earn cumulative returns of −9.5% in the 12 quarters after a loan, whereas the stocks in the top group earn cumulative returns of approximately −5.2% over the same event window. Importantly, there is no evidence of a return reversal even 12 quarters after the loan events. The absence of a reversal contradicts any explanation based on price pressure induced by mutual fund trading. This finding also suggests that lenders are able to differentiate between informed and uninformed short selling.

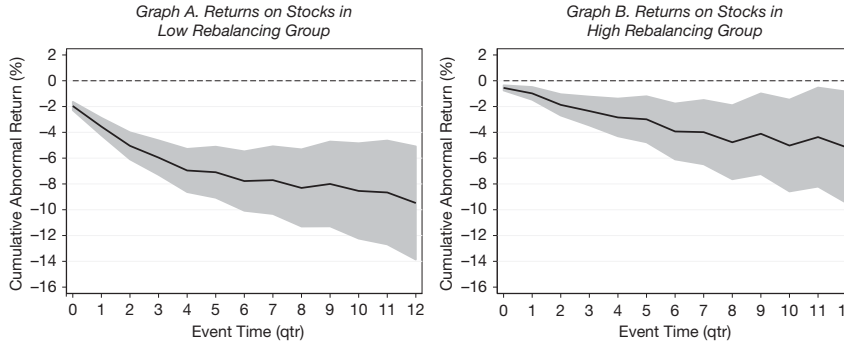
[23]The tabulated returns can be found in Table A4 in the Supplementary Material.

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FIGURE 4

Stock Returns and Rebalancing

Figure 4 shows cumulative abnormal returns adjusted for Carhart 4-factor alphas for stocks with observed loans from active funds. I split all loans from active funds into two groups based on the proportional rebalancing in quarters $t = 0$ to $t = 3$. Graph A shows cumulative returns for stocks in the bottom group (more negative rebalancing). Graph B shows cumulative returns for stocks in the top rebalancing group (more positive rebalancing). The coefficient estimates are presented in Table A4 in the Supplementary Material. The grey bands show the 95% confidence interval.



E. Trading Ability and Lending Fees

Next, I test whether there is a fee difference between active and passive funds. There are two possible interpretations for a fee difference between active and passive funds: A fee premium to passive funds can be seen as a "quality premium" that short sellers are willing to pay to reduce recall risk to borrow from funds that are less likely to recall the loans and trade based on the signals they can extract from them. Alternatively, higher fees to passive funds can be a manifestation of an "information discount" that active funds forgo to attract borrowers to acquire information from short sellers. The tests in Section VI.E examine whether a fee difference exists. The difference could be due to an "information discount," a "quality premium," or both.

I regress the lending fee proxy and the measure for overcollateralization on the passive fund indicator variable:

$$Y_{f,t} = \beta Passive_f + \epsilon_{ft}, \tag{9}$$

where $Y_{f,t}$ is the lending fee proxy in specifications (1)–(4) of Table 7 and the overcollateral measure in specifications (5)–(8). The coefficient β measures the difference in fees and overcollateralization between passive and active funds. To account for the unobserved securities lending agent fees discussed in Section IV.B, I include a fund family-time fixed effect.[24] This fixed effect also absorbs any other time-varying changes in fund-family-level lending policies that may change the loan fee allocations to funds or other lending market participation effects.[25] I additionally include investment objective code fixed effects to control for

[24] As in the Introduction and Section II, fund issuers have different lending strategies that can aim to, e.g., maximize the lending lending revenues by lending as much as possible, or to maximize the loan-level lending fee.

[25] See, for example, McCullough (2018).

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systematic differences in the types of stocks held or lent and for differences in lending practices between funds that follow different investment strategies. As a result, the β coefficient measures the difference in fee (specifications (1)–(4)) and collateral (specifications (5)–(8)) between active and passive funds *within* a fund issuer-quarter, controlling for investment strategies for funds.

Table 7 presents the results. Passive funds earn lending fees that are approximately 0.57 to 0.75 percentage points higher than those for active funds on an annualized basis. The result is highly significant both statistically and economically: This figure is approximately 50–70% of the average stock lending fee for active funds (see Table 1).

This difference in lending fees could be driven by risk-taking in the lending programs: Passive funds could accept more risk in their lending programs to boost returns. One way of doing so would be by requiring lower collateral from borrowers, thereby exposing investors in the fund to default risk. To rule this out, I estimate the same regression for $\text{overcollateral}_{f,t}$ (specifications (5)–(8) in Table 7). The coefficient β in these regressions is close to 0 and statistically insignificant. This result rejects the explanation that the difference in lending fees is due to passive funds taking more risks in their lending programs by setting lower collateral requirements.

The caveat in the analysis of lending fees and collateral levels is that the tests are performed at the fund level instead of the loan level. The regulatory disclosures in the N-CSR filings do not allow me to identify loan-level lending fees and collateral requirements. Due to this limitation, I am restricted to estimating the fund-level *average* lending fees that active and passive funds charge.

Another possible explanation for the observed fee difference is that passive funds are lending different stocks with higher lending fees. To exclude this possibility, I use market-wide average stock lending fees that I obtain through Markit. Markit collects and averages the fees daily for each stock, and thus computes a daily market average fee for each stock. I repeat the above analysis and estimate model (9) using fund-level average Markit fees. Since the fees are the same for each stock, a significant coefficient for the passive fund indicator variable in this regression would strongly suggest that active and passive funds lend *different stocks.* The null hypothesis, together with the prior findings, supports the hypothesis that active and passive funds are instead lending *the same stocks at different fees*.

Table 8 presents the results. In the counterfactual analysis where all funds lends stocks at the same fees, there is no difference in the fund-level average lending fees between active and passive funds: There is no indication that passive funds lend more expensive stocks on average; this can therefore not be an explanation for the fee differences found above. Indeed, in columns 1 and 2, the estimated coefficient is negative, suggesting that passive funds lend stocks that are on average *cheaper* than those lent by active funds. The coefficient estimates in columns 3 and 4 are not statistically different from 0.

These results support the hypothesis that passive funds earn higher lending fees than active funds when lending the same stocks.

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TABLE 8

Marketwide Average Fees

Table 8 analyzes differences in stock lending fees between active and passive funds by using a counterfactual market-average lending fee that is uniform across lenders at the stock level. The fee is based on Markit stock lending fees, and averaged across all stocks on loan by a given fund. The main independent variable of interest is the Passive fund dummy. Specification (2) controls for the logarithm of total net assets at the fund level; specification (3) controls for the lending intensity at the fund level; specification (4) also includes average loan stock short interest, average loan stock market capitalization, and lending intensity as measured by the proportion of securities on loan. $^{***}p<0.01$, $^{**}p<0.05$, $^{*}p<0.1$.

	Mkt. Lending Fee	Mkt. Lending Fee	Mkt. Lending Fee	Mkt. Lending Fee
	1	2	3	4
Passive	0.007	0.006	0.008	0.011
	(0.97)	(0.87)	(1.14)	(1.58)
ln(TNA)		0.004**		0.001
		(2.44)		(0.46)
Loanvalue/TS			−0.000	0.000
			(−1.54)	(0.20)
ln(Loan Avg.Shortint)				0.030***
				(6.18)
ln(Loan Avg.Mcap)				0.003
				(0.96)
Num. loan/Num. hold				0.000
				(0.14)
Issuer × Quarter FE	Yes	Yes	Yes	Yes
CRSP Obj Cd FE	Yes	Yes	Yes	Yes
Observations	9,914	9,812	9,914	8,100
Adjusted R^2	0.946	0.945	0.946	0.948

F. Market Participation

Passive funds hold stable and transparent portfolios and, unlike active funds, have little discretion in choosing their investment allocations. Short sellers anecdotally prefer them as lenders due to this characteristic, and higher lending fees by passive funds, as found in Section VI.E, are an indication of this preference. To examine this, I test whether passive funds participate more in the securities lending market and whether they lend more conditional on participating in the market. I estimate the following regression:

$$Y_{f,t} = \alpha + \beta_1 \text{Passive}_{f,t} + \gamma X_{f,t} + \epsilon_{f,t}, \tag{10}$$

where $Y_{f,t}$ is a variable that measures funds' participation in the lending market. In specifications (1)–(3) in Table 9, $Y_{f,t}$ is an indicator variable that takes a value of 1 if fund f lends any securities in quarter t. In specifications (4)–(9), $Y_{f,t}$ measures the intensity of lending: The dependent variable in specifications (4)–(6) is the share of the portfolio that is on loan (value of outstanding loans divided by total net assets); in specifications (7)–(9), it is the value of outstanding loans divided by the total holding in stocks that are at least partially on loan.

I control for total net assets and management fee at the fund level. To control for holdings characteristics that may affect participation in the stock lending markets or stock loan demand from the fund, I control for portfolio average market capitalization, short interest, bid–ask spread and dollar volume. I additionally control for the competition and cooperation indices used in Evans et al. (2020) in specifications (3), (6), and (9). All specifications include calendar-quarter fixed

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TABLE 9

Lending Market Participation

Table 9 analyzes stock lending market participation and lending intensity at the fund-quarter level. The dependent variable in columns 1–3 is an indicator variable that takes a value of 1 if the fund is lending. The dependent variable in columns 4–6 measures the lending market participation at the intensive margin (i.e., how much the fund lends of its portfolio). The dependent variable in columns 7–9 measures the intensity of lending and is the value of outstanding loans divided by the total value of holdings in the stocks that are on loan at the quarter end. Specifications (1), (4), and (7) include no control variables apart from quarter fixed effects. Specifications (2), (5), and (8) include controls for (log) total net assets, fund management fee, portfolio average (log) market capitalization, average short interest, average bid–ask spread, and average daily dollar volume of trading scaled by market capitalization. Specifications (3), (6), and (9) additionally include the competition and cooperation indices from Evans et al. (2020). $^{***}p<0.01$, $^{**}p<0.05$, $^{*}p<0.1$.

	Lending	Lending	Lending	Loanvalue/TNA	Loanvalue/TNA	Loanvalue/TNA	Loanvalue/TS	Loanvalue/TS	Loanvalue/TS
	1	2	3	4	5	6	7	8	9
Passive	0.111***	0.013*	0.037***	1.944***	0.525***	2.532***	44.748***	59.608***	50.828***
	(14.55)	(1.70)	(3.64)	(23.84)	(5.73)	(18.75)	(12.60)	(13.28)	(9.94)
ln(TNA)		0.042***	0.026***		0.098***	−0.275***		−6.235***	−1.902*
		(26.21)	(12.46)		(4.73)	(−9.59)		(−6.08)	(−1.65)
Mgmt fee		0.084***	0.087***		0.451***	1.233***		21.592**	12.870
		(9.85)	(5.68)		(4.30)	(5.18)		(2.23)	(1.09)
Portf. ln(Mkt cap)		−0.009***	−0.001		−0.788***	−1.369***		−13.734***	−13.526***
		(−3.19)	(−0.19)		(−21.09)	(−23.05)		(−6.06)	(−5.03)
Portf. ln(Avg.Shortint)		0.040***	0.000		0.621***	0.385***		3.284	−8.737
		(5.66)	(0.04)		(7.10)	(2.79)		(0.61)	(−1.15)
Portf. ln(Avg.BidAsk)		0.020***	0.039***		0.413***	0.447***		−7.503	−11.892
		(2.58)	(3.68)		(4.51)	(3.06)		(−1.15)	(−1.46)
Portf. ln(Avg.Dvol)		0.006	0.048***		0.473***	1.430***		−50.298***	−27.751***
		(0.65)	(3.41)		(3.90)	(7.63)		(−6.57)	(−2.74)
Competition index			−0.496***			−2.559***			53.872**
			(−10.54)			(−3.68)			(2.17)
Cooperation index			1.215***			4.742***			−208.209***
			(17.30)			(5.27)			(−5.31)
Quarter FE	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes
Issuer × Quarter FE	No	Yes	No	No	Yes	No	No	Yes	No
CRSP Obj Cd FE	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Observations	21,944	15,649	9,527	13,002	10,140	5,539	9,924	8,229	5,285
Adjusted R^2	0.065	0.480	0.293	0.073	0.519	0.327	0.029	0.152	0.096

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effects. Specifications (3), (6), and (9) add CRSP Objective Code fixed effects, and (2), (5), and (8) additionally include fund family-quarter as in Section VI.E.[26]

Table 9 presents the results. Specifications (1)–(3) show that passive funds tend to participate more in the lending market at the extensive margin. Only controlling for time fixed effects, passive funds are 11% more likely to participate in the stock lending markets. However, this difference decreases to 1.3% when including fund and portfolio controls and issuer-time and fund style fixed effects, and to 3.7% when controlling for the fund family incentives through the competition and cooperation indices from Evans et al. (2020). This decrease suggests that any difference in behavior between active and passive funds can be largely explained by fund and portfolio characteristics and issuer-level decisions and incentives.

Specifications (4)–(6) show that passive funds also lend a larger share of their portfolios overall: 1.9% more than active funds when controlling for time-fixed effects. Adding controls for fund and portfolio characteristics reduces the difference to 0.5% while controlling only for competition and cooperation within fund families increases the effect to 2.5%. The 3 final columns report the results for the lending intensity, where the dependent variable is the value of lending scaled by the total holdings in the stocks that are at least partially on loan in percentage points. When controlling only for time and issuer-time fixed effects, passive funds lend approximately 45 percentage points more than active funds. Including fund and portfolio controls as well as issuer-time and fund-style fixed effects, this difference increases to 60%. When controlling for competition and cooperation in the fund family, the difference in lending intensity between active and passive funds is about 51%.

VII. Conclusion

I use a unique hand-collected data set to study mutual funds' stock-level securities lending and their subsequent trading of the borrowed stocks. I find that U.S. mutual funds use the securities lending market to extract signals from informed short sellers and use this information to rebalance away from borrowed stocks. Funds also transmit information within the mutual fund family, demonstrating an important information spillover channel. Active funds' trading response to information spillovers is particularly strong when the lender is a passive fund, and when the funds are in more collaborative or less competitive mutual fund families.

Passive funds earn considerably higher lending revenues than active funds, and this effect is robust to controlling for a variety of portfolio-level characteristics. I also show that there is no difference in the collateral requirements between different fund types, indicating that passive funds do not take higher risks in their lending programs by trading off higher lending fees against lower collateral requirements. This is consistent both with short sellers having a preference for passive lenders, and with active funds charging lower lending fees to attract stock borrowers. This result, together with the information spillovers, suggests that fund

[26]I do not include Issuer × Quarter fixed effects in specifications (3), (6) and (9) as they would absorb the competition and cooperation indices.

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families may be able to earn higher lending fees by lending through their passive funds while also capturing some of the trading profits by passing on the information to their active funds.

Price pressure explanations for the negative returns of borrowed stocks are countered in two ways: First, active funds sell stocks that are borrowed from them whereas passive funds do not, yet there is no statistical difference in the returns of the stocks. Second, there is no reversal in the stock returns even after 12 quarters following a loan and active funds' trading. Instead, it supports the idea that passive funds provide a better lending supply quality that is reflected in the lending fee premium to passive funds: Passive funds may, for example, recall loans less frequently, thus incurring less risk to borrowers. This lending quality explanation is also not in conflict with information spillovers from passive lenders to active funds in the same family: Borrowers may accept and even hope for additional selling by revealing their information to lenders, but may pay a fee premium to mitigate the risk of premature loan recalls.

This research also sheds light on the skill versus luck debate around mutual fund managers. The findings in this article suggest that mutual fund managers have the skills to extract and use information that is collected by more skilled managers (the short sellers). However, actually receiving these extractable and exploitable signals is based on luck: Stock loans are allocated randomly based on fund–stock-level utilization and lending supply levels.

Supplementary Material

To view supplementary material for this article, please visit http://doi.org/10.1017/S0022109024000966.

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