Passive Exit

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Abstract

In recent years, securities lending—making shares available for borrowing by short sellers who "sell first and buy later"—has been an object of increasing regulatory attention. Securities lending is linked to the growth of passive investing because large, buy-and-hold passive investors are among the largest lenders of portfolio securities. But relatively little is understood about the relationship between securities lending and passive investing. In this Article, I show how securities lending allows passive investors to generate revenue from a decline in the value of their investment portfolios in addition to borrowing fees determined by demand from the market. I find that when an active mutual fund exits a portfolio firm, passive index funds belonging to the same fund family raise the cost of borrowing the firm's shares for short selling. To identify these supply-side shifts, I exploit changes in the identity of active managers which are likely to be uncorrelated with information that would otherwise drive within-portfolio variation in share lending costs. I find that the exercise of market power is pronounced in value lending programs targeting hard-to-borrow securities. Share lenders with market power capture most of the surplus arising from price declines.

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I. Introduction

Securities lending—making shares available for borrowing by short sellers who "sell first and buy later"—is under increasing scrutiny. Since 2021, the SEC has proposed multiple rules touching on this market in diverse ways.[1] Securities lending is linked to the growth of index investing, one of the most important recent trends in corporate governance. Large institutions that offer passively managed index fund products like Blackrock, Vanguard, and State Street are among the largest lenders of portfolio securities. In fact, these institutions routinely emphasize the benefits of securities lending for fund clients, arguing that lending revenues reduce management fees for ordinary investors.[2]

Notwithstanding the importance of securities lending to index investing, scant scholarship exists on the relationship between the two. This article seeks to fill that gap by theorizing of securities lending as a *contract* by which passive investors delegate monitoring to short sellers. This contract has the virtue of resolving an impasse for index investors regarding monitoring underperforming portfolio firms. Classically, Alfred Hirschman set out the two action items dissatisfied members of an organization can take: voice displeasure or exit for greener pastures.[3] This model has long explained the tradeoff facing shareholders of a poorly governed firm: agitate for change or take the so-called "Wall Street Walk" by selling shares.

However, neither option appears attractive to the index investor. Professor Jack Coffee later showed that large institutional investors have little incentive to voice their displeasure and monitor portfolio firms.[4] And as Professor Lucian Bebchuk and coauthors have explained, this trend has been exacerbated by "passive" portfolio management where low management fees give an even weaker incentive to engage in costly monitoring.[5] Further, while timely voicing displeasure through active monitoring is often too costly for index investors, exit is downright impossible. An index fund is contractually bound to replicate its underlying index, barring changing the weight

1. *See, e.g.*, Reporting of Securities Loans, No. S7-18-21, 86 Fed. Reg. 69802 (Jan. 7, 2022) (proposing the public disclosure of securities lending information); Enhanced Reporting of Proxy Votes by Registered Management Investment Companies; Reporting of Executive Compensation Votes by Institutional Investment Managers, No. S7-11-21, 86 Fed. Reg. 57478 (proposing disclosure of the effect of securities lending activities on a fund's proxy voting); Short Position and Short Activity Reporting by Institutional Investment Managers (Conformed to Federal Register version) RELEASE NO. 34-94313; FILE NO. S7-08-22 (Feb 25, 2022); Notice of the text of the Proposed Amendments to the National Market System Plan Governing the Consolidated Audit Trail for Purposes of Short Sale-related Data Collection, No. S7-08-22, 87 Fed. Reg. 14950 (Mar. 16, 2022) (proposing reporting of short positions and buy-to-cover transactions, which require borrowing in the securities lending market).
2. *See, e.g.*, Blackrock iShares Securities Lending: Unlock the Potential of Your Portfolios, https://perma.cc/H6MG-J752.
3. A.O. HIRSCHMAN, EXIT, VOICE, AND LOYALTY: RESPONSES TO DECLINE IN FIRMS, ORGANIZATIONS, AND STATES (1970).
4. John C. Coffee, Jr., *Liquidity Versus Control: The Institutional Investor as Corporate Monitor*, 91 COLUM. L. REV. 1277 (1991).
5. Lucian A. Bebchuk et al, *The Agency Problems of Institutional Investors*, 31 J. ECON. PERSPECTIVES 89 (2017).

of poorly governed constituent firms.

To be sure, there is more to understand between the unavailability of exit and its relationship with monitoring by index funds.[6] But this inability to exit positions index funds well to lend those shares to short sellers who bet negatively on a stock hoping to borrow-and-sell first at a higher price and buy-and-return later at a lower price.

In this article, I use share lending data to study this implicit exit contract between passive investors and short sellers. Like ordinary exit, passive exit is sensitive to non-public information. In ordinary exit, the sale of shares by existing shareholders accelerates the transmission of negative information into the share price. The sale of shares serves to signal mismanagement or poor performance not yet impounded into the price. Because corporate managers' compensation is typically linked to the share price, the price decline accompanying these sales is an *ex ante* deterrent to value-destroying behavior.

While index funds cannot sell the shares of individual companies in this fashion, they can *lend* those shares to short sellers seeking to borrow. Market participants seek to sell a stock short when they believe the share price is overvalued. Because short selling is sensitive to negative information, securities lending reintroduces exit to corporate governance despite the inability of index funds to sell shares.

Like ordinary exit, the profits from lending shares are sensitive to information. The financial economics literature has identified a correlation between lending fees and lower future returns before earnings announcements.[7] Index funds can share in the surplus from short selling on negative information simply by lending their shares. Increased demand by short sellers will drive up share lending rates, leading to *de facto* profit sharing between lenders and borrowers. These profits can arise simply from the demand to borrow shares even for uninformed lenders.

In short, borrowers have demand for shares and are willing to pay to borrow. Might there also be a *supply-side* exploitation of information and market power held by passive lenders? When lenders possess negative information about a firm and sufficient market power to price discriminate against borrowers, do they purposely constrict supply and raise lending rates above and beyond the rise in demand driven by greater short selling?

To examine this question in an empirically rigorous manner, I employ a *causal identification strategy*—a research design which seeks to isolate the causal effect of one factor on a complex system like the securities lending market. This strategy takes advantage of an institutional characteristic of mutual funds, namely, that the same fund family sometimes manages both active and passive funds, which allows for measuring the flow of information within fund families.

For example, when a portfolio manager drops a firm from an actively managed Vanguard fund, the information is shared with Vanguard's Portfolio Review Department and other Vanguard "access persons" who receive portfolio updates as frequently as every day. While access persons are prohibited from personally profiting

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6. Jill E. Fisch et al, *The New Titans of Wall Street: A Theoretical Framework for Passive Investors*, 168 U. PENN. L. REV. 17 (2019).

7. T. X. Duong et al, *The Information Value of Stock Lending Fees: Are Lenders Price Takers?*, 21 REV. FIN. 2353 (2017).

from nonpublic information about active funds' trading, no publicly disclosed policy exists prohibiting such information from being shared with Vanguard index funds and ETFs lending their shares to short sellers. When Vanguard controls a large volume of shares in the securities lending market for that firm, Vanguard is theoretically able to exploit that informational advantage by raising lending rates.[8]

To be clear, the suggestion is not that individual portfolio managers of active funds are personally incentivized to share information with share lending desks, but rather that fund families may compel the real-time disclosure of portfolio changes to affiliates like the securities lending desk. Direct empirical evidence for Vanguard shows such behavior exists, but as I explain *infra*, this also comports in theory with a fund family's interest because such behavior would maximize revenues across its securities lending business, where the price impact of informed lending may be smaller, on the margin, than the price impact of informed trading by the active fund. As a legal matter, the *fund family*—not its investment adviser—determines the frequency and disclosure of portfolio positions to fund family affiliates like the share lending desk. This mechanism thus extends to third-party investment advisers as well.

That said, it is difficult to neatly separate empirically the cause of an increase in share lending rates correlated with exit by an active fund into supply-side information exploitation—*i.e.*, purposeful constriction on lending shares by funds—and increased demand from short sellers. Negative information could reach fund managers, passive lenders, and borrowers at once, simultaneously increasing the price of share lending both by greater demand and artificial constriction. This is known as a problem of *causal identification*—disentangling what is driving an outcome.

I overcome this causal identification challenge by exploiting a "supply-side" (*i.e.*, lender-side) shift in the responsiveness of share lending rates to negative information: a prior change in the identity of the portfolio management team of the active fund. A stable management team, or one whose personnel hasn't experienced significant turnover, is likely to have better relationships with the securities lending side of a fund family and is thus more responsive to lending activities. The intuition underlying this sort of "longevity" effect is that a stable portfolio management team likely has better relationships with the securities lending business than one which has experienced turnover. Portfolio changes by a stable team could also be more informative due to the "tournament" nature of fund management.[9] As stable teams are usually better performers, the decision to remove a firm from a stable team's portfolio, all else equal, is more likely to be *informative* when examined after the fact (*i.e.*, less likely to be motivated by non-informational factors like a sudden need for liquidity). For this reason, it is more likely to affect rates set by lending affiliates, who can profit from this sort of information to the extent they have market power.

Critically, instability in an active fund's portfolio management team may

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8. An emerging body of scholarship in financial economics suggests that share lenders have market power to set prices in the securities lending market. *See, e.g.*, Shuaiyu Chen et al, *Market Power in the Securities Lending Market* (working paper, May 4, 2022), https://perma.cc/D5K8-D6U3.

9. Jiaping Qiu, *Termination Risk, Multiple Managers and Mutual Fund Tournaments*, 7 REV. FIN. 161 (2003).

introduce additional issues in the flow of information to affiliated share lending desks despite fund family transparency requirements. Share lending desks are likely to give greater weight to portfolio decisions by a stable fund manager, either because of a longer-lasting relationship between the manager and the desks or simply by virtue of the manager having survived longer. Both of these possibilities are consistent with (a) mandated portfolio transparency policies at the fund family level and (b) the lack of a link between supply-side comparisons between "stable" and "unstable" managers and firm-specific information driving lending demand.

Two points are in order here. ***First***, this analysis is, by necessity, speculative to a degree. Fund families are a black box. It is not possible to directly observe the information possessed by securities lending desks when setting prices. ***Second***, to arrive at rigorous empirical conclusions, it is not necessary to prove that a given mechanism *correctly* describes what is happening inside a fund family. Rather, to separate demand-side causation from supply-side causation, this article defines and identifies instability in a portfolio management team as a supply-side shock if it is (a) unrelated to firm-specific information driving short-selling demand while (b) still affecting a lending desk's exploitation of information about a change in an affiliated active fund's portfolio.[10]

This article contributes to a growing literature on securities lending. Nearly two decades ago, Professors Henry Hu and Bernard Black showed how share lending decouples cash flows from governance rights, arguing that hedge funds may borrow shares to influence corporate elections.[11] Professors Darius Palia and Stanislav Sokolinski found that the introduction of passive investors enhances price efficiency by increasing the supply of shares available for lending, loosening short-sale constraints.[12] Others have examined information flowing in the reverse direction, from passive lenders to active mutual funds.[13] In related work, I and co-authors have found that passive funds fail to recall shares for voting prior to contested elections and instead collect fees.[14]

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10. What about reverse causality? A management team might undergo changes for choosing poor stocks, which might also be likely to have higher short selling demand in the future. I address this question by measuring deviations from portfolio-wide averages on a given reporting date. Omitted variables driving the stability of a management team are likely to be uncorrelated with deviations within a portfolio unrelated to average performance. It would be unusual to remove a manager for choosing great stocks which lead the portfolio as a whole to outperform (the average) while a couple of stocks (the deviations) underperform.

11. Henry Hu & Bernard Black, *The New Vote Buying: Empty Voting and Hidden (Morphable) Ownership*, 79 S. CAL. L. REV. 811 (2006).

12. Darius Palia & Stanislav Sokolinski, *Does Passive Investing Help Relax Short-Sale Constraints?*, https://perma.cc/2XG7-YWQT.

13. S. Greppmair et al, *Securities Lending and Information Acquisition*, . A recent study finds that mutual funds extract information from the demand for short selling in the share lending market. Pekka Honkanen, *Securities Lending and Trading by Active and Passive Funds*, https://perma.cc/658Q-DCFK3679808 (2020). This study is complementary to my own by showing how funds *trade* in response to nonpublic information while I focus on how they *lend*.

14. Edwin Hu, Joshua Mitts & Haley Sylvester, *The Index-Fund Dilemma: An Empirical Study*

This article also highlights the link between passive exit and market power in the share lending market, a product of the concentration of share ownership in the hands of large institutional investors. A growing literature examines the anticompetitive effects of common ownership,[15] but the effects of concentration on share lending have not been considered. I find that the link between portfolio exit by active managers and higher share lending rates is strongest when affiliated index funds hold a large fraction of a firm's shares. The exercise of market power is concentrated in intrinsic value lending programs targeting hard-to-borrow securities.

I also find that passive lenders with market power in the share lending market capture most, but not all, of the surplus accruing to short sellers by engaging in this form of price discrimination: from 62% to as much as 87%, depending on the specification. The risk to short selling is low over this period, explaining why short sellers are willing to open a position even though the share lender has extracted a large fraction of the proceeds. To be sure, lending is not costless because a share lender is unable to sell the shares while they are borrowed. Share lending thus imposes an opportunity cost of trading the shares which is higher for actively managed funds, explaining why this effect is likely to be concentrated in index funds.

Finally, I present evidence suggesting that the exercise of market power in the share lending market screens for higher-quality short sellers. In prior work, I have found that pseudonymous short campaigns may facilitate profitable market manipulation as measured, in part, by systematic price reversals.[16] Here, I find that lending by stable managers is followed by fewer price reversals than by unstable managers, suggesting that the flow of information to passive funds not only captures rents but also deters less-informed short selling. By screening for more informed short sellers, share lenders exercise market power and impose a positive externality in the form of greater price accuracy.[17]

This article proceeds as follows. Section II provides a theoretical and institutional framework for viewing securities lending as a contractual delegation of exit to short sellers. Section III presents my empirical analysis including a description of the data, research design and findings. Section IV discusses implications of these findings for current policy debates and concludes the essay.

II. Securities Lending as Delegated Exit

A. Short Selling in the Capital Markets

Short selling, establishing an economic position that yields a profit as a stock price declines, has long been a controversial trading practice in the capital markets. Section 10(a)(1) of the Securities Exchange Act of 1934 gives the SEC plenary power to regulate

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of the Lending-Voting Tradeoff, https://perma.cc/U3VM-EYPX (2020).

15. Jose Azar et al, *Anticompetitive Effects of Common Ownership*, 73 J. FIN. 1513 (2018).
16. Joshua Mitts, *Short and Distort*, 49 J. LEG. STUD. 287 (2020).
17. *See, e.g.*, Merritt B. Fox, *Retaining Mandatory Securities Disclosure: Why Issuer Choice is not Investor Empowerment*, 85 VA. L. REV. 1335 (1999).

short sales, with no parallel grant of authority for purchases or ordinary sales.[18] For decades, the SEC restricted short selling in a variety of settings. Former Rule 10a-1 once imposed an "uptick" rule which, roughly speaking, prohibited short sales at prices below the last immediately preceding sale.[19] In 2005, the SEC enacted Regulation SHO, which replaced Rule 10a-1 and most other restrictions on short selling with a requirement that broker-dealers identify shares available for borrowing prior to placing a short sale order.[20]

These restrictions on short selling were repealed in tandem with a substantial body of scholarship condemning short sale constraints.[21] Theoretically, allowing traders who do not presently hold stock to purchase on positive sentiment but not sell on negative sentiment distorts prices.[22] Prices are likely to be too high for too long, inflated by the inability of short sellers to express a negative view.[23] Empirically, the imposition of short-sale constraints reduces liquidity, increases trading costs, and makes prices more volatile.[24]

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18. 15 U.S.C. § 78j(a)(1) (2022); see also Regulation SHO, 17 C.F.R. §§ 242.200–.204 (2022). The asymmetric statutory treatment of short sales continued in the Dodd Frank Act of 2010, which added a new Section 9(d) to the 1934 Act empowering the SEC to promulgate rules prohibiting the "manipulative short sale of any security." 15 U.S.C. § 78i(d) (2022).
19. 17 C.F.R. § 240.10a-1 (since removed).
20. 17 C.F.R. § 242.203(b)(1) (2022). Regulation SHO sought to deter so-called "naked short selling," placing short sale orders without first locating the underlying securities available for borrowing. Because clearing and settlement in securities markets occur two business days after a transaction, a naked short sale will lead to a so-called "failure to deliver" securities if the broker-dealer is unable to borrow the securities for delivery to the buyer prior to the settlement date. If there is a failure to deliver the securities, the broker-dealer may be forced to purchase the securities on the open market for delivery to the original purchaser (known as "buy-in"). This might seem self-defeating, because the price will have likely increased in the interim, leading to substantial losses for the broker-dealer (or its client). However, because naked short selling is not limited to the supply of securities available for borrow, it can lead to the execution of an unlimited volume of sell orders, which can put tremendous downward pressure on the share price prior to settlement. That downward pressure, in and of itself, may cause other investors to sell their shares, making the broker's subsequent buy-in of shares occur at lower prices than it would have otherwise occurred at. Moreover, once a short seller can successfully depress the price by causing genuine sellers to sell their shares, it is not difficult to continually roll over the short position by continuing to engage in naked short selling, induce others to sell, purchase, and repeat until the price has descended far below the fundamental value of the firm and yielded the short seller substantial profits. Naked Short Selling Antifraud Rule, Exchange Act Release No. 58,774, 94 SEC Docket 1095 (Oct. 14, 2008).
21. *See, e.g.*, Adam V. Reed, *Short Selling*, 5 ANN. REV. FIN. ECON. 245 (2013).
22. *See, e.g.*, Harrison Hong & Jeremy. C. Stein, *Differences of Opinion, Short-Sales Constraints, and Market Crashes*, 16 REV. FIN. STUD. 487 (2003); Edward M. Miller, *Risk, Uncertainty & Difference of Opinion*, 32 J. FIN. 1151 (1977).
23. This theoretical inefficiency arises even if short-sale constraints merely raise the cost of short selling, rather than prohibiting it entirely. Securities prices are still likely to be too high when these constraints make it unprofitable to short shares even though the stock is overvalued.
24. Ekkehard Boehmer & Juan (Julie) Wu, *Short Selling and the Price Discovery Process*, 26 REV. FIN. STUD. 287 (2013); Arturo Bris, William N. Goetzmann, & Ning Zhu, *Efficiency and the Bear: Short Sales and Markets Around the World*, 62 J. FIN. 1029 (2007).

Of course, short selling is not a low-risk proposition.[25] In addition to risks associated with repurchasing borrowed stock, targeted firms often engineer public relation campaigns designed to undermine the credibility and reputation of short sellers.[26] Moreover, in the long run, stock prices will steadily rise due to the equity risk premium, which rewards investors for taking on undiversifiable risk.[27] This imposes a cost on short selling above and beyond the intrinsic interest rate paid to borrow shares. But to the extent that short sellers correct mispricing in the capital markets, their interests are aligned with shareholders in the long run.[28] Investors benefit from accurate prices because they may find themselves on either side of a trade, as a buyer or seller.[29] Even large institutional investors who have expressed an aversion to short selling have conceded that the practice generally improves the efficiency of capital markets and is not inherently opposed to shareholder interests.[30]

B. Securities Lending by Index Funds

The mechanism by which institutional investors "contract" with short sellers is lending their shares for borrowing. A short seller borrows shares from a lender, sells them, and later repurchases and returns the shares back to the lender. If the share price declines from the sale to the repurchase, the trade yields a profit. The availability, costs, risks, and duration for holding associated with borrowing shares are critical factors in determining the profitability of a short position.[31]

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25. Because a short seller has sold at a given price and must repurchase the shares, the higher the share price, the greater their losses. And in contrast to buying stocks, shorting stocks bears in theory unlimited risk because there is no theoretical cap to how high stocks prices can reach.

26. During its battle with hedge fund activist Bill Ackman, Herbalife prepared a "secret dossier" where it conducted psychological profiling on Ackman. Scott Wapner, *Herbalife Prepared a 'secret dossier' on Bill Ackman As It Geared Up For Fight With Activist*, CNBC (April 20, 2018, 3:00 PM), https://perma.cc/9DFD-SPLT. For an overview of the anti-shorting actions taken by firms, see Owen A. Lamont, *Go Down Fighting: Short Sellers vs. Firms*, 2 REV. ASSET PRICING STUD. 1 (2012).

27. *See, e.g.*, Aswath Damodaran, *Equity Risk Premiums: Determinants, Estimation and Implications - The 2020 Edition*, (NYU Stern School of Business, 2020), https://perma.cc/E5VQ-96N2.

28. In a comprehensive analysis of activist short selling, Professor Frank Partnoy and co-authors show that short campaigns have revealed staggering governance failures and outright fraud. Barbara A. Bliss, Peter Molk & Frank Partnoy, *Negative Activism*, 97 WASH. U. L. REV. 1333 (2020). They distinguish between informational activism, which seeks to correct mispricing, and operational activism, in which a short seller attempts to reduce the value of a firm they are targeting, *e.g.*, by challenging its patents or hacking its computer systems. Similarly, Professor Eric Talley and I have found that market arbitrageurs learn of material, yet-to-be-disclosed cybersecurity breaches and execute trades in advance of the public disclosure. Joshua Mitts & Eric Talley, *Informed Trading and Cybersecurity Breaches*, 9 HARV. BUS. L. REV. 1 (2019).

29. *See, e.g.*, Fox, *supra* note 17.

30. See, *e.g.*, Leo Lewis & Billy Nauman, *Short Sellers Under Fire From Investment Boss of World's Largest Pension Fund*, FIN. TIMES (Dec. 11, 2019), https://perma.cc/Y8D7-TVAN.

31. For a discussion of the costs of short selling, *see generally* Joshua Mitts et al, *A Report by the Ad Hoc Academic Committee on Equity and Options Market Structure Conditions in Early 2021*

Section 17(f)(1) of the Investment Company Act of 1940 provides that "[e]very registered management company shall place and maintain its securities and similar investments in the custody" of a bank or other authorized custodian.[32] The SEC subsequently promulgated Rule 17(f)-2(b), which provides, "Except as provided in paragraph (c) of this section, all such securities and similar investments shall be deposited in the safekeeping of, or in a vault or other depository maintained by, a bank or other company whose functions and physical facilities are supervised by Federal or State authority."[33]

Without the carveout for paragraph (c), Rule 17(f)-2(b) would preclude transferring shares held by a registered management company to any third party, including in a lending transaction, as such shares would no longer be "deposited in the safekeeping of, or in a vault or other depository." However, paragraph (c) provides: "The first sentence of paragraph (b) of this section shall not apply to securities on loan which are collateralized to the extent of their full market value, or to securities hypothecated, pledged, or placed in escrow for the account of such investment company in connection with a loan or other transaction authorized by specific resolution of its board of directors."[34]

Rule 17-f(2)(c) thus allows mutual funds to lend shares so long as the shares are collateralized to the extent of their full market value. The intent behind the collateral requirement is to ensure that investors are made whole in the event of default by the borrower.[35] In a series of no-action letters, the SEC identified several additional conditions which must be met in order for a share lending program to comply with the Investment Company Act of 1940. Specifically, in a no-action letter dated November 3, 1971 to State Street Bank and Trust Company, the SEC's Office of Chief Counsel wrote:

We have not interpreted the Investment Company Act of 1940 to prohibit a mutual fund from lending its portfolio securities provided that (1) the fund receives 100 percent cash collateral from the borrower; (2) the borrower adds to such collateral whenever the price of the securities rises (i.e., mark to market on a daily basis); (3) the fund may terminate the loan at any time; (4) the fund receives reasonable interest on such a loan, any dividends, interest or other distributions on the loaned securities, and any increase in the market value of such securities; (5) the fund is not required to pay any service, placement or other fees in connection with such

(2022), https://perma.cc/XW8C-EYBQ.

32. 15 U.S.C. 80a-17(f)(1).

33. 17 C.F.R. § 270.17f-2(b) (2022).

34. 17 C.F.R. § 270.17f-2(c) (2022).

35. A typical reason why a borrower might fail to return securities is that the price has risen (perhaps substantially) since the date of a short sale. This implies that repurchasing the securities on the open market in the event of default would be quite costly to the lender. The provision of collateral limits investors' losses to the difference between the value of the collateral and the market value of the securities, rather than the latter in its entirety. Requiring additional collateral as the share price rises—*i.e.*, "mark-to-market on a daily basis," in the language of the SEC's November 3, 1971 no-action letter to State Street—provides a lender additional confidence that losses will be minimized in the event of a default by the borrower. In practice, agents often indemnify lenders in the event of default by paying lenders the difference between the value of the collateral and the price of the security to facilitate repurchase.

a loan; and (6) the fund retains voting rights on the loaned securities.[36]

These conditions prompted a series of additional no-action letters in the 1970s and 1980s, which sought relief for newer practices emerging in the securities lending industry. For example, on April 12, 1972, Salomon Brothers, at the time a large borrower of securities, requested no-action relief from requirement (6), *i.e.*, that the fund retain voting rights, on the view that redelivery of the securities to a third person implies that the third person will be the new record holder of the security, and voting rights must pass with redelivery, as the third person is the new record holder of the securities.[37]

Salomon Brothers proposed a solution which is still in use today: allowing the mutual fund to recall the securities for voting at any time on short notice. In its response, the SEC stated: "we would not object if voting rights pass with the lending of portfolio securities. However, this does not relieve the directors of a fund of their fiduciary obligation to vote proxies. If the fund management has knowledge that a material event will occur affecting an investment on loan, the directors would be obligated to call such loan in time to vote the proxies." That is, when lending shares, mutual funds must retain the ability to recall shares for voting, because otherwise fund directors would be unable to fulfill their fiduciary duties to vote proxies in a manner that furthers investors' interests, as the literature on empty voting has explored in detail.[38]

C. Value vs. Volume Lending

In general, securities lending transactions can be structured in two ways, depending on the type of collateral involved. The first is as a cash collateral loan, in which the borrower supplies the lender with cash, often 102% of the market value of the securities on loan, adjusted daily with fluctuations in the market value of the securities, which the lender reinvests in money market funds, repos, or even riskier assets.[39] Historically, this was the first type of securities lending transaction,[40] and it remains highly popular today.

In a cash collateral transaction, the lender's compensation consists of the expected return to reinvestment of the cash collateral, less a fraction paid back to borrowers and their agents. The essence of a cash collateral loan is an exchange of securities for cash of equivalent (or greater) value, which can in turn be reinvested in the capital markets in exchange for a return concomitant with the risk of such reinvestments. By providing a lender with cash, a borrower compensates a lender with an additional return on capital.[41]

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36. State Street Bank and Trust Company, SEC No-Action Letter (Nov. 3, 1971).
37. Salomon Brothers, SEC No-Action Letter (Apr. 12, 1972).
38. *See* Henry T. Hu & Bernard Black, *The New Vote Buying: Empty Voting and Hidden (Morphable) Ownership*, 79 S. CAL. L. REV. 811 (2005).
39. Frank M. Keane, *Securities Loans Collateralized by Cash: Reinvestment Risk, Run Risk, and Incentive Issues*, 19 CUR. ISSUES ECON. & FIN. 1 (2013).
40. State Street Bank and Trust Company, SEC No-Action Letter (Nov. 3, 1971).
41. In the wake of the financial crisis, a large literature considers the systematic risk implications of the reinvestment of cash collateral. Cash reinvestment is a kind of shadow banking activity that involves maturity transformation of the underlying securities into liquid

This additional return is typically split between the lender and borrowers (and their agents), and the portion paid to the latter is known as the "rebate rate." The rebate rate in a cash collateralized loan is thus an inverse measure of the "price" of lending a security: a lower rebate implies that the lender keeps a greater share of the reinvestment profits. Specifically, the so-called "intrinsic rate" (i.e., the effective interest rate) received by the lender is the difference between the collateral reinvestment rate and the rebate rate.[42]

The second kind of transaction is a non-cash collateral loan, a structure which was originally proposed to the SEC by Salomon Brothers in a request for no-action relief dated November 4, 1974.[43] Under this structure, the borrower supplies the lender collateral in the form of U.S. treasuries and agency securities which are backed by the federal government, again at 102% of the underlying value of the securities and marked-to-market daily. Borrowers pay lenders an agreed-upon daily premium, which is usually expressed as an annual percentage of the market value of the securities on loan.

What determines this premium? It is helpful to distinguish volume vs. value lending. In volume lending, an institutional investor seeks to lend a large quantity of securities at a low premium. An August 2016 publication on securities lending noted that "[i]n 2015, general collateral loans—some 80% of global loans by volume—generated annualized lending fees of 20 basis points (0.20%) or less."[44] While small in magnitude, this return is still attractive to passive index funds facing low portfolio management fee revenues.[45]

By contrast, value lending seeks "to capture a scarcity premium by lending specific hard-to-borrow securities, or 'specials.' The scarcity premiums provide the lender with a high return per dollar of securities lent, though with fewer opportunities to lend." Vanguard, in particular, emphasizes a value lending strategy. Rather than

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short-term investments.

42. For a small number of securities which are highly in demand relative to available supply, rebate rates may even be negative, in which case the borrower must pay an additional fee to the lender, yielding the lender a return in excess of the cash collateral reinvestment rate.

43. Salomon Brothers, SEC No-Action Letter, (Nov. 4, 1974) ("The rates are normally a percentage, expressed on an annual basis, of the daily value of the securities loaned. The aggregate amount of payment depends upon the duration of the loan. Thus, at the outset of the loan both the borrower and the lender know the price of the loan, and the compensation to the lender is not dependent upon its success in profitably investing in the short-term paper market. In addition to the possible advantage under the insolvency laws mentioned previously, the investment company avoids the administrative expense and burden of reinvesting cash collateral when it is compensated by such a loan premium.").

44. Andrew S. Clarke, *Securities Lending : Key Considerations*, Vanguard (Aug. 2016), **https://perma.cc/7MEZ-WW6L**.

45. The choice between volume and value lending was traditionally viewed through the lens of collateral reinvestment risk. Lenders and their agents were criticized for taking risky bets with the reinvestment of cash collateral, which could leave investors on the hook for secondary losses in the cash collateral reinvestment market—which is precisely what occurred following the 2008 financial crisis. For this reason, value lending is viewed as a less risky method of delivering returns to investors from securities lending activities, because a borrower's default risk is largely hedged by the underlying collateral.

investing borrowers' cash collateral in risky assets, Vanguard focuses its lending on those few cases when the intrinsic rate paid by short seller borrowers is high.[46] While other large passive investors like Blackrock and State Street have not specifically disclosed the fraction of value vs. volume lending, an industry publication in January 2020 noted a market-wide trend toward value lending.[47]

Value lending reflects a choice on the part of an investment manager to lend in situations where a short seller is willing to pay a high price for the opportunity to borrow a security. Thus, the revenues from value lending are more likely to be driven by situations where there is *stronger* negative information about the firm. While negative information is likely to derive demand to borrow shares regardless of the lending rate, borrowers from value lenders place a greater premium on the negative information, indicating a greater (perceived) significance of the negative information. Compare (a) a short seller who believes a company's stock is overvalued by 1% to (b) a short seller who believes the stock is overvalued by 5%. Clearly, both are willing to borrow shares when the intrinsic rate is 20 basis points (0.20%), the typical lending rate paid for volume lending. But only the latter is willing to borrow shares even when the intrinsic rate is 2%.

Thus, when an institutional investor like Vanguard embraces a value lending strategy focused on cases where the intrinsic rate is high, they are more likely to be lending when a short seller-borrower is convinced that the stock is heavily overvalued. That is, *situations in which a short seller is willing to pay a high intrinsic rate are likely to be situations in which the fund family would exit the stock in affiliated, active portfolio funds.* For this reason, it is reasonable to infer that value lending programs would benefit from information sharing between passive share lenders and their affiliated active mutual funds.

Nonetheless, mutual funds engaging in value lending programs generally do not expressly acknowledge adjusting share lending rates based on information possessed by their affiliated active funds. Vanguard claims that its securities lending program is designed to "capture the scarcity premium found in many hard-to-borrow securities and to conservatively reinvest the cash collateral."[48] The rebate rate "is affected by the scarcity value of the security, a function of market supply and demand."[49] Specifically, Vanguard claims that "for readily available securities, such as those in the large-capitalization Standard & Poors 500 Index, the lender may rebate some of the income from the reinvested collateral back to the borrower."[50] By contrast, "hard-to-borrow securities may command little or no rebate, or even a negative rebate."[51] For example,

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46. Karin Peterson LaBarge, *Securities Lending: Still No Free Lunch,* Vanguard (Jul. 2011), **https://perma.cc/5HPR-FQ3Y.**
47. Finadium Editorial Team, *IHS Markit's 2019 securities lending snapshot: H1 underperformance, Q4 upswing*, Finadium (Jan. 7, 2020) https://perma.cc/2X4B-2RQZ.
48. Vanguard, *Securities Lending: Still No Free Lunch* (Jul. 2011), https://perma.cc/DXV4-TX7U.
49. Vanguard, *Securities Lending: There's No Free Lunch* (Oct. 2010), https://perma.cc/M4KE-WYFF (emphasis added).
50. Vanguard, *Still No Free Lunch* (Jul. 2011).
51. *Id.*

"Highly sought-after names—which may also be hard-to-borrow securities—are often those of companies in troubled industries."

Vanguard has also written how an asset manager's scale may impact its securities lending pricing, noting that "large index funds can command a premium in the securities lending market because of their size and their ability to fill large orders, and because a passive management approach means they are less likely to call loans back early."[52] Vanguard also notes that larger asset managers have a greater ability to "optimize" their securities lending through "smarter lending." My findings suggest that one channel of "smarter lending" might be information obtained through active fund portfolio management.

D. Information Sharing Mechanisms

In this study, I take advantage of an institutional characteristic of mutual funds, namely, that the same fund family sometimes manages both active and passive funds. For example, when a portfolio manager drops a firm from an actively managed Vanguard fund, that information is shared with Vanguard's Portfolio Review Department and other Vanguard "access persons" who receive portfolio updates as frequently as every day. While access persons are prohibited from personally profiting from nonpublic information about active funds' trading, there is no publicly disclosed policy prohibiting that information from being shared with Vanguard index funds and ETFs lending their shares to short sellers. When Vanguard controls a large volume of shares in the securities lending market for that firm, Vanguard is theoretically able to exploit that informational advantage by raising lending rates.

Critically, I do not claim individual portfolio managers of active funds have a personal incentive to share information with share lending desks but rather that the fund family (like Vanguard) compels the real-time disclosure of portfolio changes to affiliates like the securities lending desk. This would be in the fund family's interest because that would maximize revenues across its securities lending business, where the price impact of informed lending may be smaller, on the margin, than the price impact of informed trading by the active fund. As a legal matter, the fund family—not the mutual fund nor its investment adviser—determines the frequency and disclosure of portfolio positions to fund family affiliates like the share lending desk.

Consider, for example, the supplemental information to the prospectus for the Vanguard Wellington Fund, which belongs to the Vanguard fund family but is advised by Wellington Management Company. The prospectus explicitly mandates real-time disclosure of portfolio positions to the fund family:

Vanguard discloses complete portfolio holdings between and among the following persons (collectively, Affiliates and Fiduciaries) for legitimate business purposes within the scope of their official duties and responsibilities. . . .The frequency of disclosure between and among Affiliates and Fiduciaries varies and may be as frequent as daily, with no lag. . . . Currently, Vanguard discloses complete portfolio holdings to the following Affiliates and Fiduciaries as part of ongoing arrangements that serve legitimate business purposes: Vanguard and each investment

52. Martin Kleppe et al., *Beyond Expense Ratios: A Guide to Index Fund Manager Selection*, Vanguard (June 2021), **https://perma.cc/A6GM-KSTG.**

advisor, custodian, and independent registered public accounting firm identified in each fund's Statement of Additional Information.[53]

The prospectus also states explicitly that the fund family determines who is entitled to receive real-time portfolio position information:

Any disclosure of Vanguard fund complete portfolio holdings to any Affiliates and Fiduciaries as previously described may also include a list of the other investment positions that make up the fund, such as cash investments and derivatives. Disclosure of Vanguard fund complete portfolio holdings or other investment positions by Vanguard, VMC, or a Vanguard fund to Affiliates and Fiduciaries must be authorized by a Vanguard fund officer or a Principal of Vanguard.

The fund's board of trustees is controlled by Vanguard. The prospectus states that Vanguard determines portfolio disclosure policy for the portfolio manager and investment adviser:

Vanguard and the boards of trustees of the Vanguard funds (the Boards) have adopted Portfolio Holdings Disclosure Policies and Procedures (Policies and Procedures) to govern the disclosure of the portfolio holdings of each Vanguard fund. . . . Vanguard and the Boards also considered actual and potential material conflicts that could arise in such circumstances between the interests of Vanguard fund shareholders, on the one hand, and those of the fund's investment advisor, distributor, or any affiliated person of the fund, its investment advisor, or its distributor, on the other. After giving due consideration to such matters and after the exercise of their fiduciary duties and reasonable business judgment, Vanguard and the Boards determined that the Vanguard funds have a legitimate business purpose for disclosing portfolio holdings to the persons described in each of the circumstances set forth in the Policies and Procedures and that the Policies and Procedures are reasonably designed to ensure that disclosure of portfolio holdings and information about portfolio holdings is in the best interests of fund shareholders and appropriately addresses the potential for material conflicts of interest.

As this example illustrates, the use of third-party advisors and subadvisors has little effect on the mechanism by which information as to portfolio changes reaches the securities lending desk of a fund family.

Portfolio managers are willing to work under these conditions because the brand value, marketing services and governance oversight of a fund family will increase assets under management (and thus fee revenue). Such transparency explicitly extends to affiliates of the fund family like its securities lending business. Critically, there is no real-time public disclosure when a mutual fund sells its shares, except for unusual circumstances like blockholders exceeding 5% (under section 13(d) or 13(g) of the Securities Exchange Act of 1934) or 10% of a company's shares (under section 16). Mutual fund portfolio disclosure occurs monthly or quarterly. That leaves time for the passive fund to raise lending rates after the active fund has sold its shares but before that information reaches the market via public portfolio disclosure. This behavior would be consistent with the information-sharing mechanism described in fund disclosures, i.e., transparency of real-time portfolio changes within the fund family. Real-time transparency as to portfolio changes is valuable, even after these portfolio changes have

53. Vanguard Wellington Fund, Post-Effective Amendment No. 118, (Form N-1A) (March 29, 2021), **https://perma.cc/RBA7-TASY**. Similar language appears in supplements to other Vanguard funds.

occurred, because there is no reason to believe that the market would immediately detect the selling until the next monthly or quarterly portfolio disclosure. That provides an opportunity for the lending affiliate to exploit nonpublic information regarding the portfolio changes of affiliated active funds.

Moreover, this information-sharing mechanism is consistent with my identification strategy because stable active fund portfolio managers are more likely to effectively exploit nonpublic information or share that information with the share lending desk of affiliated passive funds, whether via a kind of "longevity effect" or due to the tournament nature of fund management.[54] As predicted by this hypothesis, I find that, on average, the four-factor abnormal return from the current report date to the next is 3.32 percentage points lower for securities held by a stable management team at the active fund when looking solely at those dropped from the fund's portfolio—a statistically significant difference.

Indeed, instability in an active fund's portfolio management team may induce variation in the flow of information to affiliated share lending desks notwithstanding a policy mandating portfolio transparency within the fund family. Share lending desks are likely to give greater weight to portfolio decisions by a stable fund manager, either because of a longer-lasting relationship between the manager and the desks or simply by virtue of the manager having survived longer. Both of these hypotheses are consistent with (a) mandated portfolio transparency policies at the fund family level and (b) the exogeneity of supply-side comparisons between "stable" and "unstable" managers to firm-specific information driving lending demand.

To be sure, broker-dealers and other intermediaries play an essential role in matching lenders to potential borrowers. However, the supply of shares for lending and pricing of those shares is often within the control of the fund family, at least for large institutional investors who have market power in the share lending market. For example, as Vanguard explained in a September 2016 publication, the precise terms of a securities lending trans- action are often negotiated by a lending agent rather than the lender itself: "*An owner can lend directly to borrowers, but most rely on a "lending agent" to administer the program. . . . When a lender (or lending agent) and borrower enter into a securities loan, they negotiate the following terms: . . . The collateral amount . . . The lending fee . . . The duration of the loan . . . The dividend/reclaim rate and other economic benefits.*"[55] Moreover, the lending agent typically indemnifies the borrower for counterparty default.

However, the same publication states: "*Vanguard serves as the lending agent for the Vanguard funds' securities-lending program in the United States*." Vanguard directly lends its securities to borrowers in the United States, negotiating the collateral amount, the lending fee, the duration of the loan, the dividend/reclaim rate, and other economic benefits directly with borrowers. The same publication states that Vanguard—and not a broker/dealer or other intermediary—screens potential borrowers and determines the available supply of shares: "*To reduce the risk of counterparty default, Vanguard lends to a limited number of preapproved broker-dealers and maintains strict internal guidelines on*

54. *See* Qiu, *supra* note 9.

55. Andrew S. Clarke, *Securities Lending: Key Considerations*, Vanguard (Sept. 2016), **https://perma.cc/Q7VK-QDW6.**

the aggregate dollar amount of loans to any one borrower." On November 1, 2018, Vanguard announced that "*From 1 November 2018, all Vanguard managed funds and ETFs that directly or indirectly invest in equities will be eligible to participate in The Vanguard Group Inc.'s existing global securities lending program*."[56]

Additional evidence for the control that Vanguard directly exercises over its securities lending program is found in the 2020 Statement of Additional Information to the Vanguard Index Funds, which shows $0 revenue sharing with a lending agent across these index funds, indicating that Vanguard is serving as lending agent. Moreover, Vanguard states explicitly that it retains total control to restrict lending: "*There may be occasions when Vanguard needs to restrict lending of and/or recall securities that are out on loan in order to vote the full position at a shareholder meeting*."[57]

As noted in the Introduction, two points are in order here. ***First***, this analysis is, by necessity, somewhat speculative. Fund families are a black box. It is not possible to measure the sort of information considered by securities lending desks when setting prices. ***Second***, to arrive at plausible empirical conclusions, it is not necessary to prove beyond a reasonable doubt that a given mechanism accurately describes what is happening inside a fund family. Rather, for causal identification purposes, it is sufficient for instability in a portfolio management team to be defined a supply-side shock if it is (a) unrelated to firm-specific information driving short-selling demand while (b) still affecting a lending desk's exploitation of information about a change in an affiliated active fund's portfolio, regardless of the mechanism involved.[58]

III. Empirical Analysis

A. Data and Summary Statistics

I begin by obtaining mutual fund holdings data in the Center for Research on Securities Prices (CRSP) Survivor-Bias-Free US Mutual Fund Database from January 2014 to March 2020. For every mutual fund reporting to the SEC, CRSP reports the portfolio composition of the fund on regular intervals (sometimes quarterly but often monthly) obtained from SEC filings and other sources.

I identify passive index funds using the flag in the CRSP Mutual Fund Database which indicates that a fund exclusively tracks an index and does not allow a manager to exercise discretion in choosing securities for inclusion in the portfolio. All other

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56. *Important Notice to Unitholders*, Vanguard (Sept. 2016), https://perma.cc/XVW5-Z3A7.

57. *Statement of Additional Information*, Vanguard (Apr. 2022), https://perma.cc/G9MC-ZR4R.

58. What about reverse causality? A management team might undergo changes for choosing poor stocks, which might also be likely to have higher short selling demand in the future. I address this question by measuring deviations from portfolio-wide averages on a given reporting date. Omitted variables driving the stability of a management team are likely to be uncorrelated with deviations within a portfolio unrelated to average performance. It would be unusual to remove a manager for choosing great stocks which lead the portfolio as a whole to outperform (the average) while a couple of stocks (the deviations) underperform.

funds are considered "active" for purposes of my analysis.[59]

For every active fund in the CRSP database, I identify which publicly traded U.S. equity securities were retained from one reporting cycle to another and which were removed, as well as the fraction of fund ownership of the security as of each reporting date. At each of these intervals, CRSP also provides the identity of the fund family, *i.e.*, the company responsible for managing the fund, as well as the name of the individual(s) responsible for managing the portfolio. I merge the portfolio holding data with identifying information on the portfolio manager for every reporting period.

I obtain share lending data from FIS Astec Analytics,[60] which reports daily securities lending positions and loan availability for over 45,000 global fixed income and equity securities. The data begin in mid-2013 and extend to 2020, with increasing coverage of more securities over time. For each security and trading date, I observe a series of aggregate statistics that FIS obtains from lending agents as to both share borrowers and lenders.[61]

On the borrower side, FIS obtains the volume of outstanding shares on loan as of a given date, the volume of new shares borrowed that date, and the volume of shares returned that date. In addition, for each of these categories—outstanding, new, returned loans—FIS reports the mean, standard deviation, minimum, and maximum "*intrinsic rate*" paid by short seller-borrowers on a given date. The intrinsic rate is the effective interest rate paid by a borrower across both cash and non-cash collateral loans—"*a blended weighted average of (a) fees on non-cash loans and (b) spreads between rebate rates on cash loans and the prevailing overnight interest rate for the currency.*"[62] On the lender side, FIS obtains the total volume of shares made available for borrowing by institutional investors in their securities lending programs (referred to as "*available*" shares), as well as the volume of shares reported by lenders as out on borrow (referred

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59. Professor Adriana Robertson has persuasively argued that even the S&P 500 index is not truly "passive" but rather reflects a form of delegated management. Adriana Z. Robertson, *Passive in Name Only: Delegated Management and Index Investing*, 36 YALE J. ON REG. 795 (2019). I use the phrase "passive index" simply as shorthand for the point that a fund which replicates an index is not engaging in active portfolio management. Of course, index funds do not necessarily have lower turnover, although "active" funds naturally have higher turnover than index funds on average. To show that my results are not dependent on the designation of a fund as "index" by CRSP, in the Appendix I repeat my analysis replacing the "passive" designation with one equal to 1 if a fund is operated by the Big Four (Blackrock, Fidelity, State Street and Vanguard) and has a turnover below the 25%-quantile in the data. The results are consistent with my primary findings.

60. The data are licensed and provided by NASDAQ (formerly Quandl), which offers an academic subscription at https://perma.cc/JF47-3QBB.

61. FIS does not release granular details about its coverage of the securities lending market, other than the "major global custodians and banks in the securities lending market." https://perma.cc/YP7S-DASG. As FIS advertises its intraday data to hedge funds and other investment management professionals, there is no reason to think that the data are systematically missing certain borrowers or lenders. https://perma.cc/JF47-3QBB. Nonetheless, the absence of certain borrowers or lenders is unlikely to bias my empirical analysis, which examines trends within the available universe of borrowers and lenders within the FIS dataset.

62. NASDAQ DATA LINK, *FIS Global Securities Lending Data: Product Overview*, *available at* https://perma.cc/JF47-3QBB (last visited Dec. 30, 2022).

to as "*utilized*" shares).

I merge the FIS data with the CRSP mutual fund holdings by calculating the average of these statistics for each of the securities in each of the holding periods reported in the CRSP data. While the FIS data begin in mid-2013 and extend to 2020, there is increasing coverage of securities over time, so it is necessary to discard security-holding periods with missing FIS data. This implies that my findings should be interpreted as *conditional* on the observed sample of firms which are covered by FIS.[63]

To measure a fund family's ability to set prices in the share lending market, for each active fund and reporting date I calculate the extent of "market share" held by passive index funds belonging to the same fund family as the active fund. Because passive funds follow a buy-and-hold strategy which precludes selling the shares of underperforming companies (except for occasional index reconstitution events), they can lend more shares than active funds and, more importantly, are uniquely dependent on share lending fees to "exit" underperforming firms as ordinary "exit" is unavailable.

I compute concentration or market power as follows. Suppose the Fidelity Magellan Fund reports its holdings as of March 31, 2020. For every security held by the Fidelity Magellan Fund on that date, I sum the number of shares held by passive Fidelity index funds and divide this total by the total number of shares of the security held by mutual funds on that date. The larger the share held by Fidelity passive funds, the larger the market power held by Fidelity funds in the share lending market, and the more likely it is that Fidelity can price discriminate against informed short sellers and thereby share in the expected gains to short selling.

A large proportion of shares held by passive funds is an effective proxy for the ability to engage in first-degree price discrimination on the basis of material nonpublic information obtained from affiliated active funds for two reasons. ***First***, short sellers typically need to acquire a large block of shares to obtain a profit large enough to offset the costs of acquiring the position, which means that, on the margin, a large passive institution like Vanguard will typically find itself without competition for lending some part of the position demanded by the short seller.

Second, I have spoken with insiders at these large institutions, who have pointed out that short sellers prefer to open a position with a single lender because doing so minimizes the chance that the shares will be unexpectedly recalled. As the surprise of an unexpected, untimely recall notice is a substantial risk to opening a short position, this preference to borrow from a single lender makes it even more likely that a large institutional investor will be able to raise lending rates and/or constrict supply for a large volume of shares in a monopolistic fashion and thereby maximize lending profits.

B. Research Design and Hypotheses

Identifying the effect of a supply-side shift in share lending is a challenging endeavor. Share lending costs are the product of an equilibrium between supply and

63. That is, one cannot necessarily generalize that these findings would hold in a broader sample.

demand, which means that changes in lending costs may be driven by omitted variables and reverse causality. For example, negative information about a portfolio firm would likely drive active funds to sell their shares, passive funds to increase lending rates, and short sellers to demand more shares for borrowing. Disentangling any one of these from the others is quite challenging because they are simultaneously determined in an economic equilibrium. Prior literature has attempted to control for short seller demand when estimating changes in share lending supply,[64] but that approach may yield biased estimates when supply reacts to changes in demand not measurable in observed data.

My study overcomes these limitations by employing two stages of econometric methods.

Stage 1: Difference-in-Differences. This method sets several baselines to single out the effect of interested variables. This is a well-established econometric technique which amounts to examining changes over time in some outcome of interest and comparing those over-time changes between groups of subjects. By comparing *changes*—*i.e.*, how much an outcome increased or decreased—rather than the *level* of an outcome, a difference-in-difference analysis adjusts for differences in the outcome between groups which are unchanging over time.

Consider how a difference-in-difference analysis mitigates some (but not all) of the concerns which might arise from comparing outcomes in the share lending market between firms held by certain kinds of mutual funds to those held by other kinds of funds. Lending rates for a given company in any given period might be higher or lower for reasons related to the fundamentals of each company, many of which are not possible to measure with precision. Comparing companies based on fund ownership may simply reflect these company-specific differences which are difficult (if not impossible) to measure and adjust for statistically.

By contrast, a difference-in-differences analysis would compare changes over time in securities lending outcomes for these groups. This would adjust for any baseline difference between companies and consider only how lending outcomes evolve over time between those groups.[65] That is, my approach examines over-time variation in short selling costs within an active fund's investment portfolio reported on a given date.[66]

Stage 2: Exogenous Supply-Side Variation. The second step in my analysis is to take advantage of variation in the supply-side informational sensitivity of share lending not driven by short selling demand for individual stocks. I identify one such source

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64. *See, e.g.*, Duong et al, *supra* note 7.

65. In addition to a difference-in-differences design, I employ 74,462 *fixed effects* for every combination of an active fund portfolio and reporting date. In a difference-in-differences design, the use of fixed effects ensures that the comparison enhances the statistical precision of any estimate by subtracting the average outcome for any combination of an active fund portfolio and reporting date. While differences in the levels of short selling demand can be driven by portfolio and firm-level characteristics as of any reporting date, average differences between portfolios (including portfolio firms) are absorbed by these fixed effects.

66. More precisely, I am measuring within-portfolio *deviations* in share lending costs over time, from one reporting date to the next.

of "exogenous" variation: prior changes in the identity of the individual(s) responsible for managing an active fund's portfolio. This variation is "exogenous" in the sense that it is uncorrelated with the outcomes examined here, that is, future short-selling demand at the portfolio level.[67]

There are several reasons why this is likely to be the case. For one, the mean (median) number of U.S. equity securities managed by a portfolio manager on any given reporting date is 1,836 (2,325) firms. With that many firms in a portfolio, it is highly unlikely that short selling demand for an individual security is likely to be *consistently* correlated with unobserved trends also driving a prior change in the identity of a portfolio manager.[68]

While short selling demand for individual securities is unlikely to be correlated with prior changes in the identity of a portfolio manager, the exploitation of information by share lenders is likely to be affected by these changes. The intuition underlying this sort of "longevity effect" is that a stable portfolio management team likely has better relationships with the securities lending business than one which has experienced turnover. Portfolio changes by a stable team could also be more informative due to the "tournament" nature of fund management.[69]

Critically, instability in an active fund's portfolio management team may induce variation in the flow of information to affiliated share lending desks notwithstanding a policy mandating portfolio transparency within the fund family. Share lending desks are likely to give greater weight to portfolio decisions by a stable fund manager, either because of a longer-lasting relationship between the manager and the desks or simply by virtue of the manager having survived longer. Both of these hypotheses are consistent with (a) mandated portfolio transparency policies at the fund family level and (b) the lack of a link between supply-side comparisons between "stable" and "unstable" managers and firm-specific information driving lending demand.

Two points are in order here. ***First***, this analysis is, by necessity, somewhat speculative. Fund families are a black box. It is not possible to measure the sort of information considered by securities lending desks when setting prices. ***Second***, to arrive at plausible empirical conclusions, it is not necessary to *prove* that a given mechanism *correctly* describes what is happening inside a fund family. Rather, for causal identification purposes, it is sufficient for instability in a portfolio management team to be

67. While portfolio-wide changes in the identity of investment managers may be driven by aggregate portfolio performance, they are unlikely to be correlated with future deviations in short selling demand within a portfolio. (Recall that the fixed effect design ensures that we are examining *deviations* from the portfolio mean at each reporting date for each fund.)

68. To take a simple example, a manager is likely to be removed for choosing poor stocks, and these are also likely to have higher short selling demand. But it would be unusual to remove a manager for choosing great stocks which lead the portfolio as a whole to outperform (the mean) while a couple of stocks (the deviations) underperform. Because the change in portfolio manager identity precedes the change in short selling demand, reverse causality appears unlikely as well. I provide evidence consistent with these assumptions through a placebo test on prior periods as well as a visual verification of parallel pre-trends. Indeed, to the extent that information concerning a single security is responsible for a larger share of portfolio-wide performance, that stock will have a smaller deviation from the mean.

69. *See* Qiu, *supra* note 9.

defined a supply-side shock if it is (a) unrelated to firm-specific information driving short-selling demand while (b) still affecting a lending desk's exploitation of information about a change in an affiliated active fund's portfolio.[70]

Critically, there is no general prohibition on sharing information between active and passive funds belonging to the same fund family. For example, when a portfolio manager drops a firm from an actively managed Vanguard fund, that information is shared with Vanguard's Portfolio Review Department and other "access persons" who receive portfolio updates as frequently as every day.[71]

While access persons are prohibited from personally profiting from nonpublic information about active funds' trading,[72] there is no publicly disclosed policy prohibiting that information from being shared with Vanguard index funds and ETFs lending their shares to short sellers. One would expect that a manager who has been with the fund family for some time is more likely to identify and convey information which allows affiliated passive funds to capture some of the gains accruing to short sellers, *i.e.*, by exercising market power in the share lending market in situations which suggest that the share price will decline. This leads to the following hypothesis:

Hypothesis 1: When exiting a portfolio firm, "stable" active managers raise the cost of borrowing shares lent by affiliated passive funds with market power in that firm's shares.

Hypothesis 1 implies that share lending costs for a portfolio firm should increase

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70. What about reverse causality? A management team might undergo changes for choosing poor stocks, which might also be likely to have higher short selling demand in the future. I address this question by measuring deviations from portfolio-wide averages on a given reporting date. Omitted variables driving the stability of a management team are likely to be uncorrelated with deviations within a portfolio unrelated to average performance. It would be unusual to remove a manager for choosing great stocks which lead the portfolio as a whole to outperform (the average) while a couple of stocks (the deviations) underperform.

71. *See, e.g.*, Vanguard Wellington Fund: Supplement Dated July 1, 2020 to the Statement of Additional Information Dated March 27, 2020 ("The Fund is a party to an investment advisory agreement with Wellington Management whereby the advisor manages the investment and reinvestment of the Fund's assets. In this capacity, the advisor continuously reviews, supervises, and administers the Fund's investment program. The advisor discharges its responsibilities subject to the supervision and oversight of Vanguard's Portfolio Review Department and the officers and trustees of the Fund. . . . The frequency of disclosure between and among Affiliates and Fiduciaries varies and may be as frequent as daily, with no lag. . . . . Disclosure of Vanguard fund complete portfolio holdings or other investment positions by Vanguard, VMC, or a Vanguard fund to Affiliates and Fiduciaries must be authorized by a Vanguard fund officer or a Principal of Vanguard. Currently, Vanguard discloses complete portfolio holdings to the following Affiliates and Fiduciaries as part of ongoing arrangements that serve legitimate business purposes: Vanguard and each investment advisor, custodian, and independent registered public accounting firm identified in each fund's Statement of Additional Information.").

72. *See id*. ("Vanguard, Vanguard Marketing Corporation (VMC), the funds, and the funds' advisors have adopted codes of ethics designed to prevent employees who may have access to nonpublic information about the trading activities of the funds (access persons) from profiting from that information. The codes of ethics permit access persons to invest in securities for their own accounts, including securities that may be held by a fund, but place substantive and procedural restrictions on the trading activities of access persons.")

for "stable" active fund managers relative to "unstable" managers when these two conditions hold:

The active fund manager has removed the firm from its portfolio;

The passive funds affiliated with the active fund have market power in the share lending market, *i.e.*, a large proportion of the shares held by those passive funds.

For any active fund, we would expect to observe a correlation between the removal of a portfolio firm and short selling costs. This correlation does not reflect a causal effect; rather, it is the product of an equilibrium relationship, likely arising from negative information causing active managers to drop the firm from the portfolio, lenders to raise short selling costs, and short sellers to increase demand for borrowing shares.

I first begin by verifying the existence of this correlation. Figure 1 illustrates how this correlation arises between share lending costs and the removal of a firm from an active fund's portfolio, likely due to the arrival of negative information which leads active managers to exit the firm and share lending costs to rise. The strength of this correlation is reflected by the slope of the line in this figure.

To examine this empirically, I estimate average share lending costs over time by calculating share lending costs below for two groups: (a) firms which are removed from affiliated active fund's portfolio from one reporting date to another and (b) firms which are not removed from the active fund's portfolio. Figure 2 plots the natural log of the average retail lending rate for new loans. Similarly, Figure 3 examines trends in the other outcomes examined in this study.

The figures show that the data are consistent with Hypothesis 1 as illustrated theoretically in Figure 1, *i.e.*, the removal of a firm from an active fund's portfolio is accompanied by an increase in share lending costs. This is not a causal claim but rather an equilibrium relationship likely driven by the arrival of negative information about the portfolio firm.

I next proceed to measure how the exogenous change of a portfolio manager alters this correlation. The causal prediction is that this correlation—between active fund exit and the increase of share lending costs by affiliated passive funds—is *strengthened* by the arrival of a "stable" manager prior to the emergence of such negative information, relative to a "unstable" manager.[73] In effect, I am using the change in the identity of the portfolio manager as a kind of external "lever" which drives down the sensitivity of share lending rates to negative information. This allows me to identify the unique role that lenders play in setting prices in this market.[74]

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73. Of course, the supply-side nature of this prediction implies that it only holds when affiliated passive funds have sufficient power in the share lending market to raise borrowing costs for short sellers.

74. As I observe portfolio changes and short selling costs over time, it is possible to exploit the time dimension and examine the effect of shifts in the identity of an active fund manager on the correlation between changes in share lending costs and the removal of a firm from an active fund's portfolio. This amounts to a difference-in-difference-in-differences design, which compares share lending outcomes between reporting dates τ and $\tau+1$ (difference #1) for firms removed from an active fund's portfolio (difference #2), as between "stable" and "unstable" managers (difference #3), where a "stable" manager is one who is unchanged between reporting dates $\tau-1$ and τ.

Figure 4 illustrates my empirical design. The key prediction is that the exogenous presence of a "stable" manager will lead to an increase in share lending costs from one reporting date to the next, for firms removed from the active fund's portfolio by the following reporting date.[75]

It is standard in a difference-of-difference analysis of this type to verify that trends prior to the relevant intervention are parallel, *i.e.*, so that changes *after* the intervention can plausibly serve as a counterfactual for changes *before* the intervention. Figure 5 plots the natural log of the average retail lending rate for new loans, and Figure 6 does the same for the other outcomes examined in this study. As the figures show, "pre-trends" are parallel and only diverge after the change in manager.[76]

C. Summary Statistics

As Hypothesis 1 requires that active funds have market power in the share lending market to raise borrowing costs for short sellers, my primary sample is limited to cases where the share of ownership of the security by passive index funds belonging to the same fund family as the reporting fund exceeds 14.6%, the 95% percentile of the sample distribution of this ownership share.[77] This yields 365,636 security-reporting dates. Summary statistics for the primary sample are given in Table 1. Summary statistics for the full dataset of 7,306,001 security-reporting dates are given in Appendix Table OA1.

Definitions for these variables are as follows. For the share lending data, the "difference" variables are the "post" minus "pre" difference between the average of the lending variable for the security prior to and following the holding period disclosure date. For example, if an active fund reports its portfolio holdings on January 31, February 28, and March 31, and the current observation is February 28, the post-pre difference is the average of the lending variable for the security from February 28 to March 31 ("post") minus the average of the lending variable for the security between January 31 to February 28 ("pre").

Difference in Avg. Retail Rate for All Loans: the post-pre difference in the volume-weighted average intrinsic rate paid by borrowers for all outstanding loans as of the security-date, in percentage points.

Difference in Avg. Retail Rate for New Loans: the post-pre difference in the volume-weighted average intrinsic rate paid by borrowers for new loans opened on the security-date, in percentage points.

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75. As before, this only holds when passive funds affiliated with the active fund have market power in the share lending market to raise borrowing costs for short sellers.

76. Consistent with the findings in Table 3, the post-treatment trends for demand-side outcomes are unchanged for "stable" managers. Online Appendix Table OA2 replicates the analysis in Table 3 on pre-treatment trends, examining whether future removals of a portfolio firm by "stable" active managers are preceded by an increase in the cost of borrowing shares lent by affiliated passive funds with market power in that firm's shares. The coefficients are statistically insignificant and economically close to zero in magnitude, consistent with the visual absence of divergent pre-trends as shown in Figure 5.

77. Online Appendix Table A3 shows that the results hold when estimating regressions on the full sample.

Difference in # of Shares Available (Log): the post-pre difference in the natural log of the volume of shares made available for borrowing by institutional investors on the security-date.

Difference in # of Borrowed Shares (Log): the pre-post difference in the volume of shares borrowed among new loans on the security-date.

Difference in Utilization Percentage: the post-pre difference in the ratio of "# of shares utilized" to "# of shares available," multiplied by 100.

Share of Mgmt. Passive Ownership: the share of ownership of the security by passive index funds belonging to the same fund family as the reporting fund as of the reporting date.

Manager Unchanged (0/1): an indicator equal to 1 if the portfolio manager for the reporting active fund was unchanged from the prior reporting period.

Removed in Next Period (0/1): an indicator equal to 1 if the security was removed from the fund's portfolio in the next reporting period.

D. Findings

1. Informed Share Lending by Passive Index Funds

I begin by verifying the sensitivity of share lending outcomes to negative information. Prior literature has showed an increase in share lending costs prior to informationally sensitive events.[78] Here, I establish that when a firm is removed from an active fund's portfolio, there is an increase in costs to borrow the firm's shares when passive index funds have market power in the share lending market for that firm's stock. Examining my primary sample (limited to cases where there is a high share of ownership of the security by passive index funds belonging to the same fund family as the reporting fund), I estimate a simple regression which compares changes in share lending outcomes from one reporting period to the next between firms which are (a) present in an active fund's portfolio on the next reporting period vs. (b) those which are not.

To reiterate, this relationship is *not* causal but simply reflects the association between short selling demand and share lending outcomes in cases where affiliated passive index funds have market power in the share lending market, which could easily be driven by arrival of negative information about the underlying firm.

Variable	#	Mean	Std. Dev.	Min	Max	10%	25%	50%	75%	90%
Difference in Avg. Retail Rate for All Loans	365,636	-.008	5.161	-413.62	319.407	-.168	-.048	-.005	.03	.102
Difference in Avg. Retail Rate for New Loans	365,636	.001	7.645	-381.092	361.889	-.259	-.074	-.008	.048	.162
Difference in # of Shares Available (Log)	365,636	.025	.111	-2.616	4.971	-.045	-.011	.018	.055	.104
Difference in # of Borrowed Shares (Log)	365,636	-.004	.632	-5.922	5.431	-.729	-.369	-.01	.354	.728

78. *See* Duong et al, *supra* note 7.

Difference in Utilization Percentage	365,636	-.331	5.279	-88.39	89.964	-4.237	-1.391	-.116	.708	3.139
Share of Mgmt. Passive Ownership	365,636	.29	.13	.146	1	.172	.206	.26	.33	.418
Manager Unchanged (0/1)	365,636	.981	.137	0	1	1	1	1	1	1
Removed in Next Period (0/1)	365,636	.039	.194	0	1	0	0	0	0	0

Table 2 presents the results of this estimation for the five outcomes.

Variable	#	Mean	Std. Dev.	Min	Max	10%	25%	50%	75%	90%
Difference in Avg. Retail Rate for All Loans	365,636	-.008	5.161	-413.62	319.407	-.168	-.048	-.005	.03	.102
Difference in Avg. Retail Rate for New Loans	365,636	.001	7.645	-381.092	361.889	-.259	-.074	-.008	.048	.162
Difference in # of Shares Available (Log)	365,636	.025	.111	-2.616	4.971	-.045	-.011	.018	.055	.104
Difference in # of Borrowed Shares (Log)	365,636	-.004	.632	-5.922	5.431	-.729	-.369	-.01	.354	.728
Difference in Utilization Percentage	365,636	-.331	5.279	-88.39	89.964	-4.237	-1.391	-.116	.708	3.139
Share of Mgmt. Passive Ownership	365,636	.29	.13	.146	1	.172	.206	.26	.33	.418
Manager Unchanged (0/1)	365,636	.981	.137	0	1	1	1	1	1	1
Removed in Next Period (0/1)	365,636	.039	.194	0	1	0	0	0	0	0

Table 2 shows that the removal of a firm from an active fund's portfolio is associated with an increase in the average retail rate for all loans and new loans of 0.5782 and 0.8316 points, respectively, a reduction of 8.32 log points in the supply of shares available for lending, an increase of 1.34 log points in the volume of new shares, and an increase of 0.88 percentage points in the utilization ratio. Taken together, these estimates point toward a reduction in supply, an increase in demand, and an increase in the equilibrium cost of share lending when a portfolio firm is removed from an affiliated active firm's portfolio.

2. Supply-Side Shifts in Share Lending Costs

Hypothesis 1 predicts that when exiting a portfolio firm, "stable" active managers raise the cost of borrowing shares lent by affiliated passive funds with market power in that firm's shares. To test this hypothesis, I estimate a regression which compares, as before, changes in share lending outcomes from one reporting period to the next between firms which are (a) present in an active fund's portfolio on the next reporting period vs. (b) those which are not.

However, unlike the prior section, I further evaluate whether this over-time change differs between "stable" and "unstable" managers, where a "stable" manager is one who is unchanged from one reporting date to the next. As the prior portfolio-level replacement of a fund manager is exogenous to subsequent changes in short selling demand, this estimate can be interpreted as the *causal* effect of a supply-side shift in the identity of a portfolio manager on the sensitivity of share lending to negative information. Table 3 presents the results of this estimation.

Table 3 shows that the retention of a "stable" manager of an active fund portfolio causes an increase in the average retail rate for all loans and new loans of 0.7965 and 1.0751 percentage points, respectively, and a decrease in the shares available for lending of 4.99 log points. As expected, the estimate is statistically insignificant for the demand-side outcome of borrowed shares, indicating that a supply-side shift in the identity of a portfolio manager has no effect on short seller demand for borrowing shares. The coefficient on utilization percentage is significant, which reflects the decrease in the denominator (available shares) even though there is no change in the numerator (utilized shares).[79]

3. Value Lending Programs

To understand the mechanisms underlying this effect, I examine volume vs. value share lending programs. Recall that value lending programs are highly sensitive to

79. While this analysis is estimated on my primary sample limited to cases where the share of ownership of the security by passive index funds belonging to the same fund family as the reporting fund exceeds 14.6%, the 95% percentile of the sample distribution, Online Appendix Table OA3 reports the result of estimating this model on the full sample with an interaction term for the share of ownership of the security by passive index funds belonging to the same fund family. The coefficient on the interaction term is positive and significant, indicating that the causal effect of a supply-side shift in the identity of a portfolio manager increases with the market share held by affiliated passive index funds.

information sharing between active portfolio managers and passive share lenders. In light of Vanguard's dominance of the index fund market, it may come as no surprise that Vanguard funds comprise 85.6% of the observations in my primary sample. Not only is Vanguard one of the largest passive index fund managers, it also has a large number of active funds—more than 70 as of May 2020.[80] Online Appendix Table OA4 examines the full sample and confirms that while the effect I measure is concentrated in Vanguard funds, it is not driven entirely by Vanguard funds. The results are consistent when examining non-Vanguard funds, albeit at a slightly higher ownership cutoff (18%) than employed for the main sample (14.6%).

However, not every active fund, whether run by Vanguard or not, is equally poised to exploit informationally sensitive value lending. The ability to do so turns on the extent to which the shares held in a portfolio are hard-to-borrow specials, with high *ex ante* lending fees that allow a lender to act like a monopolist, exploiting its market power by raising lending rates and holding constant—or even increasing—the volume of shares available for lending. On the other hand, it is more difficult for lenders to directly exercise market power over the pricing of securities in greater supply. In that case, lenders might seek to reduce available supply if the price increase offsets the loss of lending volume.

To evaluate whether the effect I measure varies for securities which are hard to borrow, I estimate how the effect of replacing a fund manager on the informational sensitivity of share lending varies between hard-to-borrow and other securities. Table 4 presents the results of this estimation for the five outcomes.

Table 4 shows that the effect varies for hard-to-borrow securities in a manner consistent with the theoretical prediction. Specifically, the effect of retaining a "stable" manager of an affiliated active fund increases 0.5396 and 0.5507 percentage points for the average retail rate difference outcome for all and new loans, respectively, for every one percentage point increase in the pre-period average retail rate. The coefficient on the "shares available'" outcome increases by 0.60 log points, which is consistent with the theoretical prediction that lenders cannot directly exercise market power over the pricing of securities which are more available for lending, and thus are likely to reduce supply in those cases (or, conversely, increase the supply of securities in limited supply while simultaneously raising prices). Finally, the retention of a stable manager does not have an effect on demand-side utilization, as expected for a supply-side effect like this.

4. How Much Profit Sharing?

I now estimate how much of the surplus to short selling is captured by fund families exercising market power in the share lending market. For each firm removed from portfolio of active fund whose affiliated passive funds have market power in share lending market for

80. VANGUARD, *Mutual Funds: Actively Managed Funds*, https://perma.cc/F9UW-ZBZA (last visited Dec. 28, 2022).

the security, I calculate the cumulative raw and abnormal return from the report date to four weeks after the report (the "information value"), as well as the average share lending rate for new loans from the report date to the next report date (the "surplus extraction"), and regress the former on the latter. While most reports for the large asset managers are filed monthly, the minimum frequency is three months, so as a robustness check, I repeat this analysis but examine the return from the report date to 60 trading days after. Both sets of results are given in

Table 5.

Table 5 shows that passive lenders with market power in the share lending market capture between 77% to 87% of the surplus under the main specification which measures returns up to 20 trading days after a portfolio reporting date. The results are only slightly diminished in magnitude when measuring returns up to 60 days after a portfolio reporting date, as that specification yields coefficients ranging from 62% to 64%. As expected, including days later in the period between reports simply introduces noise. Both specifications show that passive lenders capture most, but not all, of the surplus accruing to short sellers by engaging in the form of price discrimination shown in this article.

Why might short sellers be willing to borrow in cases like these, when they are forced to share such a large fraction of their profits with share lenders? The data indicate that short sellers are still earning a sufficient return to compensate for the risk of the position. The "Sharpe ratio"—a measure of risk-adjusted returns—for a portfolio which buys the treatment group stocks and sells other stocks is -8.34 over the 20-trading day period. This indicates that the returns are high and the risk to short selling is low—by comparison, the historical Sharpe ratio for the S&P 500 has been around 1.00. It is thus far less risky for a short seller to short in these cases, explaining why they are still willing to do so even though the share lender has extracted a large fraction of the proceeds.

5. Passive Exit and Share Price Accuracy

The literature finding that short selling enhances price accuracy is based on evaluating the effect of general constraints on short selling. One study showed that prices incorporate negative information faster in countries where short sales are allowed and practiced, and that in markets where short selling is either prohibited or not practiced, market returns display significantly less negative skewness.[81] Another found that

81. Arturo Bris et al, *Efficiency and the Bear: Short Sales and Markets Around the World*, 62 J. FIN.

stock prices are more accurate when short sellers are more active.[82] The types of short selling restrictions evaluated in this literature are *informationally insensitive*—that is, they apply without regard to the quality of the information possessed by a short seller. Less is known as to whether differences in the cost of short selling which are *sensitive* to nonpublic information enhance the accuracy of share prices.

I now evaluate whether the exercise of market power in the share lending market screens for higher-quality short sellers. In prior work, I have found that pseudonymous short campaigns may facilitate profitable market manipulation as measured, in part, by systematic price reversals.[83] Figure 7 examines whether the exercise of market power by informed passive lenders imposes positive externalities in the form of improved share-price accuracy. The figure plots the continuously compounded four-factor abnormal return beginning 60 trading days prior to the report date and extending to 252 trading days after for firms which are not in the affiliated active fund's portfolio, comparing those with "stable" managers (the solid line) to those with "unstable" managers (the dashed line).

As the figure shows, the two groups follow a declining parallel trend up to the report date, suggesting that the difference between the two groups is not driven by unobserved factors. Shortly thereafter, the "unstable" group reverses direction and ends up with a statistically insignificant positive cumulative abnormal return. By contrast, the "stable" group continues shows a persistent price decline.

This evidence suggests that the flow of nonpublic information to the share lending operations of passive funds deters less-informed short selling. By screening for more informed short sellers, the exercise of market power by share lenders appears to impose a positive externality in the form of greater price accuracy, as has been noted in prior literature.[84]

6. Informed Trading and Informed Lending

Of course, passive lenders' ability to exploit portfolio changes by affiliated active funds must turn on some delay in the market's ability to fully impound the information into prices. The informed trading literature shows that, in general, prices will not fully reflect the value of an informed trader's private signal.[85] A passive fund receiving nonpublic information concerning the real-time portfolio change of an affiliated active fund can thus expect, *ex ante*, to exploit this nonpublic information

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1029 (2007).

82. Ekkehart Boehmer & Juan (Julie) Wu, *Short Selling and the Price Discovery Process*, 26 REV. FIN. STUD. 287 (2013).

83. Mitts, *supra* note 16.

84. *See, e.g.*, Fox, *supra* note 17.

85. In the classical Kyle model of informed trading, "one-half of the insider's private information is incorporated into prices." Albert Kyle, *Continuous Auctions and Insider Trading*, 53 ECONOMETRICA 1315 (1985). Later work theoretically extends and empirically verifies the Kyle model to situations where the duration of the private window is random and reached similar conclusions. Mohammadreza Bolandnazar, Robert J. Jackson Jr., Wei Jiang & Joshua Mitts, *Trading Against the Random Expiration of Private Information: A Natural Experiment*, 75 J. FIN. 5 (2020).

profitably, as the price impact of raising lending rates is likely to be smaller than trading directly (due to the indirect information flow).

As empirical evidence showing this exploitation of nonpublic information, I examine the relationship between (a) the average retail lending rate for new loans from the current report date to the following report date and (b) the four-factor buy-and-hold abnormal return over this period. As the mechanism underlying my results is the mandated transparency of portfolio changes within the fund family, I limit my analysis to the subsample of securities which were removed from the active fund's portfolio on the following report date.

If, contrary to the prediction of the informed trading literature, active funds were to extract the entirety of the value of their nonpublic information before sharing the portfolio change with affiliated passive funds, there should be no relationship between (a) the average retail lending rate for new loans from the current report date to the following report date and (b) the four-factor buy-and-hold abnormal return over this period. That is, share lending desks for affiliated passive funds would have no ability to raise rates when affiliated active funds have a profitable trading opportunity.

First, in

Table 6, I show that these are in fact correlated in this subsample of securities which were removed from the active fund's portfolio on the following report date (*i.e.*, the subsample for which portfolio changes are shared throughout the fund family on a real-time basis). On average, for every percentage point decrease in the abnormal return over this period, the average retail lending rate increases by 3.5196 percentage points—a correlation that is statistically significant.[86] To mitigate concerns that the results may be driven by monthly vs. quarterly reporting frequency, I repeat the analysis for monthly and quarterly frequencies separately. The results are consistent.

Second, I examine whether this relationship differs for stable affiliated active managers. In Table 7, I show that this correlation is significantly stronger for stable management teams of affiliated active funds. This is powerful evidence that a passive fund receiving nonpublic information concerning the real-time portfolio change of an affiliated active fund can expect, *ex ante*, to exploit this nonpublic information profitably, and this expectation is stronger when the affiliated active fund has a stable management team.

IV. Discussion and Conclusion

When an active mutual fund exits a portfolio firm, passive index funds belonging to the same fund family raise the cost of borrowing the firm's shares for short selling. This reflects a sort of "supply-side" price discrimination in the implicit contract between shareholder-lenders and short seller-borrowers. By screening for more informed short sellers, the exercise of market power by share lenders imposes a positive externality in the form of greater price accuracy. How might this implicit contract between short seller—borrowers and shareholder—lenders maximize social welfare? A complete analysis is beyond the scope of this article, but I sketch a few considerations here.

A short seller's use of borrowed securities is typically shrouded in darkness. Publicly disclosed trading data are generally anonymous, and there is no mandatory disclosure of short positions in the United States. Moreover, the share lending market is highly opaque. Large institutional investors like index funds and ETFs rarely negotiate with borrowers, but instead delegate the management of their securities lending activities to a lending agent, which may be an external bank or division within the investment adviser to the fund. Lending agents perform a number of functions, most important of which is to maintain relationships with broker-dealers looking to borrow shares and determine the volumes and intrinsic rates for securities loans. However, there appears to be very little, if any, transaction-specific reporting from agents back to their institutional investors-clients.

One possible reason is that lenders have long sought indemnification by lending agents as to counterparty default risk. Otherwise, agents would have little incentive to adequately screen borrowers, because the lender would bear the risk of default. The

86. Because the distribution of lending rates is nonlinear, I repeat the analysis with an indicator equal to 1 if the abnormal return over this period is less than -2\%. On average, retail lending rates are almost twice as high in those cases—*i.e.*, a statistically significant coefficient of 2.63 percentage points compared to an intercept of 3.03 percentage points.

flip side of delegating the decision to lend along with indemnification is that there is little reason for agents to discuss individual transactions with lenders. Indeed, the purpose of employing a lending agent is so that a passive investor need not engage directly in the day-to-day mechanics of lending shares.

At least one large institutional investor has expressed dissatisfaction with the lack of transparency as to the identity of share borrowers and use of lent shares. In December 2019, Japan's GPIF announced that it would be suspending share lending on its portfolio of global equities. In explaining the decision, GPIF's chief investment officer specifically pointed to the lack of opacity in the share lending market: "*We tried to give to our broker and the custodian bank a chance by asking them to disclose who is using our stock and for what purpose . . . and they couldn't disclose that information to us*."[87] These statements indicate a certain sentiment of dissatisfaction with the way that short sellers use borrowed shares and a frustration with the lack of transparency in share lending markets.

The opaque nature of securities lending implies that short sellers are free to do what they would like with borrowed shares, subject only to broad anti-fraud and anti-manipulation prohibitions, without an accountability mechanism to ensure that they are furthering the interests of shareholder-lenders. Like any principal-agency relationship, this raises the concern that short sellers may use borrowed shares in ways that line their own pockets or fail to promote shareholders' interests.

The question of how to ensure that securities lending promotes shareholder value has received greater SEC attention in recent years. In August 2019 the SEC issued, for the first time, Commission-level guidance on advisers' fiduciary duties regarding voting, which provided that an institution may choose not to "exercise voting authority in circumstances under which voting would impose costs on the client, such as opportunity costs for the client resulting from restricting the use of securities for lending in order to preserve the right to vote."[88] Revenues from securities lending directly determine the "opportunity costs" of recalling shares on loan for voting, and thus understanding the pricing of these loans—and the role that passive investing plays in determining that pricing—is a critical component of this cost-benefit tradeoff.

More recently, the SEC proposed publicly disclosing transaction-level data in the securities lending market on the view that this sort of granular information "allow investors, including borrowers and lenders, to evaluate not only the rates for such transactions, but also any signals that rates provide, *e.g.*, that changes in supply and demand for a particular security may indicate an increase in short sales of that security."[89] Transactional data of this type would shed greater light on the extent to which making shares available for borrowing by index funds affects the pricing of securities loans—which in turn might reveal how this sort of contracting between lenders and borrowers advances the accuracy and integrity of securities prices.

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87. Leo Lewis & Billy Nauman, *Short Sellers Under Fire From Investment Boss of World's Largest Pension Fund*, FIN. TIMES (Dec. 12, 2019), https://perma.cc/A6FP-8DKZ.

88. Commission Guidance Regarding Proxy Voting Responsibilities of Investment Advisers, Release No. IA-5325 (September 1, 2019), 84 Fed. Reg. 47423, available at https://perma.cc/QU2Q-ZCAQ.

89. 86 Fed. Reg. 69804 (Oct. 7, 2016).

One potential conflict of objectives in this sort of contract arises from the differing investment horizons of shareholder-lenders and short seller-borrowers. Passive investors tend to have a long-run, buy-and-hold investment strategy, which seeks to maximize long-run value rather than short-term prices. While these two goals may align in highly efficient markets, a large literature debates whether markets fall prey to short-term myopia, especially when it comes to the exercise of activist campaigns.[90]

Passive exit may pose an even greater threat of inducing short-termism than activist voice. For one, short sellers inherently have a short-term investment horizon.[91] The interest rate paid for borrowing shares means that every day that goes by while the position is held open reduces the short seller's profits.[92] Moreover, stock prices are expected to increase over time due to the equity risk premium, the return that investors demand as compensation for bearing risk.[93] This further increases short sellers' losses with the passage of time, unless they maintain a simultaneous long position in the market as a whole, which is costly and limits the amount of capital they can deploy in a short campaign.

A more fundamental reason why passive exit may induce short-termism is that projects which are valuable in the long-run but costly in the short-run may be the very kind of projects which are likely to attract short sellers.[94] To be sure, valuable projects which look like a waste of money in the short term are prime candidates for both traditional activists as well. And the shareholder vote provides an opportunity for management to make the case that an activist's claims are wrong.

On the other hand, it is harder to argue with a falling share price. Because trading data are anonymized, management may not necessarily be able to attribute a sharp decline in the stock price to a short seller's trading and may be forced to contend with the claim that the market simply disagrees with the value of the project. The anonymity of share prices makes passive exit a powerful weapon. This is particularly likely to be a concern when a firm pursues a project that advances social and environmental stewardship objectives at the cost of some profit. Professor Jeffrey Gordon has

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90. *See, e.g.*, Jeremy C. Stein, *Takeover Threats and Managerial Myopia*, 96 J. POL. ECON. 61 (1988); John C. Coffee, Jr. & Darius Palia, *The Wolf at the Door: The Impact of Hedge Fund Activism on Corporate Governance*, 41 J. CORP. L. 545 (2016); Lucian A. Bebchuk, Alon Brav & Wei Jiang, *The Long-Term Effects of Hedge Fund Activism*, 115 COLUM. L. REV. 1085 (2015).

91. As Michael R. Powers, David Schizer and Martin Shubik have shown, under U.S. tax law, short sales always receive short-term capital gains treatment, which disadvantages short sellers relative to long buyers, as the latter can exit underperforming positions prior to the expiration of a year—yielding a tax loss—while holding better-performing positions longer than one year—receiving an implicit tax subsidy of long-term capital gains treatment. *See* Michael R. Powers et al, *Market Bubbles and Wasteful Avoidance: Tax and Regulatory Constraints on Short Sales*, 57 TAX L. REV. 233 (2004).

92. In the case of a cash collateral loan, this takes the form of a reduction in the rebate rate; in the case of a non-cash collateral loan, the short seller will directly pay interest to the share lender.

93. Damodaran, *supra* note 27.

94. There are likely to be limitations to disclosure which prevent market prices from fully reflecting the long-run value of a project. Yifeng Guo & Joshua Mitts, *Going Public or Staying Private: The Cost of Mandated Transparency* (Columbia L. Sch. Ctr. for L. Econ. Stud., Working Paper, Paper No. 649, 2019), https://perma.cc/DA96-HREV.

persuasively argued that institutional investors seek to minimize portfolio-wide systematic risk and thus may prefer, all else equal, a project with a slightly lower expected return but substantially lower systematic risk to one with a slightly higher return but much higher systematic risk.[95]

Indeed, there is some evidence that short sellers may target firms for pursuing projects which are lower profit but advance other, important stewardship goals in the name of "greenwashing."[96] And institutional investors have questioned whether short selling furthers long-run value maximization. In the words of the chief investment officer of Japan's GPIF, "*I never met a short seller who has a long-term perspective*."[97] One important takeaway from the empirical evidence shown here is that it is unclear whether short selling should be condemned merely because of the incentive to pursue short-run profit maximization rather than long-run value creation. Rather, like other forms of delegation, passive exit can impose agency costs which optimally should be addressed in the contract between shareholder-lenders and short seller-borrowers. The evidence shown here—namely, that passive investors use market power to screen for higher-quality short sellers—shows the importance of focusing on this contract to maximize the effectiveness of regulatory policy in this area.

95. Jeffrey Gordon, *Systematic Stewardship*, 47 J. CORP. L. 627 (2022).

96. *See, e.g.*, Kristen Ridley & Simon Jessup, *Villains or Visionaries? Hedge Funds Short Companies They Say 'Greenwash'*, REUTERS, Dec. 15, 2019, https://perma.cc/WU6T-9YDV.

97. Mark Gilbert, Opinion, *This $1.6 Trillion Fund Says Short Selling Is Wrong*, BLOOMBERG, Jan. 22, 2020, https://perma.cc/L5FY-HJQ4.

Figures and Tables

Figure 1: Active Fund Exit and Share Lending Costs by Affiliated Passive Funds

This figure illustrates how an endogenous positive correlation arises between share lending costs and the removal of a firm from an active fund's portfolio, likely due to the arrival of negative information which leads active managers to exit the firm and share lending costs to rise. The strength of this correlation is reflected by the slope of the line in this figure. The causal prediction in this study is that this correlation—between active fund exit and the increase of share lending costs by affiliated passive funds—is strengthened by the exogenous presence of a "stable" manager prior to the emergence of such negative information, relative to a "unstable" manager. This prediction only holds when passive funds affiliated with the active fund have sufficient market power in the share lending market to raise borrowing costs for short sellers.

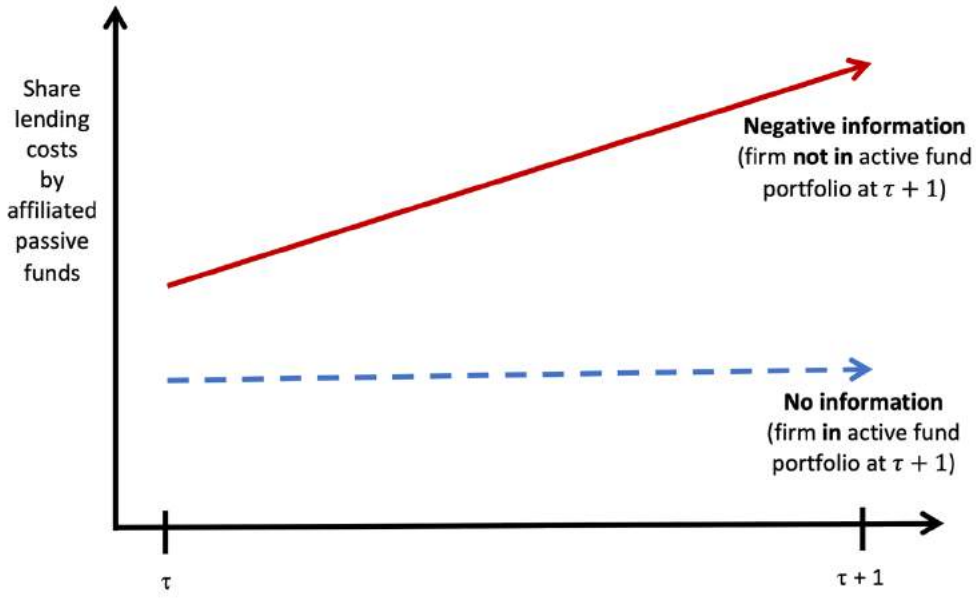

Figure 2: Negative Information Share Lending Costs: Avg. Retail Rate (New Loans)

This figure shows predicted values from the estimation of eq. (1) for two groups: (a) firms which are removed from affiliated active fund's portfolio over reporting date τ to $\tau + 1$, and (b) firms which are not removed from the active fund's portfolio. The y-axis plots the natural log of the average retail lending rate for new loans with fixed effects for every portfolio - reporting date combination over the window $(\tau - 1, \tau + 1)$. The mean of the "no information" group is the value of the linear combination of fixed effects $\eta\tau i$ which makes the prediction equal to the mean of the dependent variable. The figure shows that the data are consistent with Hypothesis 1 illustrated in Figure 1, *i.e.*, the removal of a firm from an active fund's portfolio is accompanied by an increase in share lending costs. This is not a causal claim but rather an equilibrium relationship driven by the arrival of negative information about the portfolio firm.

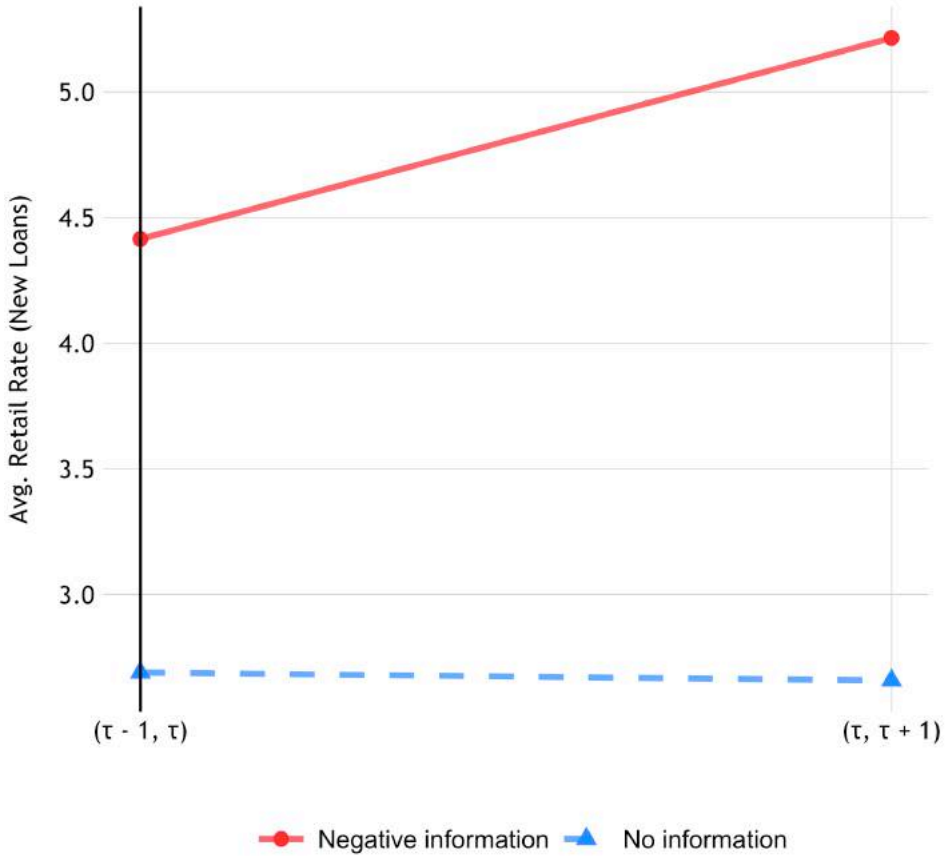

Figure 3: Negative Information and Share Lending Costs: Other Outcomes

This figure shows fixed effect means for (a) firms which are removed from affiliated active fund's portfolio over reporting date τ to τ + 1, and (b) firms which are not removed from the active fund's portfolio. The y-axis plots the other outcomes examined in this study with fixed effects for every portfolio - reporting date combination over the window (τ − 1, τ + 1). The mean of the "no information" group is the value of the linear combination of fixed effects ητi which makes the prediction equal to the mean of the dependent variable. The figure shows that the data are consistent with Hypothesis 1 illustrated in Figure 1, *i.e.*, the removal of a firm from an active fund's portfolio is accompanied by an increase in share lending costs. This is not a causal claim but rather an equilibrium relationship driven by the arrival of negative information about the portfolio firm.

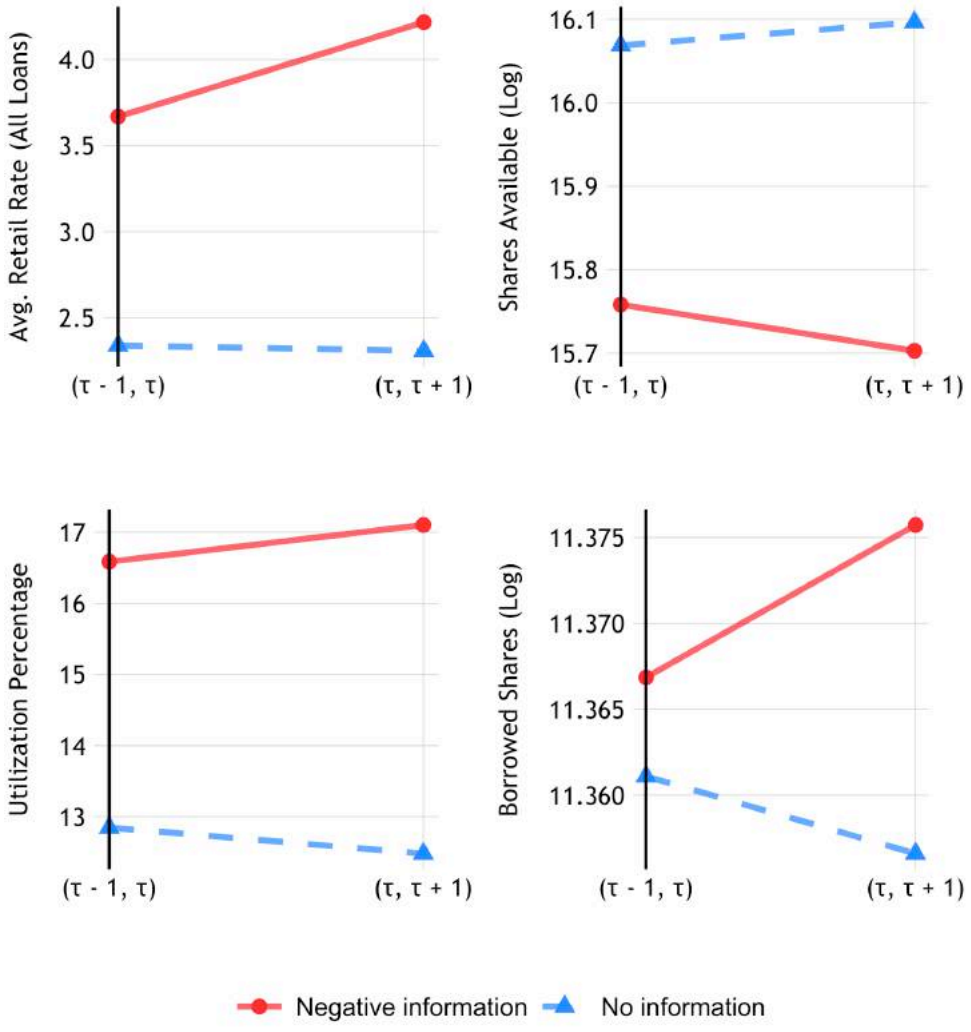

Figure 4: Triple-Difference Design: Active Fund Exit and Affiliated Share Lending Costs

This figure illustrates the difference-in-differences-in-differences design which examines changes in share lending costs for a security in an active fund's portfolio between reporting date τ and τ + 1 (difference #1) between firms which are in an active fund portfolio and those which are not as of τ + 1 (difference #2), as between "stable" managers and "unstable" managers (difference #3), where a "stable" manager is unchanged between reporting dates τ − 1 and τ . The key prediction is that the exogenous presence of a "stable" manager will lead to an increase in share lending costs between reporting dates τ and τ + 1, conditional on the firm being removed from the active fund's portfolio as of τ + 1. This prediction only holds when passive funds affiliated with the active fund have sufficient market power in the share lending market to raise borrowing costs for short sellers.

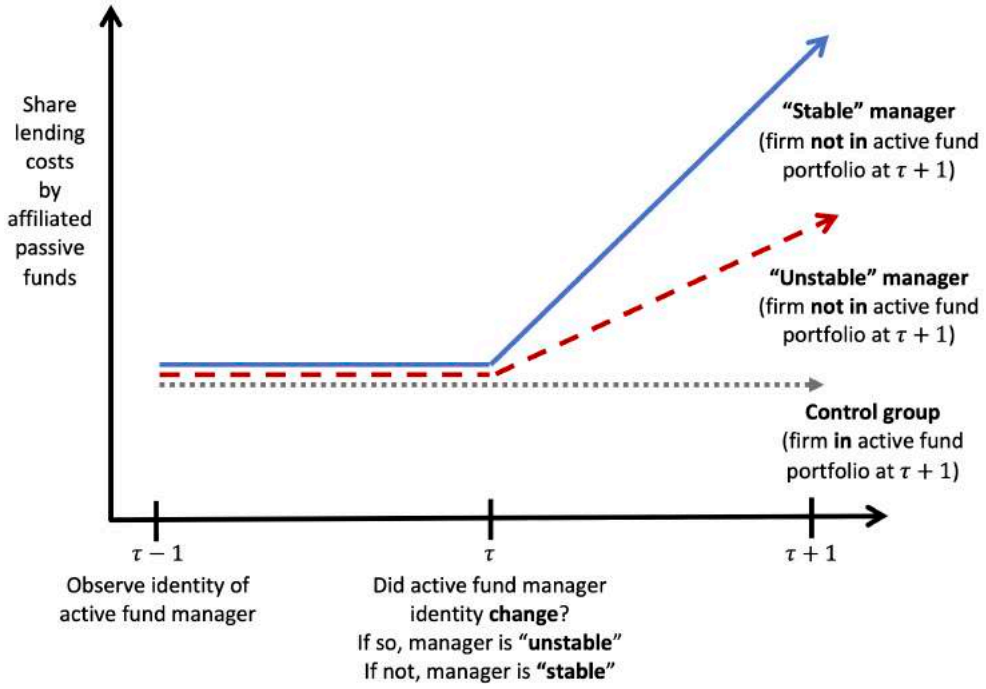

Figure 5: Parallel Trends: Avg. Retail Rate (New Loans)

This figure shows that the data are consistent with the identifying assumption behind the difference-in-differences-in-differences design portrayed in Figure 4, which examines changes in share lending costs for a security in an active fund's portfolio between reporting date τ and $\tau + 1$ (difference #1) between firms which are in an active fund portfolio and those which are not as of $\tau + 1$ (difference #2), as between "stable" managers and "unstable" managers (difference #3), where a "stable" manager is one who is unchanged between reporting dates $\tau - 1$ and τ. The y-axis plots the natural log of the average retail lending rate for new loans with fixed effects for every portfolio - reporting date combination. The mean of the control group is the value of the linear combination of fixed effects $\eta\tau i$ which makes the prediction equal to the mean of the dependent variable. The figure shows that pre-trends from $(\tau - 2, \tau - 1)$ to $(\tau - 1, \tau)$ are parallel.

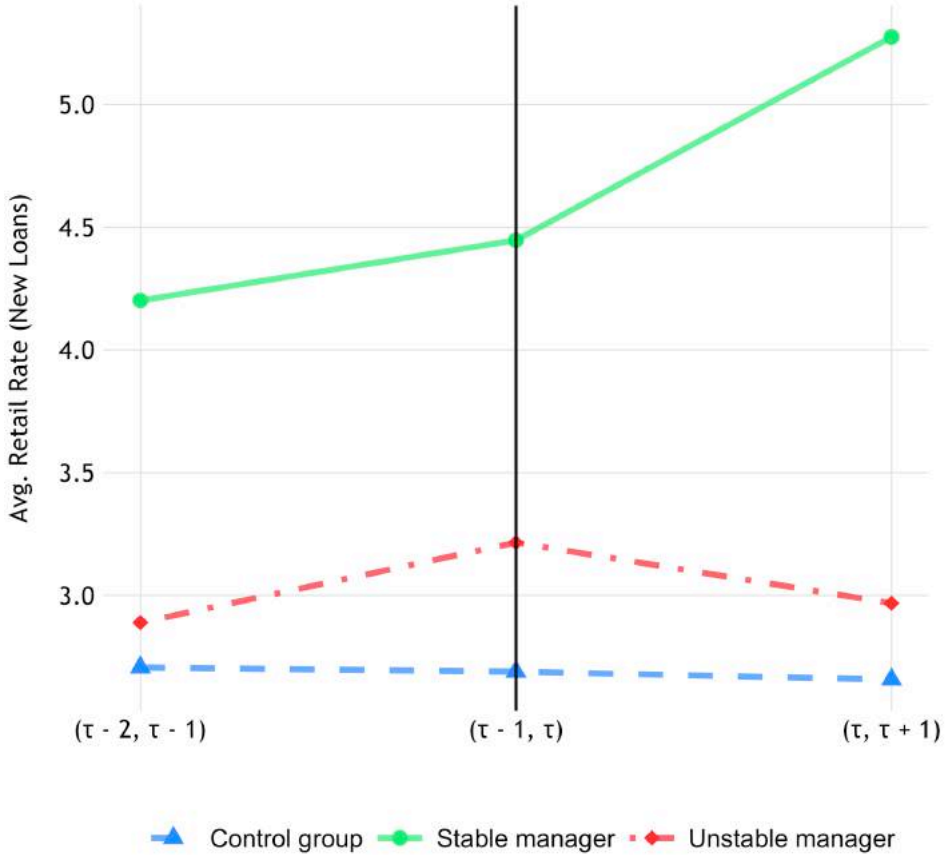

Figure 6: Parallel Trends: Other Outcomes

This figure extends Figure 5 and examines the other outcomes considered in this study. As before, the y- axis plots the average outcome with fixed effects for every portfolio - reporting date combination. The mean of the control group is the value of the linear combination of fixed effects ητi which makes the prediction equal to the mean of the dependent variable. The key identifying assumption is that pre-trends from $(\tau - 2, \tau - 1)$ to $(\tau - 1, \tau)$ are parallel. Consistent with the findings in Table 3, the post-treatment trends for demand-side outcomes are unchanged for "stable" managers.

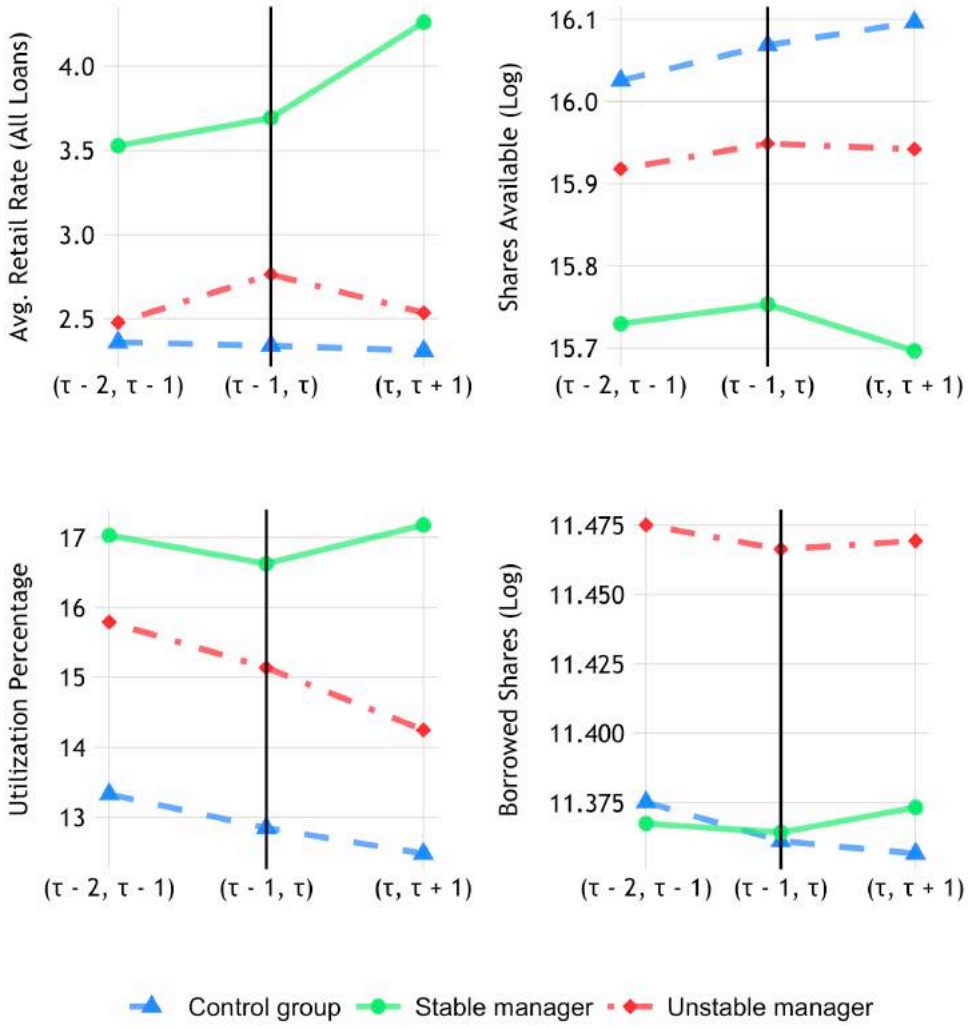

Figure 7: Passive Exit and Share Price Accuracy

This figure plots the continuously compounded four-factor abnormal return beginning 60 trading days prior to the report date and extending to 252 trading days after for firms which are not in the affiliated active fund's portfolio as of $\tau + 1$, as between "stable" managers (the solid line) and "unstable" managers (the dashed line). As the figure shows, the two groups follow a declining parallel trend up to the report date, but shortly thereafter the "unstable" group reverses direction and ends up with a statistically insignificant positive cumulative abnormal return. By contrast, the "stable" group continues shows a persistent price decline. This evidence suggests passive exit screens out less-informed short selling.

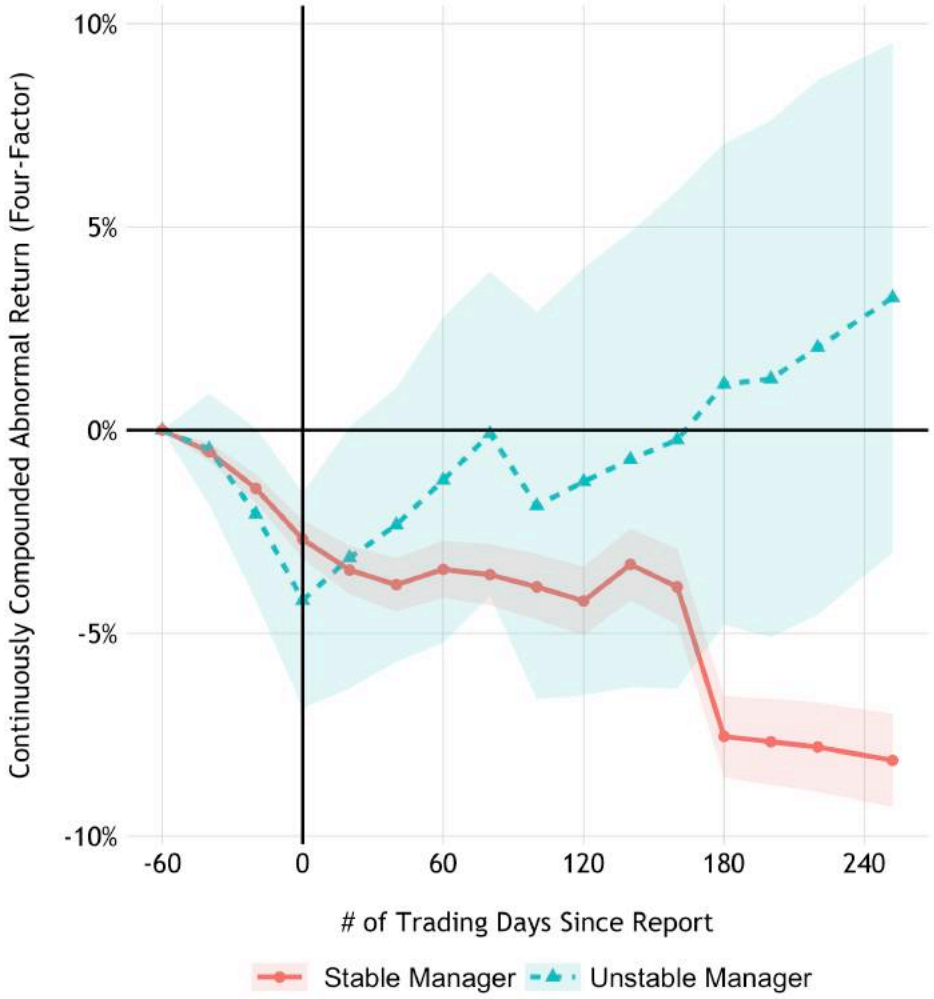

Table 1: Summary Statistics

This table presents summary statistics for the primary dataset, which has 365,636 security-reporting date observations. This dataset is limited to cases where the share of ownership of the security by passive index funds belonging to the same fund family as the reporting fund exceeds 14.6%, the 95% percentile of the sample distribution. Definitions for these variables are given in the text. For the share lending data, the "difference" variables are the difference between the average of the lending variable for the security prior to and following the holding period disclosure date. For example, if an active fund reports its portfolio holdings on January 31, February 28 and March 31, and the current observation is February 28, the post-pre difference is the average of the lending variable for the security from February 28 to March 31 ("post") minus the average of the lending variable for the security between January 31 to February 28 ("pre").

Variable	#	Mean	Std. Dev.	Min	Max	10%	25%	50%	75%	90%
Difference in Avg. Retail Rate for All Loans	365,636	-.008	5.161	-413.62	319.407	-.168	-.048	-.005	.03	.102
Difference in Avg. Retail Rate for New Loans	365,636	.001	7.645	-381.092	361.889	-.259	-.074	-.008	.048	.162
Difference in # of Shares Available (Log)	365,636	.025	.111	-2.616	4.971	-.045	-.011	.018	.055	.104
Difference in # of Borrowed Shares (Log)	365,636	-.004	.632	-5.922	5.431	-.729	-.369	-.01	.354	.728
Difference in Utilization Percentage	365,636	-.331	5.279	-88.39	89.964	-4.237	-1.391	-.116	.708	3.139
Share of Mgmt. Passive Ownership	365,636	.29	.13	.146	1	.172	.206	.26	.33	.418
Manager Unchanged (0/1)	365,636	.981	.137	0	1	1	1	1	1	1
Removed in Next Period (0/1)	365,636	.039	.194	0	1	0	0	0	0	0

Table 2: Informational Sensitivity of Share Lending by Affiliated Passive Funds

This table shows that when a firm is removed from an active fund's portfolio, the cost of borrowing its shares rises when affiliated lenders have market power in the share lending market. I estimate the following regression on my primary sample limited to cases where the share of ownership of the security by passive index funds belonging to the same fund family as the reporting fund exceeds 14.6%, the 95% percentile of the sample distribution:

$$y_{i,j} = \beta \cdot removed_{\tau-1}^{i,j} + \eta_{\tau}^{i} + \varepsilon_{\tau-1,\tau,\tau+1}^{i,j}$$

where $y_{i,j}$ is a difference in a share lending outcome for firm j in the portfolio of active fund i over the period $(\tau - 1, \tau)$ to the period $(\tau, \tau + 1)$, where τ is the current reporting date; $removed_{\tau-1}^{i,j}$ is equal to 1 if firm j is not present in fund i's portfolio on reporting date $\tau + 1$; η_{τ}^{i} is a fixed effect for portfolio i on reporting date τ; and $\varepsilon_{\tau-1,\tau,\tau+1}^{i,j}$ is a random error term. The specification employs fixed effects for every portfolio - reporting date combination, denoted by η_{τ}^{i}, which absorbs heterogeneity between funds and firms correlated with $y_{i,j}$ that does not vary within portfolio - reporting dates. The coefficient of interest is β, which estimates the difference between cases with $removed_{\tau-1}^{i,j} = 1$ and $removed_{\tau-1}^{i,j} = 0$ in the over-time difference in share lending costs over the period $(\tau - 1, \tau)$ to the period $(\tau, \tau + 1$. To reiterate, this relationship is not causal but simply reflects the association between short selling demand and share lending costs imposed by affiliated passive index funds with market power, which could easily be driven by arrival of negative information about the underlying firm.

		Equilibrium		Supple-Side	Demand-Side
	Avg. Retail Rate (All Loans)	Avg. Retail Rate (New Loans)	Utilization Percentage	Shares Available (Log)	Borrowed Shares (Log)
$\boldsymbol{removed_{\tau-1}^{i,j}}$	**0.5782*** **	**0.8316*** **	**0.8813*** **	**-0.0832*** **	**0.0134** **
	(6.27)	**(6.58)**	**(10.75)**	**(-29.88)**	**(1.97)**
(Intercept)	-0.0307***	-0.0312**	-0.3656***	0.0279***	-0.0045***
	(-3.67)	(-2.50)	(-41.86)	(166.23)	(-4.32)
Observations	365,636	365,636	365,636	365,636	365,636

Robust *t* statistics in parentheses
The (Intercept) is the value of the linear combination of fixed effects η_{τ}^{i} which makes the prediction calculated at the means of the independent variables equal to the mean of the dependent variable.
* p < 0.10, ** p < 0.05, *** p < 0.01

Table 3: Supply-Side Shift in Share Lending Costs

This table tests Hypothesis 1, which predicts that when exiting a portfolio firm, "stable" active managers raise the cost of borrowing shares lent by affiliated passive funds with market power in that firm's shares. I estimate the following regression by OLS on my primary sample limited to cases where the share of ownership of the security by passive index funds belonging to the same fund family as the reporting fund exceeds 14.6%, the 95% percentile of the sample distribution:

$$y^{i,j}_{\tau-1,\tau,\tau+1} = \beta_1 \cdot removed^{i,j}_{\tau+1} + \beta_2 \cdot \left(removed^{i,j}_{\tau+1} \times stable^{i}_{\tau-1,\tau}\right) + \eta^{i}_{\tau} + \epsilon^{i,j}_{\tau-1,\tau,\tau+1}$$

where $y^{i,j}_{\tau,\tau+1}$ is the difference in a share lending outcome for firm j in the portfolio of active fund i over the period $(\tau-1,\tau)$ to the period $(\tau,\tau+1)$, where τ is the current reporting date; $removed^{i,j}_{\tau+1}$ is equal to 1 if firm j is not present in fund i's portfolio on reporting date $\tau+1$; $stable^{i}_{\tau-1,\tau}$ is equal to 1 if the portfolio manager for fund i was unchanged from period $\tau-1$ to τ; η^{i}_{τ} is a fixed effect for portfolio i on reporting date τ; and $\epsilon^{i,j}_{\tau,\tau+1}$ is a random error term. The specification employs fixed effects for every portfolio - reporting date combination, denoted by η^{i}_{τ}, which absorbs heterogeneity between funds and firms correlated with $y^{i,j}_{\tau-1,\tau,\tau+1}$ that does not vary *within* portfolio - reporting dates. For this reason, $stable^{i}_{\tau-1,\tau}$ is only identified when interacted with $removed^{i,j}_{\tau+1}$.

		Equilibrium		Supple-Side	Demand-Side
	Avg. Retail Rate (All Loans)	Avg. Retail Rate (New Loans)	Utilization Percentage	Shares Available (Log)	Borrowed Shares (Log)
$\boldsymbol{removed^{i,j}_{\tau+1}}$	**0.7965*** **	**1.0751*** **	**1.4435*** **	**-0.0499*** **	**0.0060**
$\boldsymbol{\times stable^{i}_{\tau-1,\tau}}$	**(4.38)**	**(4.73)**	**(4.06)**	**(-5.82)**	**(0.17)**
$removed^{i,j}_{\tau-1}$	-0.1976	-0.2156	-0.5248	-0.0346***	0.0075
	(-1.27)	(-1.15)	(-1.52)	(-4.29)	(0.22)
(Intercept)	-0.0309***	-0.0314**	-0.3659***	0.0279***	-0.0045***
	(-3.69)	(-2.52)	(-41.88)	(166.19)	(-4.32)
Observations	365,636	365,636	365,636	365,636	365,636

Robust *t* statistics in parentheses
The (Intercept) is the value of the linear combination of fixed effects η^{i}_{τ} which makes the prediction calculated at the means of the independent variables equal to the mean of the dependent variable.
* p < 0.10, ** p < 0.05, *** p < 0.01

Table 4: Value Lending Heterogeneity

This table examines how the findings in Table 3 are driven by value lending programs by examining whether the key coefficient of interest varies with hard-to-borrow securities, as measured by the pre-period average retail rate for each security in the portfolio - reporting date. I estimate the following triple-difference regression by OLS:

$$y^{i,j}_{\tau-1,\tau,\tau+1} = \beta_1 \cdot removed^{i,j}_{\tau+1} + \beta_2 \cdot rate^{j}_{\tau-1,\tau} + \beta_3 \cdot \left(removed^{i,j}_{\tau+1} \times stable^{i}_{\tau-1,\tau}\right) + \beta_4 \cdot \left(removed^{i,j}_{\tau+1} \times rate^{j}_{\tau-1,\tau}\right) + \beta_5 \cdot \left(stable^{i}_{\tau-1,\tau} \times rate^{j}_{\tau-1,\tau}\right) + \beta_6 \cdot \left(removed^{i,j}_{\tau+1} \times rate^{j}_{\tau-1,\tau} \times stable^{i}_{\tau-1,\tau}\right) + \eta^{i}_{\tau} + \epsilon^{i,j}_{\tau-1,\tau,\tau+1}$$

where $rate^{j}_{\tau-1,\tau}$ is the average retail lending rate for loans of security j over the period $(\tau-1,\tau)$ and the other variables are as defined in eq. 1. As before, the specification employs fixed effects for every portfolio - reporting date combination, denoted by η^{i}_{τ}, which absorbs heterogeneity between funds and firms correlated with $y^{i,j}_{\tau-1,\tau,\tau+1}$ that does not vary *within* portfolio - reporting dates. For this reason, $stable^{i}_{\tau-1,\tau}$ is only identified when interacted with $removed^{i,j}_{\tau+1}$ or $rate^{j}_{\tau-1,\tau}$. The coefficient of interest is β_6, which estimates how the effect of replacing a fund manager on the informational sensitivity of share lending varies between hard-to-borrow and other securities.

		Equilibrium		Supple-Side	Demand-Side
	Avg. Retail Rate (All Loans)	Avg. Retail Rate (New Loans)	Utilization Percentage	Shares Available (Log)	Borrowed Shares (Log)
$removed^{i,j}_{\tau+1}$ $\times rate^{j}_{\tau-1,\tau}$ $\times stable^{i}_{\tau-1,\tau}$	**0.5396*** (11.19)**	**0.5507*** (8.54)**	**0.1354*** (3.24)**	**0.0060*** (7.94)**	**-0.0028 (-0.82)**
$removed^{i,j}_{\tau+1}$ $\times rate^{j}_{\tau-1,\tau}$	-0.4075*** (-11.66)	-0.4241*** (-7.77)	-0.1648*** (-4.08)	-0.0061*** (-8.49)	0.0041 (1.19)
$stable^{i}_{\tau-1,\tau}$ $\times rate^{j}_{\tau-1,\tau}$	0.0090 (0.25)	0.0257 (0.50)	0.0033 (0.18)	-0.0007** (-2.05)	0.0015 (1.34)
$removed^{i,j}_{\tau+1}$ $\times stable^{i}_{\tau-1,\tau}$	0.0342 (0.36)	0.3485*** (2.65)	1.3396*** (3.83)	-0.0567*** (-6.70)	0.0072 (0.21)
$removed^{i,j}_{\tau+1}$	0.3196*** (8.66)	0.3500*** (5.26)	-0.3213 (-0.94)	-0.0278*** (-3.48)	0.0034 (0.10)
$rate^{j}_{\tau-1,\tau}$	-0.0826** (-2.32)	-0.1510*** (-2.98)	-0.0201 (-1.07)	0.0009*** (2.80)	-0.0017 (-1.59)
(Intercept)	-0.0309*** (-3.69)	-0.0314** (-2.52)	-0.3659*** (-41.88)	0.0279*** (166.19)	-0.0045*** (-4.32)
Observations	365,636	365,636	365,636	365,636	365,636

Table 5: How Much Profit Sharing Between Lenders and Short Sellers?

This table estimates how much of the surplus to short selling is captured by institutional investors exercising market power in the share lending market. For each firm in the "treatment" group—*i.e.*, a firm removed from a portfolio of an active fund whose affiliated passive funds have market power in share lending market for the security—I calculate the cumulative raw and abnormal return (under one- three- and four-factor models) from the report date to 4 weeks after the report (the "information value"), as well as the average share lending rate for new loans from the report date to the next report date (the "surplus extraction"). I convert each of these to the daily level—the former by dividing the cumulative abnormal return by 20, the number of trading days over which that spans, and the latter by 252, the number of trading days in a year since lending rates are annualized in the data. I further divide the latter by 100 to account for the fact the returns are expressed in decimal values (*e.g.*, a 1% decline in the share price is represented as 0.01) whereas lending rates were reported in percentage points (*e.g.*, a 1% annual rate is represented as 1.00). I then estimate the following regression by OLS on the primary sample:

$$ret^{j}_{t,t+20} = \alpha + \beta \cdot rate^{j}_{\tau,\tau+1} + \epsilon^{j}_{t,t+20}$$

where $ret^{j}_{t,t+20}$ is the average daily raw (or abnormal) return for security j from the report date to 20 trading days after, depending on the specification; $rate^{j}_{\tau,\tau+1}$ is the average daily lending rate for security j from the report date to the following report date; and $\epsilon^{j}_{t,t+20}$ is a random error term. The coefficient of interest is β, which estimates the change in $ret^{j}_{t,t+20}$ for a percentage point change in $rate^{j}_{\tau,\tau+1}$. While most reports for the large asset managers are filed monthly, the minimum frequency is three months, so as a robustness check, I repeat this analysis but examine the return from the report date to 60 trading days after.

	Raw Return		One-Factor	
	$(t, t+20)$	$(t, t+60)$	$(t, t+20)$	$(t, t+60)$
$rate^{j}_{\tau-1,\tau}$	-0.7725***	-0.8573***	-0.8657***	-0.8678***
	(-3.02)	(-3.35)	(-3.37)	(-3.38)
(Intercept)	-0.0010***	-0.0006***	-0.0002***	-0.0002***
	(-14.74)	(-9.44)	(-3.76)	(-3.77)
Observations	14,050	14,050	14,050	14,050

	Three-Factor		Four-Factor	
	$(t, t+20)$	$(t, t+60)$	$(t, t+20)$	$(t, t+60)$
$rate^{j}_{\tau-1,\tau}$	-0.6260***	-0.6435***	-0.6485***	-0.6468***
	(-6.99)	(-7.04)	(-7.03)	(-6.98)
(Intercept)	-0.0007***	-0.0003***	-0.0000	-0.0000
	(-18.05)	(-7.94)	(-0.55)	(-0.67)
Observations	14,050	14,050	14,050	14,050

Table 6: Average Retail Lending Rate and Abnormal Return: Unconditional Correlation

This table examines the correlation between (a) the average retail lending rate for new loans from the current report date to the following report date and (b) the four-factor buy-and-hold abnormal return over that period. If, contrary to the prediction of the informed trading literature, active funds were to extract the entirety of the value of their nonpublic information before sharing the portfolio change with affiliated passive funds, there should be no relationship between these two. The table examines the subsample of securities which were removed from the active fund's portfolio on the following report date (*i.e.*, the subsample for which portfolio changes are shared throughout the fund family on a real-time basis). I estimate the following regression by ordinary least squares:

$$rate^{j}_{\tau,\tau+1} = \alpha + \beta \cdot ar4^{j}_{\tau,\tau+1} + \epsilon^{j}_{\tau,\tau+1}$$

where $rate^{j}_{\tau,\tau+1}$ is the average daily lending rate for security j for new loans from the report date to the following report date; $ar4^{j}_{t,t+20}$ is the daily four-factor abnormal return from the current report date to the next report date; and $\epsilon^{j}_{t,t+20}$ is a random error term. The coefficient of interest is β, which estimates the percentage point change in $rate^{j}_{\tau,\tau+1}$ for a one-percentage point change in $ar4^{j}_{\tau,\tau+1}$. To mitigate concerns that the results may be driven by monthly vs. quarterly reporting frequency, I repeat the analysis for monthly and quarterly frequencies separately.

	Monthly & Quarterly		Monthly		Quarterly	
$ar4^{j}_{\tau,\tau+1}$.	-3.5196***		-3.4713**		-4.2154***	
	(-2.69)		(-2.50)		(-2.84)	
$ar4^{j}_{\tau,\tau+1}$. $< -2\%$		2.6273***		3.7363***		0.5979***
		(5.49)		(5.11)		(3.88)
(Intercept)	3.9071***	3.0278***	5.4739***	4.2669***	1.0362***	0.8198***
	(20.75)	(14.15)	(18.97)	(13.15)	(18.62)	(22.76)
Observations	13,212	13,212	8,548	8,548	4,664	4,664

Table 7: Average Retail Lending Rate and Abnormal Return: By Stable Manager

This table examine whether the relationship in Table 6 differs for stable affiliated active managers. Specifically, I estimate the following regression by ordinary least squares:

$$rate^{j}_{\tau,\tau+1} = \alpha + \beta_1 ar4^{j}_{\tau,\tau+1} + \beta_2 stable_j + \beta_3 \cdot \left(ar4^{j}_{\tau,\tau+1} \times stable_j\right) + \epsilon^{j}_{\tau,\tau+1}$$

where $rate^{j}_{\tau,\tau+1}$ is the average daily lending rate for new loans from the report date to the following report date; $ar4^{j}_{t,t+20}$ is the daily four-factor abnormal return from the report date to the next report date; and $\epsilon^{j}_{t,t+20}$ is a random error term. The coefficient of interest is β_3, which estimates the percentage point change in $rate^{j}_{\tau,\tau+1}$ for a percentage point change in $ar4^{j}_{\tau,\tau+1}$. To mitigate concerns that the results may be driven by monthly vs. quarterly reporting frequency, I repeat the analysis for those frequencies separately.

	Monthly & Quarterly		Monthly		Quarterly	
$\boldsymbol{ar4^{j}_{\tau,\tau+1} \times stable_j}$	-3.4366**		-3.3335*		-4.3178***	
	(-2.27)		(-1.95)		(-2.87)	
$\boldsymbol{ar4^{j}_{\tau,\tau+1} < -2\% \times stable_j}$		2.4364***		2.4377**		0.6700***
		(4.78)		(2.53)		(3.75)
$ar4^{j}_{\tau,\tau+1}$.	-0.0882		-0.1418		0.0781	
	(-0.12)		(-0.14)		(0.40)	
$ar4^{j}_{\tau,\tau+1}$. $< -2\%$		0.2077		1.3037**		-0.0617
		(1.24)		(2.09)		(-0.72)
(Intercept)	3.9059***	3.0282***	5.4729***	4.2670***	1.0341***	0.8199***
	(20.73)	(14.16)	(18.97)	(13.15)	(18.73)	(22.76)
Observations	13,212	13,212	8,548	8,548	4,664	4,664