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Why Don't Most Mutual Funds Short Sell?

Abstract

An intriguing observation in the US mutual fund industry is that most equity funds do not short sell, even though virtually all regulatory restrictions on short selling had been lifted by 1997. We shed light on this puzzle by conducting the first systematic analysis of long-short equity funds' portfolio compositions, fund performance, and capital flows. Our results reveal that: 1) long-short mutual funds hold substantially more cash than their long-only peers and have a market beta significantly below one; 2) long-short funds generate a large positive alpha of 5% a year in risky holdings but slightly underperform their long-only peers in total returns; and 3) long-short funds face much higher flow-performance sensitivities and are more prone to use cash to absorb capital flows. We discuss several possible explanations for these findings.

Keywords: Long-Short Equity Mutual Funds; Cash Holdings; Portfolio Beta; Fund Performance; Flow-Performance Relations

1. Introduction

The last four decades have witnessed tremendous growth of the US mutual fund industry. The total net assets (TNA) of equity funds in the US increased from $250 billion in 1980 to almost $10 trillion in 2019.[1] Of particular interest to many market participants is the so-called "active extension" or 1X/X (e.g., 120/20, 130/30, 150/50) class of funds in which the short-sale constraint of traditional long-only funds is relaxed. These hedge fund-like strategies are designed to exploit mispricing both on the long side and the short side, thus bringing the benefit of "hedged" investment returns to the general public, which used to be available only to the ultra-wealthy and large institutions. Industry experts have predicted the imminent dominance of such long-short products. For instance, Tabb and Johnson (2007) and Lo and Patel (2008) forecast that the TNA of 130/30 mutual fund products could reach $2 trillion by 2010 from just under $75 billion in 2006.

The projected growth of long-short equity funds has important implications for asset prices and market efficiency. Chen, Hong and Stein (2002) argue that the short-sale constraint faced by large institutions like mutual funds is a major impediment to market efficiency because it prevents the revelation of negative information in prices. Stambaugh, Yu and Yuan (2012) show that for many asset pricing anomalies, the short leg is significantly more profitable than the corresponding long leg, especially after periods of buoyant investor sentiment, suggesting that the short-sale constraint is indeed binding for many important investors. Hypothetically, if all equity mutual funds in 2019 had adopted a 130/30 investment strategy, this would have implied nearly $3 trillion (=10*30%) in additional short positions, or nearly 10% of the total market capitalization. For reference, the market-average short interest in 2019 was around 5%.

Given the benefits of long-short equity mutual funds—both to end investors (in the form of higher returns and hedged risk) and market efficiency, it seems puzzling that the 1X/X class of funds has had disappointing growth since its inception. By 2016 (the last year of our sample), although 50% of all equity funds explicitly allow for short selling in their SEC filings, only 8% (3% asset-weighted) have ever engaged in short selling. Out

[1] See, for example, https://www.ici.org/research/stats.

of the 8% long-short equity funds, 5% are occasional short sellers who short a trivial amount compared to their total net assets. In sum, the segment of equity mutual funds expected to outgrow all the other segments accounts for only a small portion of the mutual fund industry today.

Perhaps the most natural explanation for the lack of growth of long-short equity funds is regulation. However, with the 1997 repeal of the "short-short" rule, virtually all regulatory restrictions on mutual fund short selling had been lifted, and the first wave of 1X/X fund products was introduced in the late 1990s and early 2000s.[2] A related explanation is that although mutual funds are not legally barred from short selling, they are constrained from doing so due to client restrictions, which may be imposed for a number of reasons. First, some institutional clients (state pension funds for example) may face short-sale constraints themselves and, as a result, restrict their fund managers from short-selling. Second, given incomplete contracting or imperfect monitoring, investors worried about excessive risk-taking and portfolio turnover may find it optimal to restrain their managers from short selling. Third, there may be a broad, negative sentiment (social stigma) against short selling—after all, short sellers profit from others' misfortunes. Regardless of the underlying mechanism, this client-restriction view is hard to square with the fact that nearly half of all equity funds explicitly allow for short selling in their SEC filings—which suggests that the lack of shorting is unlikely due to their inability to short.[3]

Other popular explanations for mutual funds' rare use of short selling include: 1) mutual funds' lack of shorting ability (i.e., managers with shorting skills are immediately hired away by hedge funds), and 2) the large risk and cost associated with short selling (e.g., short sellers are liable for potentially unlimited losses as the stock price rises). To shed light on these popular views, as well as to bring new perspectives, on mutual fund

[2] See Almazan, Brown, Carlson and Chapman (2004), Agarwal, Boyson and Naik (2009), and Chen, Desai and Krishnamurthy (2013) for a discussion of the history of regulations on mutual fund short selling, which we also summarize in Section 2.

[3] In particular, more than 40% of equity funds allow for short selling in their public filings even though they never short in practice. If short selling is viewed as a "crime," why would any "innocent" long-only funds not pre-commit to never use short sales? It is equally difficult to understand why 5% of equity funds short a trivial amount in their portfolios. If the act of short selling is deemed a "crime" by some investors, these "casual" short sellers commit a "crime" without reaping much benefit (a 1% short position has virtually no impact on the fund's total returns).

short-selling activity, we collect novel data and conduct the first systematic analysis of long-short mutual funds' portfolio compositions, fund performance, and capital flows; we then contrast these patterns with those of long-only mutual funds.

More specifically, we collect detailed data on mutual funds' long-short equity positions and cash holdings from their quarterly SEC filings for 2004–2016.[4] We then classify mutual fund/quarter observations into four groups: 1) G00 includes all mutual funds that are self-refrained from short selling; 2) G01 includes mutual funds that are allowed to short sell but do not use short sales in any of the previous eight quarters; 3) G1 includes "casual" long-short funds whose short positions account for less than 20% of the funds' total net assets in the past eight quarters; and 4) G2 includes "aggressive" long-short funds whose short positions account for more than 20% of their TNA in the previous eight quarters.[5] Perhaps unsurprisingly, G2 funds hold well-diversified portfolios: the average G2 fund goes long more than 200 stocks and short more than 150 stocks.

One of the most striking patterns that emerge from our data is the large heterogeneity in cash holdings: long-short equity mutual funds hold substantially more cash than long-only funds. For example, a typical mutual fund in G2 invests 110% of its TNA in long equity positions, nearly 40% in cash and cash equivalents, and has short equity positions worth 50% of its total assets. In contrast, mutual funds in G00 and G01, on average, have 3% of their total net assets in cash and cash equivalents. Note that this variation in cash holdings is not mechanically driven by short-selling margin requirements, as institutional short sellers with diversified long-short portfolios face a cash-collateral requirement that is much lower than 80%. Moreover, in our analysis of within-fund variation, with each 1% increase in short positions of a mutual fund, its cash holdings increase by merely 0.2% and its long positions increase by 0.8%, again indicating a cash-collateral requirement far below 80%.

Given the large variation in mutual funds' cash holdings, a natural question is the impact of cash dilution on funds' risk exposures and performance. As Lo and Patel (2008)

[4] We start our sample in 2004 given the small number of observations prior to 2004.

[5] We use mutual funds' short-selling activity in the previous eight quarters in our classification to avoid any look-ahead bias.

put it, a 130/30 fund portfolio can be viewed as a long-only portfolio plus a market-neutral portfolio with long and short exposures that are 30% of the long-only portfolio's market value; consequently, the market exposure of the risky holdings of a 130/30 mutual fund should be similar to that of a traditional long-only product. In our sample, the average market beta of mutual funds in G00 and G01 is 1.06. For a typical fund in G2, its risky holdings have a market beta close to one; however due to the 40% cash holdings, its overall fund beta is 0.63.[6] This beta result is surprising, as virtually all mutual funds in G2 are benchmarked against long-only indices (e.g., S&P 500, Russell 2000). A market beta substantially below one mechanically leads to 1) a large tracking error, and 2) a relatively low average return because of the missing equity risk premium.

We next turn to mutual fund performance for the various short-selling-percentage groups. Consistent with prior research, we find that long-only funds (those in G00 and G01) and occasional long-short funds (those in G1) are unable to earn a positive alpha. In contrast, G2 is the only group with significantly positive abnormal returns; for example, the risky holdings of mutual funds in G2 produce a Fama-French-Carhart four-factor alpha of 5% a year, with a *t*-statistic of nearly 4. Interestingly, around 60% of this alpha is generated by their long equity positions, and 40% by short positions; the former can be attributed to the hedging benefit of short selling (i.e., fund managers can leverage their positive information to a larger extent by hedging out industry/factor risk on the short side) and latter attributed to an information advantage on the negative side.

This return pattern also holds using CRSP mutual fund return data. The typical fund in G2 has a significant alpha (with respect to various risk adjustments) of around 3% a year with a *t*-statistic of 3 (the reduction in alpha from 5% above to 3% here is again due to the 40% cash dilution). A perhaps surprising result is that in terms of raw fund returns (i.e., returns before adjusting for systematic risk factors), aggressive long-short mutual funds slightly underperform traditional long-only products, mostly because

[6] A potential concern is that long-short mutual funds may use derivatives to adjust their risk exposures. For example, a mutual fund with 110% long equity positions, 40% cash holdings, and −50% short equity positions can achieve a market beta of 1 by going long on equity index futures with a notional amount equal to 40% of its TNA. We show that this is not the case; the market beta of G2 calculated using fund holdings multiplied by (1 − cash%) and that using CRSP mutual fund return data are similar, suggesting that the average fund in G2 does not use derivatives to significantly change its market exposure.

of long-short funds' smaller market exposures (the equity risk premium in our sample is over 8% a year).

We then zoom in on a subset of aggressive long-short mutual funds that share common managers with one or more long-only mutual funds, and we observe similar return patterns: risky holdings of aggressive long-short funds outperform those of the comanaged long-only funds by about 5% a year. Although this result does not rule out the selection channel—that managers of long-short funds are inherently more skilled—it is more consistent with the view that the capability to short broadens fund managers' opportunity set to produce abnormal returns.

Our final set of analyses studies the clienteles of different groups of mutual funds by examining their capital flow patterns. The first key result is that capital flows to long-short mutual funds are much more sensitive to the funds' past performance than capital flows to long-only mutual funds. For example, the regression coefficient of quarterly flows on lagged fund returns for G2 is two to five times as large as that of G01 and G00. This result suggests that the types of investors in G2 are very different from the types in G0: the former are much more attentive and responsive to recent fund performance.

Our second result, which is closely tied to the first one, is the heterogeneity in the contemporaneous correlation between a fund's quarterly change in cash holdings and its capital flows: long-short mutual funds are much more likely to use cash to absorb flows. For example, the regression coefficient of changes in cash and cash equivalents on contemporaneous capital flows is 0.23 for G2 but a mere 0.04 for G01 and G00. This contrast is even starker for outflows: the same regression coefficient from the outflow sample is 0.27 for G2 and 0.03 for G01 and G00. One plausible interpretation is that because funds in G2 face a much higher flow-performance sensitivity (shown above) and thus more volatile flows, they optimally choose to hold more cash as well as to use cash to absorb short-term capital flows to minimize flow-induced liquidation costs (e.g., Coval and Stafford, 2007; Lou, 2012).[7]

[7] As discussed in Section 4.4, a back-of-the-envelope calculation suggests that G2's cash holdings can accommodate up to a move in outflows of four standard deviations.

In sum, our analyses reveal several novel facts about long-short mutual funds. First, aggressive long-short equity funds, with diversified holdings on both sides, earn a significant abnormal return of 5% a year from their risky holdings, 60% of which derives from their long equity positions and 40% from their short equity positions. Second, long-short equity funds hold a substantial amount of cash, nearly 40% of their TNA, and have a market beta substantially below one. Third, because of the large cash holdings and the small market beta, long-short equity funds slightly underperform long-only products in total returns. Finally, long-short equity funds face a substantially higher flow-performance sensitivity and more volatile flows, and are much more likely to use cash to absorb temporary capital flows compared to long-only funds.

Together, our results suggest that mutual funds' reluctance to short is probably not due to a lack of shorting skills; indeed, aggressive long-short equity funds produce a large alpha but are unable to grow their assets under management. It is unlikely due to shorting risk either: long-short mutual funds are well diversified in their holdings, so the short-squeeze risk or the risk of a potentially unlimited loss for any individual short position is unlikely to have a large impact on their total portfolio returns.

Our results instead point to a novel explanation for the disappointing growth of long-short equity funds. On the one hand, long-short mutual funds can better leverage their information advantage and hedge their risk, achieving higher abnormal returns. On the other hand, they face substantially more volatile flows and thus higher flow-induced liquidation costs. Long-short funds thus hoard cash to absorb capital flows, but this also adversely impacts their fund performance. As shown by Ben-David, Li, Rossi and Song (2019), investors focus primarily on benchmark-adjusted, rather than risk-adjusted, fund returns in their fund allocation decisions. As a result, long-short mutual funds, which are typically benchmarked against long-only indices, are unable to attract capital away from traditional long-only products.

Related Literature

Our paper contributes to the vast literature on the short-sale constraint and its asset pricing implications. For example, Chen, Hong and Stein (2002) argue that the short-sale

constraint faced by mutual funds can prevent the revelation of negative information in prices, resulting in significant return predictability on the downside. Stambaugh, Yu and Yuan (2012) document that for many asset pricing anomalies, the short leg is much more profitable than the corresponding long leg, especially after periods of buoyant investor sentiment, suggesting that the short-sale constraint is binding for many important investors. All these prior studies take as given that investors face a binding short-sale constraint and then proceed to study the price implications of such constraint. Our paper, on the other hand, drills down to the causes and sources of short-sale constraints. Moreover, while we focus on the lack of shorting by mutual funds, our findings have broader implications for other investor groups that also do not short sell.

Our paper also relates to a relatively small literature on mutual fund short selling activity. Almazan, Brown, Carlson and Chapman (2004), Agarwal, Boyson and Naik (2009), and Chen, Desai and Krishnamurthy (2013) show that a large fraction of mutual funds explicitly allow for short selling in their SEC N-SAR filings but only a small fraction actually engage in short selling. Moreover, drawing on answers to Question 70 in the N-SAR form that asks whether the fund actually uses short selling in a given time period, these prior studies show that short-selling funds outperform long-only funds by 1%–2% per year on a risk-adjusted basis.[8] Our first contribution is to separate occasional short sellers from aggressive short sellers by exploiting detailed data on their short positions and show that only the latter (those in G2) are able to produce positive abnormal returns. More importantly, our paper is the first to carefully examine mutual funds' long-short positions, cash holdings, and capital flows, which allows us to uncover a set of novel findings about long-short mutual funds.

More broadly, our paper sheds light on the use of nontraditional financial tools/securities by mutual funds. Koski and Pontiff (1999), Deli and Varma (2002), Kaniel and Wang (2020), and Jiang, Ou and Zhu (2021) study whether and how mutual funds use derivatives to speculate and hedge and find that mutual funds that use derivatives do

[8] Chen, Desai and Krishnamurthy (2013) also analyze mutual funds' risky holdings over a three-year period (2003-2006) reported by the CRSP mutual fund database (which misses many short positions even today) and show that long-short equity funds profit from both their long and short holdings.

not outperform those that do not. Unlike the detailed short-position data that we collect in this study, information on mutual funds' derivatives holdings is limited and noisy before 2019; the SEC started to require mutual funds to report detailed information on derivatives holdings in Form N-PORT only after the Investment Company Reporting Modernization Reforms, first adopted in 2016 and later revised in 2017 and 2019.

Our paper also contributes to the recent growing literature on mutual fund cash/liquidity management. Chernenko and Sunderam (2016), Girardi, Stahel and Wu (2017), Jiang, Li and Wang (2020) and Choi, Hoseinzade, Shin and Tehranian (2020) show that mutual funds (especially bond funds) use cash and cash equivalents to accommodate inflows and outflows to minimize flow-induced liquidation costs; this tendency is particularly strong for funds with illiquid assets and during times of heightened uncertainty.[9] In our setting, we document that long-short equity funds face substantially more volatile capital flows and hold a lot more cash than traditional long-only funds. Drawing on the insight from the literature on mutual fund liquidity management, we argue that these patterns are consistent with long-short equity funds hoarding cash to reduce their flow-induced liquidation costs.

Finally, our paper is related to a large literature on closed-end funds (e.g., Lee, Shleifer and Thaler, 1991; Pontiff, 1996). Although the closed-end structure is more conducive to betting against long-term mispricing (as managers do not have to worry about short-term capital flows that often chase recent fund performance), it is not a popular organizational structure in the mutual fund industry, accounting for less than 3% of the industry's total TNA (e.g., Giannetti and Kahraman, 2018). Stein (2005) argues that this is a natural outcome in a competitive equilibrium: fund managers adopt the open-end structure, which is costlier than the closed-end structure, to signal that they have high-ability in a pooling equilibrium. In a similar spirit, although short selling can expand managers' investment opportunity set and potentially improve fund performance, it is not widely used by mutual funds. Given that all the hard restrictions on short selling

[9] A recent literature (e.g., Agarwal and Zhao, 2019; Franzoni and Giannetti, 2019; Agarwal, et al., 2020; Jin, et al., 2020) examines alternative ways through which mutual funds mitigate liquidation costs.

were lifted more than two decades ago, it is worth thinking about the equilibrium forces that prevent mutual funds from engaging in short selling.

2. The Institutional Background

In this section, we describe the history of regulations that limit mutual fund short selling. Contrary to the narrative that mutual funds are not allowed to short, there is in fact no regulation that directly prohibits mutual funds from short selling. Instead, regulatory restrictions are imposed on the use of leverage. Section 18 of the Investment Company Act of 1940 prohibits any registered investment company from issuing any class of senior securities that represents indebtedness, including short sale borrowings, unless the investment company has an asset coverage ratio of at least 300% immediately after such issuance. This means that a mutual fund with TNA of $100 from equity investors can short sell (or borrow) up to $50; therefore, the fund's net equity value plus the market value of securities sold short is three times the later, making it a typical 150/50 fund.

This requirement of a 300% asset coverage ratio was later relaxed to 100% in the 1979 SEC Release IC-10666; however, to fulfil the full coverage requirement, qualified collaterals are restricted to cash and high-grade debt obligations. The Release notes that, if an investment company were to issue a senior security, "the Division of Investment Management has determined that the issue of compliance with section 18 will not be raised with the Commission if the investment company 'covers' the senior security by establishing and maintaining certain 'segregated accounts.' ... The Commission believes that only liquid assets, such as cash, U.S. government securities or other appropriate high-grade debt obligations, should be placed in such segregated accounts."

The restriction on qualified collaterals was further eased in a SEC staff no-action letter in 1996: "Staff agreed not to recommend enforcement action under section 18 if a fund covers its obligations, that may otherwise be deemed to be senior securities, by maintaining a segregated account on the books of its custodian, and including in that segregated account cash or liquid securities (regardless of type) having an aggregate value, measured on a daily basis, at least equal to the amount of the covered obligations." From

1996 onward, a fund is deemed compliant as long as it maintains full coverage of its short positions using liquid securities, including stocks.

Another set of regulations that have important implications for the use of short selling is corporate tax rules. IRS Code §851 (b)(3), also known as the "short-short" rule, requires that mutual funds generate less than 30% of their revenues from the sale of securities held for less than three months (including short sales); otherwise, the fund's entire gain would be subject to the corporate tax rate. This provision, as part of a 1936 tax law, was intended to restrict short-term churning by mutual funds. The Taxpayer Relief Act of 1997 repealed this "short-short" rule and made it much less expensive for mutual funds to short sell. In sum, virtually all regulatory restrictions on short selling had been lifted by 1997.

3. Data Descriptions

We construct a novel dataset of mutual funds' long-short equity positions from several data sources.[10] Investment companies are required by the SEC to disclose their entire portfolio, including short positions, in their annual/semi-annual shareholder reports (N-CSR) and quarterly holdings reports (N-Q).[11] We manually collect mutual funds' quarterly short positions from these reports, which are our main data source. We then supplement this dataset with short positions from Morningstar and the CRSP US mutual fund database. As pointed out by Schwarz and Potter (2016), these databases contain voluntarily reported positions not in the SEC filings but also miss many positions available in the SEC filings.

We combine the three datasets by matching fund family names as well as fund names and apply the following criteria to improve matching quality: for a fund to be matched between any two databases, the number of stocks reported in the two databases for the same fund in the same quarter should not differ by more than 100% (i.e., $0.5 <$

[10] The typical go-to database of mutual fund positions, the Thomson Reuters institutional holdings database, contains mutual funds' long positions but not short positions (Schwarz and Potter, 2016).

[11] SEC: Shareholder Reports and Quarterly Portfolio Disclosure of Registered Management Investment Companies, https://www.sec.gov/rules/final/33-8393.htm.

the number of stocks reported in database A/the number of stocks reported in database B < 2), and the number of shares held in each stock should not differ by more than 25% (i.e., $0.8 <$ shares of stock reported in database A/shares of stock reported in database B < 1.25). Our sample covers the period of June 2004, the year in which mutual funds started to report holdings on a quarter frequency, through December 2016. In total, we have a sample of 1,274 distinct long-short mutual funds with 11,171 fund-quarter observations.

We next obtain information on mutual fund long positions from Thomson Reuters mutual fund holdings database and supplement it with long positions from CRSP and Morningstar. This completes the information on stock holdings by long-short mutual funds. For comparison, we also include long-only equity funds in our sample. We further obtain mutual funds' cash holdings from Morningstar, which are then supplemented by the cash holdings reported in CRSP.

For most of our analysis, we focus on the universe of US domestic equity mutual funds, using common screening criteria in the literature. Specifically, we require that 1) the investment objective code (IOC) reported by Thomson Reuters is in the set of aggressive growth, growth, growth and income, unclassified, and missing; 2) the fund's long portfolio invests more than 75% in US equity; and 3) the fund's TNA is above 5 million USD at the end of the previous quarter. After applying all these screening criteria, we end up with a sample of 3,555 distinct domestic equity funds (including both long-only and long-short funds) with 102,764 fund-quarter observations.

In all subsequent return-based tests, where we compare fund returns inferred from reported quarter-end holdings (with the assumption that mutual funds do not trade intra-quarter) and total fund returns as reported by CRSP, we further exclude mutual funds whose CRSP fund returns and holding-based returns have a correlation below 0.5. This filter weeds out cases in which fund-level information and holdings information diverge, potentially due to data errors, incomplete records, and/or significant uses of derivatives (which we are unable to observe). We lose roughly 10% of our sample with this filter.

In addition to detailed information on mutual funds' portfolio holdings, our analysis also requires information on mutual funds' investment policy. Question 70-R in SEC form

N-SAR specifically asks whether the fund's investment policy permits short selling. We manually extract the answers to this question from the N-SAR form and then link this information to our main dataset by matching fund names.

Information on mutual fund characteristics and monthly fund returns is obtained from Morningstar and CRSP. For funds with multiple share classes, we sum up the TNA across all share classes to calculate the total fund TNA; for other fund characteristics, we take the TNA-weighted average across all share classes. Monthly fund gross returns are calculated as net returns plus 1/12 of annual fees and expenses.

Finally, information on fund manager characteristics is also obtained from Morningstar and CRSP. For information on co-management, we obtain fund manager names from CRSP; following Agarwal, Ma and Mullally (2018), we drop managers that simultaneously manage more than four mutual funds to avoid pseudo-managers (those with a name attached to multiple funds without really managing any of these funds). We obtain personal and education history information on managers from Morningstar.

4. Main Results

4.1. Summary Statistics: Long-Short Mutual Funds

Table 1 shows the total number, aggregate TNA, and aggregate short positions of long-short equity funds, as well as those of long-only funds year by year. The left-hand side of the table reports the number of long-short funds—with all investment objectives—as well as a breakdown of funds in each of the investment categories. The total number of long-short funds increased from 157 in 2004 to 453 in 2016, out of which 30%–40% were US equity funds (the rest included balanced funds, international equity funds, and others). In all our empirical analysis, we focus on US equity funds. The right-hand side of the table shows the distribution of funds within the US equity fund universe. In our sample, nearly 50% of all US equity funds explicitly permit short selling in their SEC N-SAR filings; however, the fraction of funds that actually engaged in short selling only increased modestly from 2% in 2004 to 8% in 2016. At the end of our sample, the total TNA of long-short US equity funds is approximately 100 billion USD, less than 3% of the size of

US equity funds; their aggregate short positions amounted to 15 billion USD, 2% of the average market aggregate short interest.[12]

To aid our empirical analyses, we group all US equity funds into four categories in each quarter based on information in N-SAR filings and short selling activity in the previous eight quarters: 1) funds that are not permitted to short (G00); 2) funds that are permitted to short but do not engage in short selling in the previous eight quarters (G01); 3) casual short sellers, whose average short positions in the previous eight quarters account for less than 20% of the fund's TNA (G1); and 4) aggressive short sellers, whose short positions in the previous eight quarters account for more than 20% of their TNA (G2). We use information in the previous eight quarters in our classification to avoid any look-ahead bias. Mutual funds' short selling activity, and therefore their classification, is persistent over time: for example, out of all mutual funds in group G2 in year t, over 80% remain in G2 after two years, 8% are reclassified to group G1, and the remaining 10% are defunct.

Panels A and B of Appendix Table A1 list Lipper fund style classifications for casual long-short funds (G1) and aggressive long-short funds (G2), respectively. Funds in G1 cover a wide range of investment objectives; in contrast, funds in G2 are much more concentrated in style categories that clearly indicate short selling activity. For example, "long-short equity," "equity market natural," "extended large-cap core," "specialty diversified equity," and "alternative-event driven" are the five most popular style categories for G2 funds, and collectively account for 75% of all funds in G2.

Panels A and B of Table 2 report summary statistics of fund and manager characteristics of different fund groups, respectively. There is no discernable difference among groups G00, G01, and G1. In contrast, aggressive long-short funds (G2), relative to long-only funds, are significantly smaller ($360M vs. $1.4B), have higher monthly portfolio turnover (21% vs. 7%), charge higher management fees (1.61% vs. 1.13%), and are typically younger (7 vs. 14 years). Panel B shows that G2 funds are also more likely to be managed by a team of managers as well as managers with a Ph.D. degree. Moreover,

[12] For comparison, US equity closed-end funds, a group that has been studied extensively in prior literature, had a total TNA of 75 billion USD in 2016.

manager turnover is slightly higher for G2 funds than funds in other groups (a turnover rate of 2.71% per quarter for G2 vs. 2.11% for G1 vs. 2.57% for G0).

In Panel C of Table 2, we report the distribution of holdings characteristics of aggressive long-short funds (G2). The portfolio of a typical G2 fund contains 205 stocks on the long side and 155 stocks on the short side, so is well diversified on both legs. We also report the distribution of the equal-weighted and value-weighted average short interest of stocks in long-short funds' portfolios. For both weighting schemes, the mean and median short interest is approximately 6%, in the ballpark of the average short interest of the CRSP stock universe. This suggests that long-short mutual funds do not concentrate their short positions on a small number of stocks with abnormally high shorting demand. Appendix Table A2 further reports stock characteristics of fund holdings. Relative to G1 and G0 funds, G2 funds on average hold stocks with larger size and higher past one-year returns; meanwhile, the three groups of mutual funds hold stocks with similar book-to-market ratios.

4.2. Cash Holdings and Portfolio Beta

We next turn to portfolio compositions of different mutual fund groups, that is, how mutual funds allocate capital across long equity positions, short equity positions, and cash and cash equivalents. We define long%, short%, and cash% as the ratio of total value of stocks in long positions, the absolute value of stocks in short positions, and the value of cash and cash equivalents to fund TNA, respectively. By construction, long% − short% + cash% equal roughly 100%.

Conventional wisdom suggests that mutual funds have little incentive to hold cash, other than for liquidity management purposes (Chernenko and Sunderam, 2016). This view applies to both long-only funds and long-short funds. Our results reveal a striking pattern—aggressive long-short funds keep a large amount of cash, substantially more than funds in other groups. Panels A, B, and C of Table 3 report the time series averages of cross-sectional distributions of long%, cash%, and short% for different fund groups. For example, the portfolio of a typical long-only fund (G00 and G01) consists of 92% long equity positions, 0% short positions, and 2%–3% cash. As mutual funds' short% increases,

both long% and cash% rise. The average G1 fund (with short% between 0 and 20%) holds 106% of its TNA in long equity positions and 6% in cash. The average G2 fund— having short positions worth about 50% of its TNA—invests 109% of its TNA in long equity positions and 37% in cash. Put differently, the average "150/50 fund" does not invest 150% of its TNA in long equity positions; instead, it has 110% in long equity positions, 40% in cash, and 50% in short positions.

One potential concern is that the large cash holdings of G2 funds are driven by a small number of market-neutral funds that are typically benchmarked against cash-like instruments (such as Treasury bills). Appendix Table A3 repeats the exercise for G2 funds but excludes all market-neutral funds (roughly 10% of the G2 sample). The results are qualitatively similar. The remaining funds in G2 have, on average, 113% of their TNA in long equity positions, 44% in short positions, and 27% in cash.

Note also that the cash-holding result is not mechanically driven by brokerage margin requirements for short selling. First, institutional short sellers with diversified long-short portfolios face a cash-collateral requirement that is much lower than 80%. Moreover, exploring within-fund variation of portfolio compositions, we find that when a long-short fund increases its short positions, most of this change is absorbed by an accompanying increase in long positions rather than a rise in cash holdings. Specifically, Panel D of Table 3 shows panel regressions of the relations between long%, cash%, and short%. The main independent variable in these regressions is a fund's short% in each quarter; the dependent variable in columns (1)–(3) is long%, and that in columns (4)–(6) is cash% in the same quarter. Given the add-up constraint that long% − short% + cash% is close to 100%, the coefficient from the long% regression and that from the cash% regression should roughly add up to 1.[13]

We first explore cross-sectional variation by including only quarter-fixed effects. As reported in columns (1) and (4), for a 1% increase in short%, the long% increases by 0.29% and cash% by 0.76%. We next turn to the time-series variation of portfolio compositions *within* each fund by including fund-fixed effects in columns (2) and (5), and

[13] For this empirical exercise, we further impose the restriction $0.5 < \text{long\%} + \text{cash\%} - \text{short\%} < 1.5$ to weed out apparent data errors.

both time- and fund-fixed effects in columns (3) and (6). Once fund-fixed effects are included, the relation between cash% and short% becomes much weaker: the coefficients in column (5) and (6) are 0.206 and 0.207, respectively. At the same time, the relation between long% and short% becomes much stronger: the coefficients in columns (2) and (3) rise to 0.765 and 0.764, respectively. In sum, the results in Panel D, exploiting both across-fund and within-fund variation, suggest that long-short equity funds keep a large amount of cash on the side (a decision that is largely independent from the fund's actual short selling activity), and then engage in pairs-trading in their daily operations (so that long% and short% move together).

In Panel E of Table 3, we further examine whether long-short equity funds engage in some form of industry-neutral pairs trading. Specifically, we conduct fund-quarter-industry–level regressions where the dependent variable is the value of long positions in each industry divided by the fund's total TNA, and the independent variable is the value of short positions in the same industry as a percentage of the fund's TNA. Columns (1) and (2) include all industries, while columns (3) and (4) exclude industries in which the fund has no holdings (long or short) in that quarter. We control for fund×industry-fixed effects in columns (1) and (3), and additionally for quarter-fixed effects in columns (2) and (4). For all specifications, the relation between changes in long positions and changes in short positions within the same industry is close to one-for-one.

The heterogeneity in cash holdings of different mutual fund groups has obvious implications for funds' risk exposures (e.g., market beta). Panel A of Table 4 reports the time series average of cross-sectional distributions of market beta of funds' stock holdings as well as that of market beta of funds' overall returns. The risky-holdings-based beta is defined as the weighted average beta of all stocks in the portfolio, where the stock beta is calculated using a three-year rolling window of monthly returns. The fund beta is calculated using CRSP monthly returns in the 12 months after the short% classification. As shown in the top half of Panel A, the average risky-holdings-based beta of long-short funds (G2) is 1.05, similar to that of long-only funds. However, the average fund beta of G2, as shown in the lower half of the same Panel, is 0.63; the difference in the two betas

can be largely explained by G2 funds' cash holdings.[14] For reference, the fund return beta of G0 is slightly above 1. This beta pattern is surprising, as most mutual funds in G2 are benchmarked against long-only indices (e.g., S&P 500, Russell 2000). A market beta below one mechanically leads to 1) a large tracking error, and 2) a relatively low expected return given a positive equity risk premium.

Panel B of Table 4 reports panel regressions of the relation between market beta and short%. The dependent variable in columns (1)–(3) is the risky-holdings–based beta, and that in columns (4)–(6) is the fund return beta. As shown in columns (1)–(3), the risky-holdings–based beta has zero correlation with short%, consistent with our earlier result that long-short funds are holding similar stocks to long-only funds. As for the fund return beta (which is influenced by cash holdings), the coefficient is significantly negative in column (4), reflecting the difference in cash holdings between aggressive long-short funds and other funds. Once we turn to within-fund variation by including fund-fixed effects, this negative relation is no longer statistically significant, suggesting that there is only a weak within-fund relation between cash% and short%.

The substantial cash holdings by G2 funds not only affect their market exposures but also their idiosyncratic risk and return skewness. In Appendix Table A5, we report idiosyncratic volatility, total volatility, and return skewness calculated from both fund's risky holdings and their total returns. As can be seen, based on risky holdings, G2 funds on average have higher idiosyncratic volatility but similar total volatility and return skewness, compared to the other two groups of funds. After incorporating the impact of cash dilution, the overall returns of G2 funds have smaller idiosyncratic volatility, smaller total volatility, and less negative return skewness than G0 and G1 funds.

4.3. Fund Performance

[14] Appendix Table A4 shows that these results are robust to the exclusion of market-neutral funds; the average beta of stock holdings and that of overall fund return for group G2 are 1.04 and 0.68 after excluding market-neutral funds.

In this section, we examine the performance of mutual funds in various short% groups. We study two types of fund returns: 1) hypothetical portfolio returns inferred from mutual funds' reported stock holdings (assuming no intra-quarter trading), which are not affected by their cash holdings; and 2) total fund returns as reported by the CRSP mutual fund database.

Panel A of Table 5 reports raw returns (without risk-adjustments) of the various short% groups. As shown in column (1), in terms of risky-holdings-based performance, G2 funds have an average monthly return of 1.1% and outperform long-only funds by nearly 40 bps per month with a *t*-statistic of 3.3. Perhaps surprisingly, as shown in column (5), G2 funds have a monthly total fund return (as reported by CRSP) of 65 bps and underperform long-only funds by roughly 5 bps per month, albeit insignificantly. The difference between risky-holdings-based returns and total fund returns can be attributed to long-short funds' cash holdings; indeed, long-short funds' average fund returns are in line with their risky-holdings returns multiplied by (1 − cash%).

In Panel B, we report the CAPM alphas of various mutual fund groups. As can be seen from column (1), G2 funds are the only ones whose risky holdings can produce significantly positive abnormal returns. For example, G00, G01, and G1 funds earn 0.2 bps, −2 bps, and −0.7 bps per month, respectively, from their risky holdings. In contrast, G2 funds earn a monthly CAPM alpha of 41 bps (*t-statistic* = 3.62), and the difference between G2's risky-holdings-based returns and those of any other group is statistically significant at the 1% level.

We further explore the sources of the positive alpha of G2 funds. As suggested by prior studies, the ability to short not only allows investors to exploit their information advantage on the downside but also helps hedge their industry/factor risk on the upside, thus allowing investors to leverage their positive information more aggressively (e.g., Huang, O'Hara and Zhong, 2021; Hwang, Liu and Xu, 2019). To examine these two possibilities, we decompose risky-holdings-based returns into returns produced by long stock positions and returns of short positions. As shown in columns (2) and (3) of Panel B, long and short stock holdings contribute roughly 60% and 40% of G2 funds' CAPM alpha; specifically, G2 funds earn 23 bps of CAPM alpha from their long positions and

about 18 bps from their short positions.[15] In other words, aggressive long-short mutual funds reap the benefits of short-selling on both sides of their portfolios.

In column (5), we report the CAPM alpha based on total fund returns. Long-short equity funds in G2 again are the only ones with a positive CAPM alpha of 19 bps per month with a t-statistic of 2.5. The difference in the CAPM alpha based on total fund returns between G2 and any other fund group is again statistically significant. In column (4) of the same panel, we report risky-holdings-based CAPM alpha adjusted for funds' cash%. The difference in alphas between columns (4) and (5) for G2 of roughly 7 bps per month reflects funds' unobserved intra-quarter trading activity as well as all the transaction costs incurred in their trading (e.g., Kacperczyk, Sialm and Zheng, 2008).

We then repeat the same portfolio exercise with different risk adjustments in Panels C–E, which report the Fama-French three factor, the Fama-French-Carhart four factor, the Fama-French-Carhart four factor plus the Pastor-Stambaugh liquidity factor, and the Fama-French five-factor fund alphas, respectively. The results are virtually unchanged: after considering various risk models, long-short equity funds in G2 outperform long-only funds in G0 by about 40 bps per month in terms of risky-holdings-based returns and by about 25 bps per month in total fund returns.

One potential concern with the above return pattern is that long-short equity funds and long-only funds might differ along several fund characteristics, such as fund size and age, which are known to be associated with future fund performance (e.g., Chen, Hong, Huang and Kubik, 2004; Pollet and Wilson, 2008). To address this concern, we conduct two additional tests. First, instead of reporting portfolio returns, we conduct Fama-MacBeth regressions of fund returns on short% group dummies, as well as a set of fund characteristics including the logarithm of fund TNA, fund age, turnover, and expense ratios. The time series of the coefficients on these short% group dummies then indicates the monthly returns of these short% groups after controlling for various fund characteristics. As shown in Table 6, the results are nearly identical to those reported in

[15] The excess returns of G2 funds' short positions are negative, as shown in Panel A; this is because short positions bet against the market, so lose out on the market risk premium. Indeed, after controlling for the market factor, the CAPM alpha of G2 funds' short positions is significantly positive.

Table 5. G2 funds outperform long-only funds by more than 40 bps per month in terms of risky-holdings-based returns and by more than 20 bps in terms of total fund returns; these return differences are statistically significant and robust to a range of risk adjustments.

In the second test, we use a matching procedure to account for the nonlinear effect of fund size and age on fund performance. Specifically, for each long-short fund in G2, we select three long-only funds that 1) are launched in a two-year window around the inception date of the G2 fund, and 2) have the closest TNA to the G2 fund. As shown in Online Appendix Table A6, G2 funds outperform long-only funds with similar fund age and size by more than 40 bps per month in risky-holdings-based returns and by nearly 30 bps per month in total fund returns.

There are two potential explanations for the documented return differential between long-short equity funds and long-only funds. First, this return difference is consistent with a selection channel: managers of long-short funds are simply more skilled than managers of long-only funds and the skill difference drives the return difference. Second, short selling has a causal impact on fund performance; specifically, the ability to short broadens managers' opportunity tool set to produce abnormal returns. To help distinguish between the two views, we compare the performance of long-short mutual funds with long-only funds that are comanaged by the same managers.

As shown in Table 7, in which short% is calculated using information both in the previous eight quarters and over the entire sample, G2 funds' risk holdings significantly outperform those of their comanaged long-only funds. For example, the difference in the Fama-French-Carhart four-factor alphas between long-short funds and their comanaged long-only funds is 47 bps per month with a t-statistic of 2.93. Although we cannot entirely rule out the selection channel, these results are more consistent with the view that short selling helps improve fund performance.[16]

[16] One potential explanation for the results in Table 7 is that long-short funds charge higher management fees so fund managers are more incentivized to produce alphas in the long-short funds than the comanaged long-only funds. To show this is not the case, we conduct panel regressions of fund returns on expense ratios within the sample of comanaged funds. As shown in Online Appendix Table A7, expense ratios are insignificantly associated with future fund returns.

In Online Appendix Table A8, we report two additional measures of fund returns. The first column reports the average Sharpe ratio of each mutual fund group. As cash holdings do not affect the Sharpe ratio, and G2 is the only group with a significantly positive alpha, long-short equity funds in G2 have a Sharpe ratio that is significantly higher than other groups. For example, the annualized Sharpe ratio of G0 is 0.54, and that of G2 is 0.696; the latter is more than 30% higher. For reference, the annualized stock market Sharpe ratio in our sample is 0.56. Column (2) then reports the tracking error of various mutual fund groups. Given a market beta of 0.6, G2 funds have an annual tracking error of over 10%; for comparison, the average annual tracking error in G0 and G1 is around 6%.

In sum, the results shown in Tables 5–7 suggest that aggressive long-short equity funds are able to produce significant abnormal returns in their risk holdings by exploiting both the information advantage and hedging benefits of short selling. However, the large cash holdings (nearly 40% of their TNA) and a market beta of 0.6 put a drag on their total performance. As a result, long-short funds underperform long-only funds in total fund returns by about 50 bps a year (statistically insignificant). Coupled with the fact that G2 funds have an annual expense ratio that is 50 bps higher than that of G0 funds, the net-of-fee return difference between long-short funds and long-only funds is over 1% per year.

4.4. Flow-Performance Relations

Our next set of analyses studies investor clienteles in these different mutual fund groups by examining their capital flow patterns. To start, we compare the flow-performance sensitivity across different mutual fund groups. This sensitivity is defined as the regression coefficient of quarterly flows on lagged annual fund returns after controlling for fund flows in the previous four quarters; fund returns are measured against various asset pricing models: excess fund returns, CAPM alpha, the Fama-French three-factor alpha, the Fama-French-Carhart four-factor alpha, the Fama-French-Carhart four factor plus the Pastor-Stambaugh liquidity factor alpha, and the Fama-French five-factor alpha.

Table 8 reports the regression results. Capital flows to long-short mutual funds are much more sensitive to the fund's past performance than capital flows of long-only mutual funds. For example, the regression coefficient of quarterly fund flows on lagged excess fund returns is 5.527 for G2 funds, 3.018 for G1 funds, and 2.154 for long-only funds (those in G00 and G01). This monotonically decreasing pattern is unchanged if we instead use risk-adjusted returns as the performance measure.[17]

One potential driver for the documented difference in the flow-performance sensitivity between long-only and long-short funds is the difference in the types of investors these funds attract. This can be seen from the mutual fund classifications used by large gatekeeper platforms such as Morningstar and Lipper. For example, long-short equity mutual funds are often classified as extended core funds, long/short equity funds or alternative funds, while long-only equity funds are often classified as large-cap/small-cap/value/growth core funds. One interpretation of our result is thus that investors of long-short funds are more sophisticated and are more attentive to past fund performance, relative to investors in long-only funds.

Our second analysis examines the contemporaneous relation between quarterly changes in a fund's cash holdings and its capital flows. More specifically, we conduct Fama-MacBeth regressions in which the dependent variable is the change in cash holdings from quarter $t-1$ to t scaled by the fund's TNA at the end of quarter $t-1$, and the independent variable is the capital flow to the fund in quarter t again divided by the fund's TNA in quarter $t-1$. If mutual funds use only cash to absorb their quarterly capital flows, we expect to see a regression coefficient of 1; if, on the other hand, mutual funds deal with capital flows entirely by scaling up or down their risky holdings, we expect a coefficient of 0.

Table 9 reports the regression results. Aggressive long-short mutual funds are much more prone to use their cash holdings to absorb capital flows. For example, the sensitivity

[17] In Online Appendix Table A9, we follow the matching procedure in Online Appendix Table A6 and focus on G2 funds and long-only funds with similar fund size and age. We still observe that the flow-performance sensitivity of long-short funds is significantly higher than that of long-only funds, suggesting that the result in Table 8 is not due to differences in fund size and age between long-short funds and long-only funds.

of cash holdings to capital flow is 0.23 for G2 funds, 0.08 for G1 funds, and 0.04 for G0 funds.[18] This monotonically declining pattern is even stronger for the outflow sample: the same regression coefficient becomes 0.27 for G2 funds, 0.07 for G1 funds, and 0.03 for G0 funds when mutual funds face capital outflows.[19]

Given the cash-to-capital-flow sensitivity, we next gauge the economic magnitude of long-short funds' cash holdings in a back-of-the-envelope calculation. Specifically, as shown in Panel B of Table 3, the average cash holdings of G2 funds are 37% of the TNA. Given the average short holdings of 50% for G2 funds and a cash-collateral requirement of roughly 20% (as implied by the within-fund analysis in Table 3), long-short equity funds hold 27% ($= 37\% - 50\% \times 20\%$) excess cash. Meanwhile, given a standard deviation of 23% in quarterly flows of G2 funds, a one standard deviation move in outflows is associated with a 6% ($= 23\% \times 0.27$) decrease in cash holdings. Put differently, G2 funds hold sufficient cash to accommodate up to a four standard deviation move in quarterly outflows.

4.5. Dispersion in Fund Beta

Perhaps the most puzzling findings of our analyses are the low average fund beta and large beta dispersion of long-short mutual funds, as it is nearly costless to adjust a fund's market exposure using derivative contracts such as equity index futures. One possibility is that while the average fund beta is significantly below one, each fund family launches multiple long-short products with the same underlying long-short portfolio but different levels of market exposures to cater to different investors' needs. For example, a fund family may choose a beta that is close to 0 to cater to institutional clients who want a market-neutral alpha product, then a beta of 0.4 to 0.8 for corporate clients who want

[18] Note that these coefficients likely understate the importance of cash in dealing with capital flows as we focus on quarterly flows. Mutual funds probably rely more on cash to absorb daily flows.

[19] One potential explanation for the large cash holdings by G2 funds is that they cannot easily use long positions as collaterals for their short positions due to high turnover. In Online Appendix Table A10, we show that this explanation is unlikely to drive our results as portfolio turnover has no impact on the relation between cash holdings and short positions of mutual funds.

some market exposures on top of the alpha, and finally a beta of 1 for retail clients who evaluate mutual fund performance relative to long-only benchmarks.

In this section, we carefully examine the dispersion in fund beta. To start, we compare the characteristics of long-short mutual funds with different levels of market exposures. In Panel A of Online Appendix Table A11, we divide all aggressive long-short mutual funds into four equal groups (remember that the 25th, 50th, 75th percentile thresholds in the beta distribution are around 0.4, 0.6, and 0.9, respectively) and examine the differences in fund expenses, turnover, and retail shares across the four quartiles. There is no clear monotonic relation between market beta and any of these fund characteristics. Annual expenses are the highest for long-short mutual funds in the second quartile—with a beta between 0.4 and 0.6—at 1.89%. Monthly turnover is also the highest for the second quartile at slightly over 30%. Retail shares (defined as the TNA weight of retail share classes within each fund) peaks for mutual funds in the third quartile—with a beta between 0.6 and 0.9—at nearly 50%.

In Panel B of the same table, we classify all long-short mutual funds into two groups based on the sample median of fund beta and analyze the flow-performance sensitivities of the two groups. As can be seen from the panel, the regression coefficients of next-quarter capital flows on last-year fund performance, measured relative to various asset pricing models, are nearly identical. Together, the results shown in Panels A and B of Appendix Table A11 suggest that there are no significant differences in clienteles across long-short funds with different levels of market exposures.

In Panel C, we analyze dispersion in fund beta within each fund family. If the catering story described above is true, we expect fund families to launch multiple, nearly identical products with different market exposures. We test this possibility by examining the correlations in residual returns—after controlling for the market factor—across long-short funds within the same family. More specifically, we divide all long-short products within a family into two halves: those with high and those with low market betas. For each long-short product in the low-beta group, we then match it to a long-short fund in the high-beta group with the largest residual correlation. Finally, we take the average of

this maximum correlation for all funds in the low-beta group and report the distribution of this mean-max correlation across fund families.

As shown in the first row of Panel C, the average correlation in residual fund returns between the best matched pair of low-beta and high-beta funds within the same family is around 0.35, suggesting that these funds are unlikely pursuing identical strategies. In the second row, we impose a further restriction that the matched fund from the high-beta group must have a beta that is at least 0.3 larger than that of the low-beta fund; this is to ensure that we are comparing two funds with sufficiently different market exposures. The average correlation in residual fund returns drops to 0.24 in this case.

Combined, the evidence presented in Online Appendix Table A11 is largely inconsistent with the idea that fund families launch multiple long-short mutual funds—building on the same long-short active portfolio—to cater to different investor groups with differential needs for market exposures. We leave it to future research to shed more light on exactly why long-short mutual funds choose an average market beta that is substantially below one.

5. Discussions of Possible Explanations

As discussed in the introduction, one of the most natural explanations for the lack of growth of long-short equity funds is binding regulatory constraints. However, by 1997, all regulatory restrictions on short selling had been lifted, so regulations are unlikely to have been an important deterrent to mutual fund short selling in the last two decades.

A related explanation is client restrictions on short selling, both implicit and explicit. For example, a subset of institutional clients may face short-sale constraints themselves and in turn pass on such constraints to their managers. A second possibility is that there is a broad negative sentiment (social stigma) against short selling. Third, due to incomplete contracting and/or imperfect monitoring, investors that are worried about excessive portfolio risk and turnover may find it optimal to ban the use of short selling altogether. To start, regardless of the underlying mechanism, this client-restriction view is hard to square with the fact that nearly 50% of all equity funds explicitly allow for short selling in their prospectuses and SEC filings. Moreover, this client-restriction

view—particularly the optimal-contracting channel—has broader, interesting implications for the organization of the delegated portfolio management industry.

Another popular explanation is a lack of shorting ability among mutual fund managers, as smart managers with short-selling skills are immediately hired away by hedge funds. We show that long-short funds significantly outperform long-only funds on a risk-adjusted basis, and yet are unable to grow their assets under management. We further show that long-short equity funds outperform even long-only funds co-managed by the same managers, suggesting that the ability to short affords the managers a large opportunity/tool set to generate abnormal returns. More broadly, this lack-of-talent argument, while unlikely to completely explain our empirical findings, raises interesting questions about the asset management industry. What are the implications of the current fee structures of mutual funds and hedge funds for the organization of the asset management industry? Do hedge funds attract all the talent and mutual fund compete on fees? What are the optimal compensation schemes for mutual funds and hedge funds? Should we perhaps allow mutual funds to also charge performance fees?

Finally, the lack of shorting by mutual funds may be due to the large marginal costs and risks associated with short-selling. As shown in Panel C of Table 2, long-short equity funds hold well-diversified portfolios, so the short-squeeze risk and the risk of a potentially unlimited loss for any particular short position is unlikely to have a big impact on the overall portfolio performance. Moreover, long-short equity funds do not seem to concentrate their short positions on a small number of stocks with abnormally high shorting demand, so the marginal shorting cost is also unlikely to explain our findings.

Our results (those in Tables 5–9) instead point to a novel explanation for the disappointing growth of long-short equity funds. On the one hand, short selling helps mutual funds leverage their information advantage and hedge portfolio risk to achieve higher abnormal returns. On the other hand, long-short mutual funds face substantially more volatile flows and thus higher flow-induced liquidation costs, which lead them to hoard cash. The two effects combined result in a slightly lower average fund return and a higher tracking error. As shown in Ben-David, Li, Rossi, and Song (2019), investors focus primarily on benchmark-adjusted, rather than risk-adjusted, fund returns in their

mutual fund investment decisions. Consequently, long-short fund products, which are typically benchmarked against long-only indices, are unable to attract capital away from traditional long-only products.

6. Conclusion

Despite that all regulatory restrictions on mutual fund short-selling had been lifted by 1997 and the potential benefits of short selling to both mutual fund investors and market efficiency, the class of long-short mutual funds has had disappointing growth in the last two decades. By 2016, although nearly 50% of all equity mutual funds explicitly allowed for short selling in their prospectuses and quarterly SEC filings, only 3% had meaningful short positions.

To shed light on this puzzling observation, we collect novel data on mutual funds' long/short positions, cash holdings, and capital flows from public SEC filings. Our analyses reveal a number of novel facts about long-short mutual funds. First, aggressive long-short equity funds earn significant abnormal returns in their risky holdings. Second, long-short equity funds hold a substantial amount of cash in their portfolios (40% for the typical fund in G2) and have a market beta substantially below one. Third, because of the large cash holdings and small market beta, long-short equity funds slightly underperform long-only funds in terms of total returns. Finally, long-short equity funds face a much higher flow-performance sensitivity and are much more likely to use cash to absorb temporary capital flows.

Taken together, our results are unlikely to be driven by a set of popular explanations for mutual funds' rare use of short selling: 1) regulatory constraints, 2) client restrictions, 3) a lack of short-selling talent in the mutual fund industry, and 4) large marginal costs and risks of short selling. Instead, we propose an alternative way of thinking about our results: long-short equity funds hold a substantial amount of cash to absorb large fluctuations in capital flows; this portfolio choice lowers their total returns, increases their tracking errors, and makes them less attractive to fund investors. We leave it to future research to further our understanding of why the flow-performance relation is

so much more sensitive for long-short equity funds and why long-short equity funds are content with a market beta that is substantially below one.

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Table 1: Summary Statistics

This table reports the total number, total net assets under management (TNA), total short positions of long-short funds, as well as those of the universe of US equity funds each year during our sample period from June 2004 to December 2016.

Year	Number of Funds							Total Assets ($ Million)		
	Long-Short Funds					US Equity Funds Permitted to Short	US Equity Funds	US Equity Long-Short Funds		US Equity Funds
	Total	US Equity	Balanced	International Equity	Others			TNA	Total Short Positions	TNA
2004	157	57	29	10	61	967	2,373	12,814	1,374	1,949,462
2005	161	65	36	8	52	1,049	2,362	11,914	2,571	2,221,290
2006	222	94	39	9	80	989	2,274	27,871	4,565	2,503,033
2007	282	113	63	15	91	1,114	2,562	31,707	7,376	2,636,604
2008	283	115	78	13	77	1,253	2,793	30,322	5,799	2,289,644
2009	265	100	79	17	69	1,161	2,638	27,393	7,479	1,950,401
2010	301	133	95	15	58	1,155	2,547	42,986	8,090	2,238,542
2011	318	136	132	17	33	1,056	2,289	53,880	8,712	2,623,638
2012	335	132	151	21	31	1,020	2,195	49,601	7,110	2,866,396
2013	347	135	149	29	34	974	2,078	67,831	9,446	3,463,929
2014	377	131	136	31	79	916	1,996	139,001	12,576	4,102,284
2015	450	154	161	24	111	879	1,947	118,477	12,666	4,127,552
2016	453	153	168	20	112	859	1,892	101,672	15,833	4,187,769

Table 2: Fund, Manager, and Holdings Characteristics

This table reports the panel distribution of fund, manager, and holdings characteristics of different types of US equity mutual funds. We classify mutual fund/quarter observations into four groups: G00 includes all mutual funds that are self-restrained from short selling; G01 includes mutual funds that are allowed to short sell but do not use short sales in any of the previous eight quarters; G1 includes long-short funds whose short positions account for less than 20% of the funds' total net assets (TNA) on average in the past eight quarters; G2 includes long-short funds whose short positions account for more than 20% of their TNA on average in the previous eight quarters. Panel A reports fund characteristics of funds in each group, including TNA, monthly turnover, annual expense ratio, and fund age. Panel B reports manager characteristics for each fund group. *No. of years with the current fund* measures how long the current fund managers have been managing the fund. *Team management* is a dummy variable that is equal to 1 if a fund is managed by more than one manager in the current quarter. *Fraction of Managers with a Ph.D. degree* is the fraction of managers who have a Ph.D. degree within each fund. Panel C reports the holdings characteristics of aggressive long-short funds in group G2. *Number of stocks* measures the number of stocks in long and short portfolios in each G2 fund. We also report the distribution of the average short interest for each G2 fund: equal-weighted short interest is the simple average of short interest within each fund, and the value-weighted short interest is weighted by the value of a stock's short position as a fraction of the fund's total short positions. The table reports the mean, the median, and the 5^{th}, 25^{th}, 75^{th}, and 95^{th} percentiles.

Panel A: Fund Characteristics						
	Mean	5th	25th	50th	75th	95th
TNA ($ million)						
G00(=0)	1415.30	13.10	64.60	232.30	884.60	5317.40
G01(=0)	1483.74	13.60	75.40	292.50	1016.30	5717.70
G1(0-20%)	1713.99	10.90	51.00	209.10	1257.40	7674.70
G2(≥20%)	362.51	9.70	38.10	97.20	324.60	1636.00
Monthly turnover						
G00(=0)	0.06	0.01	0.02	0.05	0.08	0.17
G01(=0)	0.08	0.01	0.03	0.05	0.09	0.20
G1(0-20%)	0.09	0.01	0.03	0.06	0.12	0.26
G2(≥20%)	0.21	0.05	0.09	0.15	0.26	0.59
Annual expense ratio						
G00(=0)	1.12%	0.26%	0.85%	1.12%	1.38%	1.91%
G01(=0)	1.13%	0.39%	0.86%	1.10%	1.40%	1.87%
G1(0-20%)	1.25%	0.20%	0.81%	1.29%	1.62%	2.34%
G2(≥20%)	1.61%	1.04%	1.30%	1.52%	1.85%	2.50%
Fund age						
G00(=0)	15.25	2.42	7.25	12.17	18.67	41.50
G01(=0)	13.41	2.42	6.58	10.75	16.92	30.92
G1(0-20%)	12.68	1.00	4.50	10.75	16.67	35.92
G2(≥20%)	6.85	0.67	2.58	5.50	9.58	17.33

Panel B: Fund Manager Characteristics						
	Mean	5th	25th	50th	75th	95th
No. of years with the current fund						
G00(=0)	7.20	1.33	3.33	5.83	9.58	17.83
G01(=0)	6.39	1.08	2.83	5.33	8.83	14.92
G1(0–20%)	5.10	1.08	2.33	4.08	7.00	12.33
G2(≥20%)	4.84	0.83	2.33	4.08	6.83	10.33
Team management						
G00(=0)	0.58	0.00	0.00	1.00	1.00	1.00
G01(=0)	0.58	0.00	0.00	1.00	1.00	1.00
G1(0–20%)	0.55	0.00	0.00	1.00	1.00	1.00
G2(≥20%)	0.66	0.00	0.00	1.00	1.00	1.00
Fraction of managers with a Ph.D. degree						
G00(=0)	0.03	0.00	0.00	0.00	0.00	0.33
G01(=0)	0.03	0.00	0.00	0.00	0.00	0.20
G1(0–20%)	0.05	0.00	0.00	0.00	0.00	0.33
G2(≥20%)	0.07	0.00	0.00	0.00	0.00	0.67

Panel C: Long-Short Fund (G2) Holdings Characteristics						
	Mean	5th	25th	50th	75th	95th
Number of stocks						
Long positions	204.71	32	80	135	215	553
Short positions	154.94	18	52	108	172	435
Short interest of stocks						
Equal weighted	6.69%	3.50%	4.81%	6.17%	7.92%	11.36%
Value weighted	6.69%	3.16%	4.68%	6.11%	8.06%	12.29%

Table 3: Portfolio Compositions: Long Positions, Short Positions, and Cash

This table reports the portfolio weights of long positions, cash holdings, and short positions of different types of US equity mutual funds. We classify mutual fund/quarter observations into four groups: G00 includes all mutual funds that are self-restrained from short selling; G01 includes mutual funds that are allowed to short sell but do not use short sales in any of the previous eight quarters; G1 includes long-short funds whose short positions account for less than 20% of the funds' total net assets (TNA) on average in the past eight quarters; G2 includes long-short funds whose short positions account for more than 20% of their TNA on average in the previous eight quarters. For each fund in each quarter, we define the long%, short%, and cash% as the ratio of total value of stocks in long positions, the absolute value of stocks in short positions, and the value of cash and cash equivalents to fund TNA, respectively. Panels A, B, and C report the time-series average of cross-sectional summary statistics of long%, cash%, and short% for different fund groups, respetively. Panel D reports panel regression results with fund-quarter-level observations that examine the contemporaneous association between long%, cash%, and short%. The main independent variable of interest is a fund's short% in each quarter; the main dependent variable in columns (1)–(3) is long%, and that in columns (4)–(6) is cash% in the same quarter. We control for time-fixed effects in columns (1) and (4), fund-fixed effects in columns (2) and (5), and both time and fund-fixed effects in columns (3) and (6). Long% is winsorized above at the value of 200%, short% is winsorized above at the value of 100%, and cash% is winsorized at the values of −90% and 90%. Panel E reports the results from panel regressions where the observations are at the fund-quarter-industry level. The dependent variable is the market value of long positions in each industry divided by the fund's total TNA (denoted as *long%* in this panel), and the independent variable of interest is the market value of short positions in the same industry divided by the fund's TNA (denoted as *short%* in this panel). Industries are defined using two-digit Standard Industrial Classification (SIC) codes. Variables are winsorized at the 1st and 99th percentiles within each quarter. Columns (1)–(2) include all industries, while columns (3)–(4) exclude industries in which the fund has no holdings either in the long leg or in the short leg in that quarter. We control for fund×industry-fixed effects in columns (1) and (3), and both additionally time-fixed effects in columns (2) and (4). Standard errors clustered at both the time and fund levels are reported in parentheses. ***, ** and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Cross-Sectional Distribution of long%

	Mean	5th	25th	50th	75th	95th
G00(=0)	92.51%	77.62%	88.83%	93.01%	96.00%	101.33%
G01(=0)	91.70%	75.50%	87.50%	92.26%	95.41%	100.89%
G1(0–20%)	106.22%	55.65%	87.03%	95.41%	110.03%	158.88%
G2(≥20%)	108.96%	62.12%	85.80%	99.87%	124.22%	184.26%

Panel B: Cross-Sectional Distribution of cash%

	Mean	5th	25th	50th	75th	95th
G00(=0)	2.72%	-0.01%	0.29%	1.61%	3.62%	9.08%
G01(=0)	2.51%	-0.03%	0.26%	1.44%	3.45%	8.84%
G1(0–20%)	6.48%	-0.33%	0.29%	2.08%	6.76%	32.28%
G2(≥20%)	36.91%	-0.43%	3.19%	25.66%	75.20%	90.00%

Panel C: Cross-Sectional Distribution of short%						
	Mean	5th	25th	50th	75th	95th
G00(=0)	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
G01(=0)	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
G1(0–20%)	4.42%	0.00%	0.00%	0.16%	5.08%	21.39%
G2(≥20%)	52.29%	13.64%	28.43%	46.75%	78.79%	95.39%

Panel D: Long Positions, Cash Holdings, and Short Positions						
Depvar =	*Long%*			*Cash%*		
	(1)	(2)	(3)	(4)	(5)	(6)
Short%	0.291***	0.765***	0.764***	0.755***	0.206***	0.207***
	(0.050)	(0.079)	(0.080)	(0.048)	(0.055)	(0.055)
Time Fixed Effects	Yes		Yes	Yes		Yes
Fund Fixed Effects		Yes	Yes		Yes	Yes
No. Obs.	99,051	99,051	99,051	99,051	99,051	99,051
Adj. R^2	0.133	0.447	0.533	0.436	0.731	0.733

Panel E: Long Positions and Short Positions by Industry				
	All Industries		Excluding Industries where Funds Have no Holdings	
Depvar=	*Long%*	*Long%*	*Long%*	*Long%*
	(1)	(2)	(3)	(4)
Short%	1.210***	1.201***	0.869***	0.853***
	(0.269)	(0.265)	(0.335)	(0.326)
Time Fixed Effects		Yes		Yes
Fund×Industry Fixed Effects	Yes	Yes	Yes	Yes
No. Obs.	776,282	776,282	357,880	357,880
Adj. R^2	0.565	0.568	0.584	0.591

Table 4: CAPM Beta and Short Positions

This table reports the relation between short positions and funds' market beta. We classify mutual fund/quarter observations into four groups: G00 includes all mutual funds that are self-restrained from short selling; G01 includes mutual funds that are allowed to short sell but do not use short sales in any of the previous eight quarters; G1 includes long-short funds whose short positions account for less than 20% of the funds' total net assets (TNA) on average in the past eight quarters; G2 includes long-short funds whose short positions account for more than 20% of their TNA on average in the previous eight quarters. Panel A reports the time series average of cross-sectional distribution of market betas based on funds' stock holdings (*Risky-Holdings–Based Beta*), as well as market betas of funds' overall returns (*Fund Return Beta*). The *Risky-Holdings–Based Beta* is defined as the weighted average beta of all stocks in the portfolio, where the stock beta is calculated using monthly returns in a rolling past-three-year window. The *Fund Return Beta* is calculated using CRSP monthly returns in the 12 months after the short% classification. Within each quarter, we winsorize market betas at the 1st and 99th percentiles. Panel B reports panel regressions that examine the relation between market beta and short%. The dependent variable in columns (1)–(3) is *Risky-Holdings–Based Beta*, and that in columns (4)–(6) is *Fund Return Beta*. The independent variable is the short% of the same fund in the same quarter. We winsorize short% above at the value of 100%. We control for time-fixed effects in columns (1) and (4), fund-fixed effects in columns (2) and (5), and both time and fund-fixed effects in columns (3) and (6). Standard errors clustered at both the time and fund levels are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Cross-Sectional Distribution of Market Beta

	Mean	5th	25th	50th	75th	95th
Risky-Holdings–Based Beta						
G00(=0)	1.124	0.799	0.978	1.104	1.259	1.515
G01(=0)	1.150	0.784	0.999	1.131	1.292	1.562
G1(0–20%)	1.111	0.789	0.976	1.080	1.227	1.502
G2(≥20%)	1.046	0.669	0.847	1.046	1.228	1.460
Fund Return Beta						
G00(=0)	1.064	0.664	0.907	1.048	1.223	1.496
G01(=0)	1.098	0.670	0.926	1.075	1.256	1.599
G1(0–20%)	0.968	0.427	0.809	0.994	1.134	1.421
G2(≥20%)	0.633	0.099	0.360	0.668	0.899	1.111

Panel B: Portfolio Beta and Short Positions

Depvar =	Risky-Holdings–Based Beta			Fund Return Beta		
	(1)	(2)	(3)	(4)	(5)	(6)
Short%	-0.0688	-0.0644	-0.0498	-0.845***	-0.0313	-0.0221
	(0.045)	(0.073)	(0.081)	(0.087)	(0.057)	(0.055)
Time Fixed Effects	Yes		Yes	Yes		Yes
Fund Fixed Effects		Yes	Yes		Yes	Yes
No. Obs.	101,077	101,077	101,077	94,090	94,090	94,090
Adj. R^2	0.070	0.546	0.610	0.096	0.411	0.473

Table 5: Fund Performance by Different Types of US Equity Mutual Funds

This table reports the equally weighted average fund performance of different groups of US equity mutual funds. We classify mutual fund/quarter observations into four groups: G00 includes all mutual funds that are self-restrained from short selling; G01 includes mutual funds that are allowed to short sell but do not use short sales in any of the previous eight quarters; G1 includes long-short funds whose short positions account for less than 20% of the funds' total net assets (TNA) on average in the past eight quarters; G2 includes long-short funds whose short positions account for more than 20% of their TNA on average in the previous eight quarters. We study several types of fund returns: a) monthly returns based on mutual funds' reported stock holdings, including those in both the long leg and short leg (*Stock Holding Returns*); b) cash-adjusted stock holding returns (*Stock Holding Returns * (1 – cash%)*); and c) fund overall returns as reported by CRSP (*Fund Returns*). We also decompose *Stock Holding Returns* into returns from long positions (*Long-Holding Returns*) and those from short positions (*Short-Holding Returns*), so that *Stock Holding Returns = Long-Holding Returns + Short-Holding Returns*. To weed out data errors and incomplete records, we drop funds whose market value of long-leg holdings is smaller than that of short-leg holdings, as well as funds for which the correlation between *Stock Holding Returns* and *Fund Returns* is below 0.5. We report the returns in excess of risk-free rate in Panel A, CAPM alphas in Panel B, alphas adjusted by the Fama-French three factors in Panel C, alphas adjusted by Fama-French-Carhart four factors in Panel D, alphas adjusted by Fama-French-Carhart four factors plus the Pastor-Stambaugh liquidity factor in Panel E, and alphas adjusted by Fama-French five factors in Panel F. *T*-statistics based on standard errors with Newey-West correction are reported in brackets. Estimates significant at the 5% level are indicated in bold.

Panel A: Excess Returns

	Stock Holding Returns	Long-Holding Returns	Short-Holding Returns	Stock Holding Returns * (1 – Cash%)	Fund Returns (CRSP)
	(1)	(2)	(3)	(4)	(5)
G00(=0)	0.728%	0.728%		0.710%	0.697%
	[1.74]	[1.74]		[1.75]	[1.71]
G01(=0)	0.725%	0.725%		0.710%	0.713%
	[1.67]	[1.67]		[1.68]	[1.65]
G1(0–20%)	0.707%	0.748%	-0.041%	0.662%	0.631%
	[1.70]	[1.68]	[-1.51]	[1.71]	[1.69]
G2(≥20%)	**1.097%**	**1.329%**	-0.232%	**0.801%**	**0.653%**
	[2.63]	**[2.08]**	[-1.05]	**[2.45]**	**[2.32]**
G2-G00	**0.369%**	**0.601%**		0.091%	-0.045%
	[3.36]	**[2.61]**		[0.72]	[-0.29]
G2–G01	**0.372%**	**0.604%**		0.091%	-0.060%
	[3.30]	**[2.82]**		[0.65]	[-0.35]
G2–G1	**0.389%**	**0.581%**	-0.191%	0.139%	0.022%
	[3.43]	**[2.82]**	[-0.97]	[1.18]	[0.17]

Panel B: CAPM Alpha					
	Stock Holding Returns	Long-Holding Returns	Short-Holding Returns	Stock Holding Returns * (1 – Cash%)	Fund Returns (CRSP)
	(1)	(2)	(3)	(4)	(5)
G00(=0)	0.002%	0.002%		0.004%	-0.009%
	[0.04]	[0.04]		[0.10]	[-0.18]
G01(=0)	-0.019%	-0.019%		-0.013%	-0.024%
	[-0.35]	[-0.35]		[-0.25]	[-0.43]
G1(0-20%)	-0.007%	-0.016%	0.009%	-0.007%	-0.008%
	[-0.14]	[-0.30]	[0.86]	[-0.15]	[-0.17]
G2(≥20%)	**0.409%**	**0.231%**	**0.177%**	**0.261%**	**0.194%**
	[3.62]	**[2.16]**	**[2.05]**	**[2.95]**	**[2.51]**
G2-G00	**0.406%**	**0.229%**		**0.257%**	**0.203%**
	[3.58]	**[2.70]**		**[2.67]**	**[2.41]**
G2-G01	**0.427%**	**0.250%**		**0.274%**	**0.218%**
	[3.78]	**[3.02]**		**[2.81]**	**[2.55]**
G2-G1	**0.416%**	**0.247%**	**0.168%**	**0.269%**	**0.202%**
	[3.45]	**[2.80]**	**[2.00]**	**[2.60]**	**[2.22]**

Panel C: Fama-French Three-Factor Alpha					
	Stock Holding Returns	Long-Holding Returns	Short-Holding Returns	Stock Holding Returns * (1 – Cash%)	Fund Returns (CRSP)
	(1)	(2)	(3)	(4)	(5)
G00(=0)	0.011%	0.011%		0.013%	-0.001%
	[0.32]	[0.32]		[0.40]	[-0.02]
G01(=0)	-0.010%	-0.010%		-0.005%	-0.015%
	[-0.23]	[-0.23]		[-0.11]	[-0.34]
G1(0-20%)	-0.003%	-0.011%	0.008%	-0.004%	-0.005%
	[-0.08]	[-0.27]	[0.80]	[-0.12]	[-0.13]
G2(≥20%)	**0.415%**	**0.247%**	**0.168%**	**0.264%**	**0.197%**
	[3.60]	**[2.42]**	**[2.71]**	**[2.94]**	**[2.62]**
G2-G00	**0.405%**	**0.236%**		**0.252%**	**0.198%**
	[3.90]	**[2.72]**		**[3.10]**	**[3.22]**
G2-G01	**0.425%**	**0.257%**		**0.269%**	**0.213%**
	[4.17]	**[3.07]**		**[3.32]**	**[3.44]**
G2-G1	**0.418%**	**0.258%**	**0.160%**	**0.269%**	**0.203%**
	[3.75]	**[2.89]**	**[2.58]**	**[2.98]**	**[2.69]**

Panel D: Fama-French-Carhart Four-Factor Alpha					
	Stock Holding Returns	Long-Holding Returns	Short-Holding Returns	Stock Holding Returns * (1 – Cash%)	Fund Returns (CRSP)
	(1)	(2)	(3)	(4)	(5)
G00(=0)	0.013%	0.013%		0.015%	0.002%
	[0.38]	[0.38]		[0.46]	[0.05]
G01(=0)	-0.007%	-0.007%		-0.002%	-0.012%
	[-0.15]	[-0.15]		[-0.04]	[-0.25]
G1(0-20%)	-0.004%	-0.011%	0.007%	-0.005%	-0.004%
	[-0.11]	[-0.25]	[0.67]	[-0.15]	[-0.11]
G2(≥20%)	**0.399%**	**0.241%**	**0.159%**	**0.253%**	**0.192%**
	[3.58]	**[2.42]**	**[2.58]**	**[2.94]**	**[2.57]**
G2-G00	**0.386%**	**0.228%**		**0.238%**	**0.190%**
	[3.85]	**[2.71]**		**[3.07]**	**[3.11]**
G2-G01	**0.406%**	**0.248%**		**0.254%**	**0.204%**
	[4.11]	**[3.05]**		**[3.29]**	**[3.31]**
G2-G1	**0.403%**	**0.251%**	**0.152%**	**0.258%**	**0.196%**
	[3.73]	**[2.92]**	**[2.45]**	**[2.97]**	**[2.60]**

Panel E: Five-Factor (Carhart 4F+Liquidity) Alpha					
	Stock Holding Returns	Long-Holding Returns	Short-Holding Returns	Stock Holding Returns * (1 – Cash%)	Fund Returns (CRSP)
	(1)	(2)	(3)	(4)	(5)
G00(=0)	0.008%	0.008%		0.010%	-0.003%
	[0.30]	[0.30]		[0.40]	[-0.10]
G01(=0)	-0.013%	-0.013%		-0.007%	-0.018%
	[-0.35]	[-0.35]		[-0.21]	[-0.48]
G1(0-20%)	-0.007%	-0.014%	0.007%	-0.008%	-0.007%
	[-0.19]	[-0.36]	[0.71]	[-0.24]	[-0.20]
G2(≥20%)	**0.384%**	**0.228%**	**0.155%**	**0.241%**	**0.181%**
	[3.99]	**[2.52]**	**[2.58]**	**[3.26]**	**[2.97]**
G2-G00	**0.375%**	**0.220%**		**0.230%**	**0.184%**
	[4.05]	**[2.69]**		**[3.18]**	**[3.31]**
G2-G01	**0.396%**	**0.241%**		**0.248%**	**0.199%**
	[4.23]	**[2.99]**		**[3.34]**	**[3.40]**
G2-G1	**0.391%**	**0.242%**	**0.148%**	**0.249%**	**0.189%**
	[4.03]	**[2.94]**	**[2.46]**	**[3.19]**	**[2.80]**

Panel F: Fama-French Five-Factor Alpha					
	Stock Holding Returns	Long-Holding Returns	Short-Holding Returns	Stock Holding Returns * (1 – Cash%)	Fund Returns (CRSP)
	(1)	(2)	(3)	(4)	(5)
G00(=0)	0.017%	0.017%		0.018%	0.009%
	[0.56]	[0.56]		[0.65]	[0.31]
G01(=0)	0.013%	0.013%		0.016%	0.009%
	[0.35]	[0.35]		[0.48]	[0.25]
G1(0-20%)	0.034%	0.025%	0.009%	0.033%	0.039%
	[1.07]	[0.74]	[0.84]	[1.05]	[1.16]
G2(≥20%)	**0.383%**	**0.247%**	**0.136%**	**0.233%**	**0.156%**
	[3.70]	**[2.50]**	**[2.20]**	**[2.95]**	**[2.25]**
G2-G00	**0.366%**	**0.230%**		**0.215%**	**0.147%**
	[3.94]	**[2.72]**		**[3.01]**	**[2.56]**
G2-G01	**0.371%**	**0.234%**		**0.217%**	**0.147%**
	[4.08]	**[2.87]**		**[3.09]**	**[2.63]**
G2-G1	**0.349%**	**0.221%**	**0.128%**	**0.201%**	0.117%
	[3.63]	**[2.60]**	**[2.07]**	**[2.65]**	[1.70]

Table 6: Fund Performance by Different Fund Groups: Controlling for Fund Characteristics

This table reports the comparison of fund performance across different groups of US equity mutual funds. We classify mutual fund/quarter observations into four groups: G00 includes all mutual funds that are self-restrained from short selling; G01 includes mutual funds that are allowed to short sell but do not use short sales in any of the previous eight quarters; G1 includes long-short funds whose short positions account for less than 20% of the funds' total net assets (TNA) on average in the past eight quarters; G2 includes long-short funds whose short positions account for more than 20% of their TNA on average in the previous eight quarters. To control for fund characteristics and adjust for risk exposures, we take the following two steps in a similar spirit of Fama-MacBeth regressions. First, in each month, we run cross-sectional regressions of fund performance on fund group dummies, controlling for fund characteristics. The dependent variable is fund performance at month $t+1$, measured as *Stock Holding Returns* in Panel A, and as *Fund Returns* (as reported in CRSP) in Panel B. The key independent variables are three dummy variables indicating whether the fund belongs to G01, G1, or G2 group, respectively (G00 is omitted and serves as the baseline group). Control variables include the logarithm of fund age since inception, the logarithm of fund TNA at the end of last quarter, as well as turnover and expense ratios in the last quarter. The regression specification is as follows:

$$Return_{i,t+1} = \sum_{n\in\{G01,G1,G2\}} \beta_{n,t}\cdot Dummy_{i,n,t} + \beta_{1,t}\cdot \log\left(Fund\ age_{i,t}\right) + \beta_{2,t}\cdot \log\left(TNA_{i,t}\right) + \beta_{3,t}\cdot Expense_{i,t} + \beta_{4,t}\cdot Turnover_{i,t} + \varepsilon_{i,t+1},$$

where $Dummy_{i,n,t}$ is a dummy variable, which equals 1 if fund i belongs to group n ($n \in \{G01, G1, G2\}$) at month t and equals 0 otherwise. The estimate of $\beta_{n,t}$ represents the difference of monthly performance between funds in group n and funds in group G00, after controlling for fund characteristics. Meanwhile, the difference between the estimates of $\beta_{k,t}$ and $\beta_{l,t}$ represents the return difference of monthly performance between funds in groups k and l. In the second step, we run time-series regressions of estimates of $\beta_{n,t}$ on risk factors to obtain the difference of alphas between funds in different groups n and funds in group G00. We report the difference in excess returns in column (1), alphas adjusted by the market factor in column (2) (*CAPM*), alphas adjusted by the Fama-French three factors in column (3) (*FF 3F*), alphas adjusted by the Fama-French-Carhart four factors in column (4) (*Carhart 4F*), the Fama-French-Carhart four factors plus the Pastor-Stambaugh liquidity factor in column (5) (4F+Liquidity), and alphas adjusted by the Fama-French five factors in column (6) (*FF 5F*). To weed out data errors and incomplete records, we drop funds whose market value of long-leg holdings is smaller than that of short-leg holdings, as well as funds for which the correlation between *Stock Holding Returns* and *Fund Returns* is below 0.5. *T*-statistics based on standard errors with Newey-West correction are reported in brackets.

Panel A: Stock Holding Returns						
	Excess Returns	CAPM	FF 3F	Carhart 4F	4F+Liquidity	FF 5F
	(1)	(2)	(3)	(4)	(5)	(6)
G2-G00	0.411%	0.489%	0.484%	0.470%	0.462%	0.428%
	[3.18]	[3.75]	[4.73]	[4.67]	[4.82]	[4.46]
G2-G01	0.414%	0.506%	0.501%	0.484%	0.477%	0.429%
	[3.06]	[3.85]	[4.81]	[4.71]	[4.79]	[4.51]
G2-G1	0.422%	0.485%	0.484%	0.471%	0.462%	0.396%
	[3.29]	[3.66]	[4.37]	[4.35]	[4.56]	[3.70]

Panel B: Fund Returns						
	Excess Returns	CAPM	FF 3F	Carhart 4F	4F+Liquidity	FF 5F
	(1)	(2)	(3)	(4)	(5)	(6)
G2-G00	0.037%	0.324%	0.315%	0.309%	0.305%	0.242%
	[0.19]	[2.97]	[4.17]	[3.98]	[3.97]	[3.86]
G2-G01	0.018%	0.333%	0.324%	0.314%	0.312%	0.237%
	[0.08]	[2.98]	[4.01]	[3.78]	[3.75]	[3.75]
G2-G1	0.074%	0.296%	0.292%	0.285%	0.281%	0.183%
	[0.45]	[2.77]	[3.54]	[3.37]	[3.41]	[2.64]

Table 7: Fund Performance of Long-Short Funds vs. Long-Only Funds with Common Managers

This table reports the comparison of fund performance between long-short mutual funds and long-only funds that are comanaged by the same managers. We first select long-short funds whose average short positions account for more than 20% of their TNA on average in the previous eight quarters (defined as G2 in Panel A), or those whose average short positions account for more than 20% of their TNA during the whole sample (defined as G2 in Panel B). For each long-short fund in G2, we then identify long-only equity mutual funds that share common managers with the long-short fund in the same quarter. For this exercise, we measure fund performance using monthly returns based on fund stock holdings (*Stock Holding Returns*). We report the returns in excess of risk-free rate in column (1), alphas adjusted by the market factor in column (2) (*CAPM*), alphas adjusted by the Fama-French three factors in column (3) (*FF 3F*), alphas adjusted by the Carhart four factors in column (4) (*Carhart 4F*), the Fama-French-Carhart four factors plus the Pastor-Stambaugh liquidity factor in column (5) (4F+Liquidity), and alphas adjusted by the Fama-French five factors in column (6) (*FF 5F*). *T*-statistics based on standard errors with Newey-West correction are reported in brackets.

Panel A: Groups Based on Average Short% in the Previous 8 Quarters						
	Excess Returns	CAPM	FF 3F	Carhart 4F	4F+Liquidity	FF 5F
	(1)	(2)	(3)	(4)	(5)	(6)
Long-Only Funds	0.766%	0.087%	0.107%	0.090%	0.090%	0.102%
	[1.91]	[1.09]	[1.49]	[1.44]	[1.43]	[1.48]
Short Funds (G2)	1.247%	0.543%	0.564%	0.557%	0.536%	0.516%
	[2.74]	[3.60]	[3.76]	[3.73]	[4.18]	[3.15]
Difference	0.481%	0.456%	0.457%	0.468%	0.446%	0.414%
	[3.23]	[2.78]	[2.83]	[2.93]	[3.26]	[2.90]

Panel B: Groups Based on Average Short% in the Whole Sample						
	Excess Returns	CAPM	FF 3F	Carhart 4F	4F+Liquidity	FF 5F
	(1)	(2)	(3)	(4)	(5)	(6)
Long-Only Funds	0.722%	0.041%	0.054%	0.043%	0.038%	0.054%
	[1.75]	[0.67]	[0.87]	[0.76]	[0.70]	[0.89]
Short Funds (G2)	1.229%	0.563%	0.578%	0.574%	0.553%	0.534%
	[2.88]	[4.01]	[4.06]	[4.02]	[4.60]	[3.47]
Difference	0.507%	0.522%	0.524%	0.531%	0.515%	0.480%
	[4.10]	[3.94]	[4.11]	[4.19]	[4.64]	[3.79]

Table 8: Flow-Performance Sensitivity by Different Fund Groups

This table reports results from Fama-MacBeth regressions of fund flows on fund performance for different types of US equity mutual funds. We classify mutual fund/quarter observations into three groups: G0 includes all mutual funds that do not use short sales in any of the previous eight quarters (combining the previous G00 and G01); G1 includes long-short funds whose short positions account for less than 20% of the funds' total net assets (TNA) on average in the past eight quarters; G2 includes long-short funds whose short positions account for more than 20% of their TNA on average in the previous eight quarters. For each group of funds (G0, G1, or G2), we run Fama-MacBeth regressions and estimate the flow-performance sensitivity with the following specification:

$$flow_{i,t+1} = \beta_{0,t} + \beta_{1,t} \cdot Performance\ Measure_{i,t} + \sum_{n=1}^{4} \gamma_{n,t} \cdot flow_{i,t+1-n} + \varepsilon_{i,t+1}.$$

The performance measure in quarter t is calculated as the average monthly excess returns in column (1), the alphas adjusted by CAPM model (*CAPM*) in column (2), the alphas adjusted by the Fama-French three factors (*FF 3F*) in column (3), the alphas adjusted by Fama-French-Carhart four factors (*Carhart 4F*) in column (4), the alphas adjusted by Fama-French-Carhart four factors plus the Pastor-Stambaugh liquidity factor (*4F+Liquidity*) in column (5), the alphas adjusted by Fama-French five factors (*FF 5F*) in column (6). The dependent variable $flow_{i,t+1}$ is calculated as the net capital flow to the fund in quarter $t+1$ divided by the fund's TNA at the end of quarter t, and is winsorized at the 1st and 99th percentiles within each quarter. Control variables include lagged capital flows in the previous four quarters. We report the flow-performance sensitivity, defined as the time series average of the regression coefficient $\beta_{1,t}$, for each group of funds. The last row reports the difference between G2 funds and G0 funds. Standard errors with Newey-West correction are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Depvar =	$Flow_{t+1}$					
	Excess Returns	CAPM	FF 3F	Carhart 4F	4F+Liquidity	FF 5F
	(1)	(2)	(3)	(4)	(5)	(6)
G0(=0)	2.154***	2.039***	2.116***	1.884***	1.692***	1.545***
	(0.291)	(0.257)	(0.186)	(0.187)	(0.182)	(0.156)
G1(0-20%)	3.018***	3.564***	2.595***	2.291***	2.372***	1.574***
	(0.720)	(0.775)	(0.614)	(0.621)	(0.543)	(0.463)
G2(≥20%)	5.527***	10.587***	8.155***	8.205***	8.527***	3.939***
	(1.560)	(2.434)	(2.544)	(2.589)	(2.568)	(1.472)
G2–G0	3.373**	8.548***	6.039***	6.321***	6.835***	2.394*
	(1.643)	(2.485)	(2.479)	(2.434)	(2.325)	(1.369)

Table 9: Cash Holdings and Fund Flows by Different Fund Groups

This table reports results from Fama-MacBeth regressions of changes in fund cash positions on quarterly fund flows for different types of US equity mutual Funds. We classify mutual fund/quarter observations into three groups: G0 includes all mutual funds that do not use short sales in any of the previous eight quarters (combining the previous G00 and G01); G1 includes long-short funds whose short positions account for less than 20% of the funds' total net assets (TNA) on average in the past eight quarters; G2 includes long-short funds whose short positions account for more than 20% of their TNA on average in the previous eight quarters. For each group of funds (G0, G1, or G2), we run Fama-MacBeth regressions of changes in fund cash positions on fund flows in the same quarter, and report the estimated coefficients (the sensitivity) for each fund group. The dependent variable, $\Delta \text{Cash}_t/\text{TNA}_{t-1}$, is the change of cash dollar amount from the end of quarter $t-1$ to the end of quarter t, scaled by TNA at the end of quarter $t-1$. The independent variable $flow_t$ is calculated as the net capital flow in quarter t divided by the fund's TNA at the end of quarter $t-1$. We also separate the fund-quarter observations into those with fund inflows (*Flow+*) and those with outflows (*Flow-*). The last row reports the difference in sensitivity between G2 funds and G0 funds. Fund flows and $\Delta\text{Cash}_t/\text{TNA}_{t-1}$ are winsorized at the 1st and 99th percentiles within each quarter. Standard errors with Newey-West correction and are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Depvar =	$\Delta\text{Cash}_t/\text{TNA}_{t-1}$		
	Flow	Flow+	Flow-
	(1)	(2)	(3)
G0(=0)	0.037***	0.038***	0.031***
	(0.002)	(0.003)	(0.003)
G1(0-20%)	0.081***	0.073**	0.074***
	(0.020)	(0.032)	(0.025)
G2(≥20%)	0.230***	0.181***	0.269***
	(0.035)	(0.052)	(0.087)
G2–G0	0.193***	0.143***	0.238***
	(0.035)	(0.053)	(0.086)