Stock Repurchasing Bias of Mutual Funds

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Abstract

We show that mutual fund managers' trading experiences bias their future repurchasing decisions. Specifically, a stock's repurchasing probability at a given fund is 17% larger if it was previously sold for a gain rather than for a loss. In line with positive trading experience driving repurchasing decisions, we find that fund managers still prefer to repurchase stocks sold for a gain at a fund they managed before if they switch to a new fund. In addition, repurchasing bias is stronger if the previous sale is more salient to fund managers, and thus should be more easily remembered. Repurchasing bias is weakly associated with lower fund performance: repurchased winner stocks underperform repurchased loser stocks by around 5% p.a., which is mainly due to mean-reversion of stock returns.

JEL-Classification Codes: G11, G23, G41

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1 Introduction

The behavior and performance of mutual fund managers is crucial to the financial well-being and wealth of many households. According to the Investment Company Institute, 55.9 million households in the US owned mutual funds in 2017, while the overall investment volume in mutual funds amounted to $16.3 trillion.[1] Decisions made in delegated portfolio management obviously affect a large number of individual investors and it is therefore important to understand, how these decisions are made.

Although fund managers are deemed professional investors and thus are supposed to behave more rationally than retail investors, there is evidence that they are also subject to some of the behavioral biases that are widely documented for retail investors. For example, fund managers have been shown to suffer from home bias (Ivković and Weisbenner (2005), Seasholes and Zhu (2010), and Pool et al. (2015)), and overconfidence (Odean (1999) and Puetz and Ruenzi (2011)).

One particularly important source of bias when it comes to financial decision making are experience effects. The literature on experience effects has shown that, for example, experienced inflation and personal investment outcomes affect financial risk-taking (Malmendier and Nagel (2016), Strahilevitz et al. (2011)).[2] Experience effects are particularly relevant for financial risk-taking, because they are frequently associated with strong positive or negative emotions. According to the concept of emotional tagging (Richter-Levin and Akirav (2003), Laudenbach et al. (2019)), these emotions determine which experiences are anchored in memory and how easy they are retrievable later on. That is, the stronger an experience is tagged by emotions, the more easily it is remembered, and the more predictive it is for future behavior.

[1] For a detailed view on the Investment Company Institute's annual statistics on households' mutual fund holdings, see `https://www.ici.org/pdf/2017_factbook.pdf`.

[2] See also Malmendier and Nagel (2015) and Malmendier et al. (2011) for evidence on the effect of previous experiences on financial decision making.

In this paper, we examine whether fund managers' emotional tagging of previous trading experiences affect their future trading decisions. Specifically, we argue that selling a stock for a gain should be associated with positive emotions such as happiness and pride. As a result, this trading experience is tagged with a positive emotion and anchored as such in memory. In contrast, selling a stock for a loss should be associated with negative emotions such as regret and disappointment, and thus result in a negative trading experience. According to Mellers et al. (1997), individuals aim to maximize their expected emotional experiences when choosing between risky options. That is, they will choose the option associated with more anticipated positive emotions. In a similar vein, Loewenstein (2000) argues that anticipated emotions predict economic decision making.[3] Therefore, we conjecture that, in an effort to repeat the positive emotional experience, mutual fund managers may be biased towards repurchasing a stock that they sold for a gain (i.e., a past "winner"), while they may be less prone to repurchase a stock that they sold for a loss (i.e., a past "loser").

We test this conjecture based on a large dataset of quarterly U.S. mutual fund holdings from 1980 to 2014. For each individual mutual fund-stock combination, we define winner and loser stocks as those instances where a mutual fund sold the entire stock position for a gain or a loss, respectively. We then examine whether the probability that a stock is repurchased depends on whether it has been sold for a gain or a loss. We control for various fund characteristics such as fund size, fund age, fund performance, and the fund's trading activity. We also include stock, fund, and time fixed effects, and even fund $\times$ time fixed effects or stock $\times$ time fixed effects, respectively. These fixed effects account for unobservable (time-varying) stock and fund characteristics due to which i) certain stocks may be more likely to be repurchased, ii) certain types of funds may be more prone to repurchase stocks, or iii) certain years when repurchasing behavior may be more common due to general market conditions.

[3] This view has been supported by Frydman and Camerer (2016), who show that an individual's reluctance to repurchase stocks that have increased in price since they were sold is correlated with neural activity in areas of the brain that are associated with emotional responses.

Our main result shows that mutual fund managers are significantly more likely to repurchase a stock if it has been sold for a gain before. That is, independent of a fund's general repurchasing rate due to, for example, a restricted investment universe, repurchasing decisions are biased towards stocks sold for a gain. This result is economically significant: relative to the average repurchasing probability of all stocks, the probability of a past winner stock to be repurchased is about 17% larger than that the probability of a past loser stock to be repurchased. Furthermore, results including stock $\times$ time fixed effects show that, even the same stock is more likely to be repurchased by a fund manager who sold it for a gain rather than for a loss.

We also examine whether stock price changes after the sale influence fund managers' repurchasing decision. We find that if a stock was previously sold for a gain, it is about 1.2% less likely to be repurchased if its price has gone up since the sale. In economic terms, the effect of the price change after the sale accounts for about 23% of the average probability to repurchase a stock.

In line with the view that positive (negative) emotions associated with selling a stock for a gain (loss) drive repurchasing bias of mutual fund managers, we find that mutual fund managers carry their trading experiences with them: they are still more likely to repurchase previous winner stocks in their current portfolios, if these stocks were sold for a gain at the previous fund the manager was in charge of. Further, repurchasing bias is stronger if selling the stock for a gain is more salient to the manager, i.e., if no or only a few other stocks were sold at the same time or if the stock was sold right after the purchase.

Repurchasing bias may harm mutual fund investors if past winner stocks underperform past loser stocks. Further, it may explain why actively managed funds underperform their passive benchmarks (Jensen (1968), Gruber (1996), and Carhart (1997)). While we only find weak evidence of underperformance on the fund level, we document that repurchased winner stocks underperform repurchased loser stocks by about 5% p.a. This result suggests that repurchasing bias is not due to superior information of fund managers about past

winner stocks. Furthermore, we find that the price of repurchased stocks increases between the time they have been sold and repurchased and the stock price of repurchased winners increases even more than that of repurchased losers. This suggests that mutual funds would have benefited from just keeping these stocks, especially winner stocks that they repurchase later, in their portfolios, thereby avoiding trading costs.

The paper most closely related to ours is Strahilevitz et al. (2011). The authors show that individual investors are also more likely to repurchase stocks that were previously sold for a gain rather than for a loss. They argue that this repurchasing behavior is due to positive (negative) emotions that retail investors experience when selling stocks for gains (losses).[4] We show that stock repurchasing bias is present among institutional investors, too. While Strahilevitz et al. (2011) find no strong performance effects among individual investors, though acknowledging that these investors would be better off holding index funds, we find that mutual funds would perform better if their managers were not subject to a repurchasing bias.

Similar to home bias, the repurchasing bias is an emotion-based bias that leads to personal attachment to a certain kind of stock (specifically, local stocks and stocks that are previously sold for a gain). The results of our paper imply that these emotion-based biases are strong enough to impact even the behavior of more sophisticated investors such as mutual fund managers, who have been shown to be less affected by other biases that are highly relevant for retail investors such as the disposition effect (Frazzini (2006) and Cici (2012)) or attention bias (Barber and Odean (2007)).

[4]The results of Strahilevitz et al. (2011) were replicated in a lab experiment by Weber and Welfens (2011).

2 Data and summary statistics

2.1 Data and sample selection

We obtain quarterly stock holdings data of U.S. mutual funds from 1980 to 2014 from the Thomson Reuters Mutual Fund Holdings Database. We then merge the stock holdings data with the CRSP Survivorship-Bias-Free Mutual Fund Database using MFLINKS by Wermers (2000). The CRSP Mutual Fund Database contains data on fund characteristics such as total net assets (TNA), monthly returns, expense ratios, and first offer dates. We further merge the data with the Morningstar Direct database using TICKER and CUSIP as fund identifiers since the Morningstar database provides more accurate information on who is running a fund. We aggregate all share classes of the same fund to avoid multiple counting.

We include all actively managed, open-end U.S. domestic equity funds in the sample. As stock repurchasing bias is only relevant for actively managed funds, we exclude ETFs, index funds, and funds with an expense ratio below 0.1% p.a. We also exclude funds with total net assets in the bottom 5% of all observations to make sure that reported stock holdings do not change because of complete liquidation of the fund.[5]

In the next step, we merge the mutual fund data with stock information from CRSP using the report date (RDATE) and the stock identifiers (CUSIP and PERMNO) in the stock holdings. Following Daniel et al. (1997) and Wermers (1999), we only include regular common stocks traded on NYSE, AMEX or NASDAQ.

Since repurchasing decisions are only relevant when a stock has been sold by a fund before, we only keep those observations in the sample when a fund has sold a certain stock. We define the sale of a stock as clearing the entire position. According to Alexander et al. (2006), selling to zero usually represents value-based sales while selling partial positions may be

[5] Including these funds with low total net assets does not materially change our main result.

caused by liquidity restrictions or portfolio rebalancing. Thus, to capture deliberate trades of fund managers that are significant enough to be associated with repurchasing bias, we focus on stocks that have been completely sold before. For each stock sold by a fund, we track it for one year to see whether the stock is repurchased by the same fund.

Our final sample consists of 7,521,881 fund-stock-quarter observations, including 4,404 distinct funds holding 18,164 distinct stocks.

2.2 Construction of main variables

Repurchasing dummy variable

For each stock sold by a fund, we check whether it re-appears in reported stock holdings of the fund within the next four quarters, i.e., one year after the sale, following Strahilevitz et al. (2011). This way, we ensure that the same managers are likely to be in charge of the fund and the emotions triggered by the previous sale are still vivid in managers' memory.[6] Our main dependent variable, $\text{Repurchase}_{i,j,q}$, is equal to one for the quarter in which a stock first re-appears in the stock holdings report of the fund after the sale. The repurchase dummy is set to zero if the stock does not re-appear in the stock holdings report of the fund in the respective quarter within a year after selling the stock. Thus, the repurchase dummy is equal to zero for all opportunities to repurchase the stock within one year after its sale, and it is equal to one if the stock is actually repurchased in a given quarter. We do not include the stock in the sample anymore after it is repurchased and becomes part of the fund's stock holdings, i.e. the sample only comprises repurchasing activities and opportunities to repurchase. Furthermore, we exclude delisted stocks from the sample as they are no longer available for repurchase.

[6] In our later analysis, we explore manager changes explicitly.

Appendix B provides an overview of the top 20 funds that engage most strongly in repurchasing behavior (Panel A) and of the top 20 stocks that are most frequently repurchased in our sample period (Panel B).

Definition of winner and loser stocks

We do not directly observe whether a fund sells a stock for a gain or a loss since we only observe quarterly holdings, which do not provide information on the exact trading day within the quarter. A fund may have sold a stock at any point in the time period from the last time the stock appears in the stock holdings of the fund to the next report date of the fund. Therefore, we approximate the returns of sales in two different ways to ensure the robustness of the results.

First, we define a winner dummy, WinnerFIFO, by comparing the price at the time of sale with the weighted average purchase price based on the first-in-first-out (FIFO) principle following Frazzini (2006).[7] WinnerFIFO equals one if the sale price is higher than the average purchase price of the stock, and equals zero if the sale price is lower than the average purchase price. Second, we also use the value-weighted average of all purchase prices before the sale to measure whether the previous sale was for a gain or a loss and define a winner dummy, WinnerAVG. WinnerAVG is equal to one if the sale price is higher than the value-weighted average of all purchase prices before the sale so the measure is not influenced by the sequence of stock purchases. Both WinnerFIFO and WinnerAVG are used in Cici (2012) when the author defines whether a stock is held with a capital gain or a capital loss in order to examine the disposition effect among mutual funds. To clearly separate repurchasing of winner and loser stocks, we do not consider cases in which a stock is sold with a zero return.[8]

[7] Results (not reported) are robust to using the price at the last time when the stock is reported in the holdings or the first report date when the stock is no longer reported. Results in the paper are based on the assumption that the stocks are sold on the next report date of the fund after the stock's last appearance in the fund's holding.

[8] Our main results do not change if we include stocks sold at a zero return.

We further calculate the purchase price of stocks with low-in-first-out and high-in-first-out principles following Cici (2012) and compare the purchase price with the selling price to determine whether the stock was sold for a gain or a loss. Additionally, we apply the last-in-first-out principle to calculate the purchase price and use the last holding period returns of a stock by a mutual fund to check the robustness. The results are presented in Appendix G.

All other variables are described in detail in Appendix A.

2.3 Summary statistics

Panel A of Table 1 reports summary statistics of all variables used in our analysis. We find that stocks in our sample are repurchased by the same fund within one year with a probability of 5.2% on average. According to the WinnerFIFO (WinnerAVG) measure, 50.1% (50.2%) of the stocks in our sample are sold for a gain. Furthermore, 56.5% of stocks increase in price after they have been completely sold by a fund in a given quarter.

In Panel B of Table 1 we compare all control variables according to whether a stock is repurchased or not, respectively. Funds engaging in repurchasing behavior are larger, trade more, and have less volatile returns. We also observe that the average values of both winner dummies differ significantly in the two groups: the average of both winner dummies is higher for the repurchased stocks than for the non-repurchased stocks. More specifically, repurchased stocks are more likely to be winner stocks with an average above 50%, while the stocks that are not repurchased are more likely to be loser stocks with an average below or equal to 50% for proxies, WinnerFIFO and WinnerAVG.

Panel C of Table 1 shows the average difference in the control variables conditional on repurchased stocks being winner or loser stocks according to the WinnerFIFO measure.[9] We find that winner stocks are significantly more likely to be sold by larger, older, less

[9]Results (not reported) are virtually identical if we use the WinnerAVG measure instead.

active, and better performing funds with a lower expense ratio. We also observe that the probability to be repurchased is 1.2% higher if the stock is a previous winner rather than a previous loser. The difference is as high as 23.1% of the baseline repurchase probability and economically significant.

Appendix C presents correlations between all variables used in our analysis. They show that multicollinearity should not be an issue in our regressions. Our two measures of winner stocks are positively and significantly correlated with a coefficient of 0.955.

3 Repurchasing behavior of mutual fund managers

We start by examining whether stocks that were previously sold for a gain are more likely to be repurchased by mutual funds than stocks that were sold for a loss. Figure 1 depicts the average return from a stock's complete sale conditional on whether this stock is repurchased, or not. Visual inspection already shows that returns of repurchased stocks are higher than those of stocks that are sold completely, but not repurchased. According to the WinnerFIFO measure, the return difference amounts to 3.51%, while according to the WinnerAVG measure, the return difference amounts to 4.43%. Both differences are statistically significant at the 1% level.

3.1 Baseline Results

To further test our hypothesis that stocks previously sold for a gain are more likely to be repurchased than stocks previously sold for a loss, we calculate the proportion of winner stocks repurchased (PWR) and the proportion of loser stocks repurchased (PLR) and test for significant differences based on non-parametric t-tests. Following Strahilevitz et al. (2011), PWR and PLR are defined as:

$$PWR = \frac{NWR}{ORW}, \tag{1}$$

$$PLR = \frac{NLR}{ORL}, \tag{2}$$

where NWR (NLR) is the number of winners (losers) completely sold by a fund and then repurchased within one year after the sale. ORW (ORL) reflects the number of opportunities to repurchase previous winners (losers). It is based on the observations in the four quarters after a stock is completely sold by a fund. NWR (NLR) and ORW (ORL) are aggregated across all funds over the sample period.

Table 2 shows average differences between PWR and PLR. In column (1), winners are measured by WinnerFIFO, while in column (2), winners are measured by WinnerAVG. The difference between PWR and PLR is 1.2%, no matter which proxy for winner stocks is used. The difference is statistically significant at the 1% level. Following Strahilevitz et al. (2011), to be conservative, we only assume that realized repurchases instead of all observations are independent of each other.

The difference between PWR and PLR that we document for fund managers (i.e., 1.2%) is economically smaller than what has been documented for retail investors, where differences range between 2.0% and 4.8% (Strahilevitz et al. (2011)). We also observe that the ratio between PWR and PLR is lower for fund managers: it ranges between 1.255 (0.059/0.047) compared to a range of 1.360 to 2.356 documented for retail investors (Strahilevitz et al. (2011)). Thus, professional investors seem to be less subject to repurchasing bias than individual investors. However, the significant difference in proportions already provides evidence for the conjecture that repurchasing bias also exists among mutual fund managers.

In the next step, we test our hypothesis on the repurchasing bias among fund managers more formally and estimate the following linear probability model with fixed effects and fund characteristics as control variables:

$$
\begin{aligned}
Repurchase_{i,j,q} =& \alpha + \beta_1 WinnerDummy_{i,j,q} + \beta_2 FundSize_{i,q} + \beta_3 FundAge_{i,q} \\
& + \beta_4 FundTurnoverRatio_{i,q} + \beta_5 FundExpenseRatio_{i,q} + \beta_6 Fund \\
& ReturnVolatility_{i,q} + \beta_7 FundRanking_{i,q} + u_j + w_i + v_q + \varepsilon_{i,j,q},
\end{aligned} \tag{3}
$$

where i, j, q indicate funds, stocks, and the quarter of the (potential) repurchase within four quarters after the sale, respectively. The dependent variable, Repurchase$_{i,j,q}$, is an indicator of whether stock j sold completely by fund i is repurchased in quarter q within one year after the sale. Winner$_{i,j,q}$ denotes our two measures of winner stocks, WinnerFIFO$_{i,j,q}$ or $WinnerAVG_{i,j,q}$, as defined in Section 2.2.[10]

We include various fund characteristics as control variables. Fund size and fund age are included, because repurchasing activity may generally be higher for large funds with more stocks in their portfolios that they could potentially repurchase. We also control for a fund's turnover ratio, as it may be positively correlated with repurchasing activity. A fund's expense ratio is included as another proxy for its trading activity and activeness in general. Furthermore, we include a fund's performance ranking in its segment and its return volatility, as these variables may influence the fund manager's decision to repurchase past winner stocks due to tournament incentives or window dressing (Brown et al. (1996), Kempf and Ruenzi (2008), Agarwal et al. (2014)). A more detailed definition of all variables is contained in Appendix A.

All models include stock, fund, and time fixed effects to control for unobserved fund trading patterns, stock characteristics, and potential time trends in repurchasing behavior. Fund fixed effects take out the investment style of funds, i.e., whether funds invest in only stocks in one sector or with certain characteristics. In another specification not presented in Equation 3, we further include fund times time fixed effects to control for any time-variant fund

[10] In Appendix D, we show that our results are robust if we define winner and loser stocks based on market-adjusted returns.

trading patterns. For example, if a mutual fund systematically sold more winner stocks, it may (mechanically) be more likely to repurchase winner stocks in the future. Controlling for fund times time fixed effects helps us mitigate this concern. In addition, we assume that the repurchasing behavior is independent across funds but not within funds and thus cluster standard errors by fund.[11] Estimation results are presented in Table 3.

In columns (1) and (4), we estimate the baseline effect without any additional control variables, while in columns (2) and (5), we control for fund characteristics. We include fund times time fixed effects in columns (3) and (6). Across all specifications, we find that mutual fund managers are significantly more likely to repurchase stocks that they previously sold for a gain. The impact of the winner dummy on the probability of a stock to be repurchased is positive and statistically significant at the 1% level in all model specifications. The effect is also economically meaningful: depending on the winner measure and the model specification, the estimates show that the probability of being repurchased is 0.9% to 1% higher for previous winners than for previous losers. Relative to the mean repurchasing probability of a stock in the sample (5.2% in Panel A of Table 1), this difference corresponds to a 17% higher probability for a winner stock to be repurchased.

Coefficient estimates of most control variables on fund characteristics are also in line with expectations. We find that larger funds are significantly more likely to repurchase stocks. More active funds also tend to repurchase more stocks: the higher the turnover ratio of a fund, the more likely a fund repurchases a stock. Results also show that a better fund ranking in each sector has a negative impact on the likelihood to repurchase a stock previously sold.

In Table 4, we additionally include stock $\times$ time fixed effects. They should mitigate concerns that mutual funds tend to repurchase stocks with certain characteristics and these stocks happen to be more likely to be previous winners at a given point in time. For example, if mutual funds are more likely to purchase growth stocks and these growth stocks happen to have been sold for a gain by many mutual funds at the same point in time, we would

[11] In unreported robustness analysis, we cluster standard errors by both, fund, and time. Results do not change.

observe that previous winners are more likely to be repurchased than previous losers. After adding stock times time fixed effects, the coefficient estimates of the winner dummies are still positive and statistically significant at the 1% level. Thus, even for the same stock, the probability to be repurchased is dependent on whether the stock was sold for a gain or a loss by a mutual fund before. The probability to repurchase increases by 0.1% when the stock was previously sold for a gain and the increase amounts to 0.2% of the baseline probability to repurchase (5.2% in Panel A of Table 1).

We also run regressions of the repurchase dummy on dummy variables for different return intervals to examine how the magnitude of gains and losses in the previous sale influences the repurchasing bias. Regressions include the same set of fixed effects as in Equation 3. We plot the corresponding coefficients for various return intervals in Figure 2. We find that the repurchasing bias is highly dependent on whether the stock was sold for a gain or for a loss before. Regardless of which measure we use for returns, the coefficient for return intervals becomes positive when the returns move from the negative domain to the positive domain. However, a stock's likelihood of being repurchased does not increase even further the higher the gain that the fund received in the previous sale, while its likelihood of being repurchased decreases even further the higher the losses the fund incurred when selling the stock before. This asymmetric impact of the magnitude of losses and gains on the repurchasing probability may be due to loss aversion: fund managers may feel more pain when selling for a loss compared to the happiness they feel when selling for the gain, even if this gain is of the same (absolute) magnitude as the loss (Tversky and Kahneman (1992) and Kahneman and Tversky (1984)). When fund managers decide whether to repurchase a stock, the magnitude of losses and the associated pain may thus be more vivid and influence the repurchasing probability; for gains, it only seems to matter that the stock was sold with a positive return, and not so much at what magnitude.

Investors are probably not willing to repurchase stocks that were sold for a loss in the 30 days after the sale because they are not allowed to claim the capital loss for tax purposes if they

do so. In this time period, mutual funds may thus be reluctant to repurchase previous loser stocks to ensure tax benefits for their investors. To test whether these tax considerations explain our results, in a robustness test, we exclude the first quarter after the sale in our analysis. Appendix E presents the results. Even though the effect of winner dummies on repurchase becomes slightly smaller after excluding the first quarter, it still remains statistically significant at the 1% level and accounts for more than 13% of the baseline probability of repurchase. We find evidence that the tax wash-sale rule indeed contributes slightly to the positive effect of being a previous winner on the repurchasing probability, but the effect still exists after accounting for these tax considerations.

Taken together, we find evidence that mutual fund managers are more likely to repurchase a stock if they have sold it for a gain rather than for a loss before. We argue that this pattern in repurchasing behavior is due to the impact of positive (negative) emotions associated with selling a stock for a gain (loss) on the subsequent willingness to buy this stock again.

3.2 The impact of price movements after the sale on fund managers' repurchasing behavior

In addition to the phenomenon that previous winners are more likely to be repurchased than previous losers, Strahilevitz et al. (2011) show that individual investors are less likely to repurchase a stock whose price has increased, rather than decreased since it was sold. They attribute this finding to regret aversion: if the stock price goes up after the sale, investors regret to have sold it, because they would have earned more if they had kept it in their portfolio. Thus, they attach negative feelings to the stocks if the price has gone up since the sale and are less prone to repurchase those stocks. In line with this view, Frydman and Camerer (2016) conduct an experimental study and relate this avoidance behavior to neural measures of regret.

To examine whether the price change of a stock after the sale also influences the repurchasing decision of mutual fund managers, we define a dummy variable, Price $\text{Up}_{i,j,q}$, which is an

indicator of whether the price of a stock at the sale is lower than the price of this stock in quarter q. The mean of Price up is 0.565 (Panel A of Table 1), which means that slightly more than half of the stocks sold by mutual funds have increased in price between the sale and repurchasing date, rather than decreased. Unconditionally, repurchased stocks are more likely to have increased in price compared to the stocks that are not repurchased, as shown in Panel B of Table 1. However, when observing the price movement of a stock after it has been sold, investors already know what they earned from the previous sale. Therefore, we focus on the impact of the price movement after the sale on the repurchasing behavior of mutual funds, conditional on being a winner or loser in the previous sale.

We re-run our main regression and add an interaction term of the winner dummy and a dummy variable capturing a stock's price change between the time when it was sold and repurchased, Price Up. Results are presented in Table 5.

In all model specifications, the coefficient estimates of the interaction terms are negative and statistically significant at the 1% level. If a fund sold a stock for a gain, but the price of the stock went up since it was sold, it decreases the probability of repurchasing the previous winner stock by 1.1% to 1.2%, depending on the winner measure. For instance, results in column (1)-(3) show that the probability of repurchasing a previous winner whose price has increased since the sale is 1.2% lower than that of repurchasing a previous winner whose price has decreased since the sale. Given that the difference in the probability to repurchase previous winners and previous losers is 1.6% when the stock price decreases after the sale, the negative marginal effect of an increasing price after the sale amounts to 75% of the difference, which is economically significant. Thus, mutual fund managers are more likely to repurchase past winner stocks if their price has decreased after they were completely sold.

3.3 The impact of team management on mutual funds' repurchasing bias

Whether group decision-making leads to better decisions is widely debated in the economic and psychological literature (e.g., Lamm and Myers (1978) and Adams and Ferreira (2003)).

In the mutual fund industry, Baer et al. (2005) find that team-managed funds earn slightly lower returns than single-managed funds. In light of the above discussion, we examine whether decision making in a team reduces or increases the influence of the repurchasing bias.

We construct a dummy variable, Team managed$_{i,j,q}$, which is equal to one if a fund is managed by more than one fund manager in a given quarter, and zero otherwise. 60.8% of the funds in our sample are team-managed (Panel A of Table 1), and repurchasing activity is positively related to the fund being managed by a team rather than a single manager (Panel B of Table 1).

To test whether repurchasing bias is higher for team-managed funds, we interact our main winner dummy variable with a variable indicating team-managed funds and include it in our baseline regression. Results are presented in Table 6.

We find that team-managed funds are significantly more likely to repurchase stocks they sold for a gain than single-managed funds. The interaction term of the winner dummy and the indicator for team-managed funds is positive and statistically significant at the 5% or 10% level, depending on which winner proxy is used. In economic terms, the coefficient on the interaction term indicates that the difference in the probability to repurchase previous winners and previous losers increases by 0.2%, if a fund is team-managed, rather than single-managed. In economic terms, team-managed mutual funds are 25% more likely to repurchase previous winner stocks rather than previous loser stocks. This finding suggests that group decision making in portfolio management does not reduce but rather exacerbates the influence of fund managers' repurchasing bias. This finding is consistent with Cici (2012), who shows that the disposition effect is stronger among team-managed mutual funds than single-managed funds.

4 Do fund manager changes mitigate the repurchasing bias?

To further establish that fund managers' repurchasing bias is due to their emotional attachment to stocks they sold for a gain or a loss, respectively, we now explore manager changes. If repurchasing bias is due to positive or negative emotions experienced when selling a stock for a gain or a loss, we expect it to be much weaker after a manager change. There still may be a small effect due to analysts or the back-office of the fund that remains the same and still remembers whether a stock was sold for a gain or loss, but we should not observe a repurchasing bias similar to a fund where no manager change took place.

Furthermore, we conjecture that fund managers should still be more likely to repurchase stocks they sold for a gain, even if they have left a fund A and now manage a new fund B. In this case, we expect them to be more likely to repurchase stocks sold for a gain at fund A such that the portfolio of fund B now contains these stocks, too.

We first examine whether fund manager changes help eliminate the repurchasing bias in a given fund. We define a dummy variable, Manager change, which is equal to one if a stock was sold before the funds' management is replaced, but the repurchase decision is made only after the new fund management has taken over. We identify complete manager changes following Jin and Scherbina (2010): a complete manager change for team-managed funds begins when the first new manager arrives and ends when the last old manager leaves. Correspondingly, for single-managed funds, a complete manager change is defined to begin when a new manager arrives and to end when the old manager leaves. In addition, the replacement period is set to at most 90 days in order to avoid double counting of closely spaced sequential changes. Overall, there are 2.3% complete management changes in our whole sample (Panel A Table 1).

We then re-run our baseline linear probability model from Table 3, but additionally include an interaction term of our winner dummy with a dummy variable reflecting a complete manager change. Results are presented in Table 7. In all specifications, the coefficient estimates

of the interaction term are negative in all model specifications and statistically significant at the 5% or 10% level in most cases. For example, the result in column (1) means that new fund managers are 0.4% less likely to repurchase previous winners sold by their predecessors than fund managers who remain in charge of the same fund. The decrease is about half of the baseline repurchasing bias, according to which fund managers are 0.9% more likely to repurchase previous winners rather than previous losers. Nevertheless, we still observe a significant repurchasing bias even after a complete management change. This may be due to the fact that the new fund management is still supported by the same research and advisory team as the old fund management. This team may also be subject to repurchasing bias and thus recommend buying stocks sold for a gain more frequently than stocks sold for a loss.

In the next step, we analyze whether fund managers are still more likely to repurchase stocks they sold for a gain, even if the sale was made at an earlier fund this fund manager was in charge of before managing the current fund. In this part of our analysis, we restrict our sample to single-managed funds only, because it is less clear whether one of the managers in a team-managed fund responds strongly emotionally to a trading decision made by the team regarding a stock, and then has enough power to influence the decision to repurchase the same stock in another team.

In the following analysis, the sample consists of repurchasing activities and opportunities to repurchase stocks previously sold by a fund manager in another fund she managed before. Thus, the repurchase dummy is now defined on the fund manager level.

To account for the fact that single fund managers may be responsible for several funds at the same point in time and thus sell the same stock through different funds, we calculate previous returns of stocks sold as the average return of the stock across all funds belonging to the same single manager. We then run a regression of the repurchasing dummy on the main winner dummy with manager fixed effects, time fixed effects and manager $\times$ time fixed effects after a fund manager has left all funds where she sold a particular stock.

As shown in Panel A of Table 8, fund managers are still 0.2% to 0.3% more likely to repurchase previous winners rather than previous losers in a newly managed fund, even if they have already left all funds where they sold this particular stock. All coefficient estimates are statistically significant at the 1% level. Relative to the average of the repurchase dummy of 0.85% in this sample, the effect of being a previous winner accounts for about 25% of the baseline probability to repurchase a given stock. Results are very similar if we restrict the sample to cases where one manager managed only one fund when she sold a particular stock (Panel B of Table 8). This result supports the view that the repurchasing bias we document is indeed caused by positive (negative) emotions experienced when a stock was previously sold for a gain (loss).

5 The impact of memory salience on the repurchasing bias

According to salience theory (BorGenShl12), limited attention makes it impossible for individuals to remember each experience that they have made. Rather, attention is focused on salient events which are more easily retrieved from memory and eventually overweighed in subsequent behavior. Following this theory, we conjecture that our baseline effect should be stronger if a previous sale was more salient and thus, the positive or negative experience is anchored more strongly in memory.

We define several memory salience proxies to test our conjecture. First, it has been established in the psychology literature that individuals have limited capacity when processing incoming information (e.g., Miller (1956) and Craik and Lockhart (1972)). Thus, if mutual fund managers trade many stocks at the same time, their memory of one individual stock trade may be less salient than if they trade only one stock. Therefore, we use a fund's turnover ratio and also the number of other stocks sold at given point in time as proxies for memory salience.

Furthermore, the psychology literature suggests that repetitions of stimuli enhance future recall or recognition of that stimuli. According to Sawyer (1974), presentation frequency increases recall and recognition. Thus, if the purchase of a stock is close to its subsequent sale, fund managers may better remember their trading experience in this stock. Therefore, we use the holding period of a stock as another proxy for memory salience, arguing that shorter holding periods, i.e., a higher trading frequency, should be associated with stronger repurchasing bias.[12]

We then re-run our baseline regression in Equation 3 and additional include proxies for memory salience, as well as their interaction with our winner dummies.[13] Results are reported in Table 9.

We find that the repurchasing bias decreases with the number of other stocks sold, the holding period before the sale, and the fund turnover ratio. Thus, it is stronger if memory salience is high. For example, in Column (1), the difference between the probabilities to repurchase previous winners and losers decreases by 0.2% to 0.5% when the number of other stocks sold goes up from the lowest quintile to the higher quintiles. In economic terms, the decrease accounts for around 20% to 40% of the baseline repurchasing bias.

In addition to memory salience, the strength of emotional tags to fund managers' previous trading experience should also matter for repurchasing bias (LauMalNie19). That is, repurchasing bias should be stronger if the previous trading experience is associated with strong positive or negative emotions. We conjecture that this should be the case if the fund manager's trade was accompanied by fund inflows rather than fund outflows. If fund managers face outflows, and thus have to trade for liquidity reasons, they may feel less responsible for the trade as it was driven by investors withdrawing money from the fund. In contrast, if fund managers clear a position in spite of receiving inflows, they should feel more respon-

[12] We also use the time period between the sales and repurchase decisions as a memory salience measure because of the decay theory in psychology (e.g., Berman et al. (2009)), i.e., the memory fades over time. Results (unreported) show that repurchasing bias decreases in the one year after the sale of a stock.

[13] As all of our proxies for memory salience are continuous variables, we sort them into quintiles.

sible for the trading outcome. Therefore, we expect more disappointment and unhappiness (happiness and pride) when selling at a loss (gain) with simultaneous inflows, rather than outflows. As a consequence, we should observe a stronger repurchasing bias for stocks sold for a gain at a time when the fund experienced inflows rather than outflows.[14] We test this conjecture in Appendix F and find weak evidence that this is indeed the case.

6 The impact of repurchasing bias on mutual fund performance

We now examine whether fund managers' repurchasing bias as documented in the previous section has an impact on mutual fund performance. Retail investors' repurchasing bias may still maximize their utility function if they obtain positive emotions from repurchasing stocks they have sold for a gain. Thus, even if retail investors' repurchasing bias resulted in underperformance of their portfolios, the extra utility obtained from repurchasing a past winner stock may outweigh the financial loss. In contrast, mutual fund managers are clearly supposed to maximize their investors' financial outcome, i.e., fund performance. Any utility they obtain from repurchasing past winner stocks should not lead to increased trading in these stocks unless these stocks outperform others and thus contribute to a higher fund performance.

To investigate whether fund managers' repurchasing bias affects mutual fund performance, we compute a fund's monthly net return, and its CAPM, Fama-French three-factor, and Carhart four-factor alphas as measures of fund performance.[15] We then sort funds into quintiles according to the extent to which they are subject to repurchasing bias. Repurchas-

[14] In line with this view, previous studies find a smaller disposition effect among investors if they make decisions through agents (Chang et al. (2016) and Shapira and Venezia (2001)).

[15] The risk factors to compute monthly alphas are obtained from Kenneth French's website: `http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html`.

ing bias is determined by the ratio of PWR and PLR, as shown in Equations 1 and 2.[16] Specifically, we rank funds into quintiles based on their PWR/PLR ratio in the previous quarter or in the current quarter, respectively. Funds with the highest PWR/PLR are included in the top quintiles and funds with the lowest PWR/PLR are in the bottom quintile. Portfolios are formed for each quintile and are held for three months on a quarterly rolling basis. We then compute the equal-weighted performance of the portfolios for each quintile. As shown in Table 10, the difference of returns and alphas between the top quintile and bottom quintile is negative in most cases and is statistically significant in some cases when we measure the bias level in the same quarter as the return difference. Thus, we find some, albeit weak, evidence that mutual funds that are more likely to repurchase winners perform worse than mutual funds that are not subject to a repurchasing bias.

In the next step, we switch to the stock level to examine whether repurchased winner stocks underperform repurchased loser stocks. If this is the case, we can conclude that mutual fund managers do not repurchase stocks they sold for a gain because they possess superior information about these stocks and know that they will outperform again in the future. However, they may still repurchase these stocks because of the positive emotional experiences they made when selling them for a gain. As a result, they may even ignore negative information about this stock, which they would otherwise consider when acting purely rationally.

To analyze whether stocks sold for a gain underperform stocks sold for a loss after the repurchase, we assign repurchased stocks in each mutual fund portfolio (based on the holdings report at the previous quarter end) to one of two portfolios: repurchased winners and repurchased losers. Repurchased winners (losers) refer to the stocks that were repurchased within one year after the sale with a gain (loss). We compute monthly returns on the repurchased winners and repurchased losers until the quarter end if the stocks are still held in the fund portfolio during this quarter. Portfolios are re-balanced every quarter. Within

[16] We report the results in this section by defining winner stocks based on the WinnerFIFO measure. Results are similar if we use WinnerAVG.

a given fund portfolio, stocks are value-weighted by the fund's dollar holdings. Finally, we compute average portfolio values for all funds across time.

Results are presented in Table 11. We find that repurchased winner stocks significantly underperform repurchased loser stocks in the quarter after they are repurchased. Specifically, annualized returns of repurchased winner stocks are 5.35% lower than repurchased loser stocks and the difference is statistically significant. CAPM, Fama-French three-factor, and Carhart four-factor alphas are also lower for the repurchased winner portfolio. The difference is particularly pronounced for the Carhart four-factor alpha, which accounts for the momentum effect. The Carhart four-factor alpha of the repurchased winner portfolio is more than 4% lower than that of the repurchased loser portfolio. In our sample, the quarterly repurchasing volume of mutual funds amounts to $19 billion dollars. Given that repurchased stocks underperform by 4% p.a., this results in an annual loss of $3.04 billion dollars, which is economically significant.

We further examine why repurchased winners underperform repurchased losers and find that long-term reversal of stock returns is the most likely explanation (Jegadeesh and Titman (1993) and De Bondt and Thaler (1985)).[17] Specifically, we focus on repurchased winner and loser stocks, which are included in the portfolios in Table 11, and examine stock return movement over a 60-month window around the repurchase.

We plot the average market-adjusted abnormal return of repurchased winners and losers against the months around the repurchase in Figure 3. Mutual funds sold these stocks one year before the time of repurchase which is month t=0. We find that repurchased winners have higher monthly returns than repurchased losers in most months before the repurchase. The difference between repurchased winners and repurchased losers becomes insignificant or even negative after month t=-8. After the repurchase, repurchased winners underperform repurchased losers by around 1% per month and the difference is statistically significant

[17] See also e.g., Barberis et al. (1998), Daniel et al. (1998) and Hong and Stein (1999) for explanations of long-term reversals.

from t=0 to t=2. Three months after the repurchase, we still observe underperformance of repurchased winners, but the difference becomes smaller and eventually disappears.

Overall, the stock return pattern of repurchased winners and losers is consistent with long-term reversal, which may explain the underperformance of repurchased winners compared to repurchased losers after the repurchase. [18]

Finally, we examine how returns of repurchased winners and losers would have developed if a mutual fund did not sell and repurchase a particular stock but held them in its portfolio for a longer period of time. If mutual funds are able to avoid a drop in the stock price by selling the stock and repurchasing it again later, we can regard the avoidance as timing ability of fund managers. However, if the stock price increases after the sale and mutual funds repurchase the stock at a higher price, it is surprising why a fund sells and repurchases the stock instead of just keeping it in its portfolio.

We focus on the stock returns that mutual funds have foregone between the sale and the repurchase of a stock. Specifically, we construct a portfolio with repurchased stocks in each mutual fund in the months between the sale and the repurchase of the stock. We compute monthly returns on the repurchased stocks in the fund portfolio, weighted by the fund's dollar holdings. We then compute the average portfolio return across all funds. Results are presented in Panel A of Table 12.

Both, raw returns and alphas of the portfolio comprising repurchased stocks are positive and most of them are statistically significant, except for the Fama French three-factor alpha. The raw annual return amounts to 17.81% and the risk-adjusted alphas are about 3% p.a. This finding suggests that repurchased stocks outperform after they have been sold. Thus, a mutual fund would have benefited from keeping these stocks in its portfolio. In addition, transaction costs may also be significant. For example, transaction costs of the average

[18] We also examine whether different stock characteristics of repurchased winners and repurchased losers drive the underperformance of repurchased winners compared to repurchased losers. However, appendix H shows that stock characteristics such as for example size, book-to-market ratio, and debt ratio do not explain repurchased winners' underperformance.

quarterly repurchase of $19 billion dollars amount to $152 million dollars, if we assume that per unit transaction costs are on average 0.8% for mutual funds (Edelen et al. (2013)). These costs would be avoided if the fund manager just kept repurchased winners in her portfolio.

In the next step, we use the same portfolio construction method and form portfolios for repurchased winners and repurchased losers separately. We then test the long-short returns of these two portfolios against a zero return. As shown in Panels B of Table 12, the difference in returns of repurchased winner portfolio and repurchased loser portfolio is as high as 10% p.a. and is statistically significant at the 5% or 10% level. This means that mutual funds forego higher returns when they sell and repurchase previous winners. Furthermore, we observe negative risk-adjusted returns in repurchased losers but only one of them is statistically significant.

Note, that the potential losses presented here can be reconciled with the harm of the disposition effect and reflect that mutual funds may miss some opportunities to gain by selling winners too early. We conclude that the repurchasing bias towards stocks sold for a gain cannot be information-driven since mutual funds would have been better off if they just kept these stocks in their portfolios.

7 Conclusion

This paper provides the first evidence that mutual fund managers are biased towards repurchasing stocks that they previously sold for a gain rather than for a loss. We conjecture that this behavior is driven by a preference to re-experience the positive emotions evoked when they sold the stock for a gain. In contrast, mutual fund managers try to avoid re-experiencing negative emotions such as regret or disappointment that were triggered when a stock was sold for a loss before. In line with this view, we find that repurchasing bias at a given fund is strongly reduced after a complete replacement of the fund management.

Furthermore, even after a fund manager leaves the fund where she sold a particular stock for a gain, she is still more likely to repurchase this stock when managing any new fund.

We do not find support for the view that mutual funds are biased towards repurchasing past winner stocks because of superior information, betting on momentum, or because past winner stocks generally outperform past loser stocks. In contrast, repurchased winners underperform repurchased losers by around 5% p.a. after the repurchase.

Our results are important for investors delegating portfolio management to actively managed funds, by highlighting that mutual fund managers are subject to behavioral biases, too. Investors may be better off investing in a passively managed fund that, by definition, does not engage in this type of trading behavior.

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Figure 1: Average returns of stocks sold that are (not) repurchased

This figure plots average returns of stocks that are sold and repurchased and of stocks that are sold, but not repurchased. A stock is defined as repurchased if it has been sold completely and then is repurchased by the same fund within one year. Returns are computed by either the first-in-first-out principle, or by using the value-weighted average of all purchase prices of a stock.

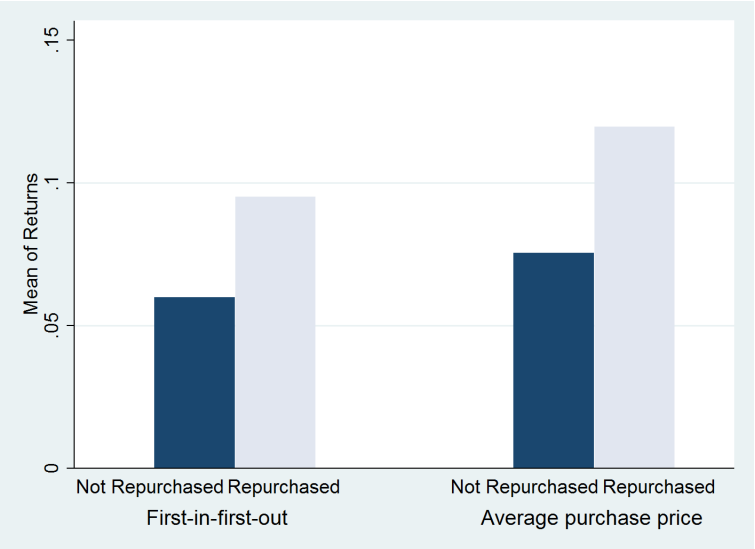

Figure 2: Repurchasing probability conditional on past stock returns

This figure plots the probability to repurchase a stock for different intervals of past stock returns. The probability to repurchase a stock is estimated from a linear probability model with stock, fund, and time fixed effects. The red vertical line indicates the probability to repurchase a stock when a stock was previously sold at a zero return. Blue vertical lines indicate 95% confidence intervals. Standard errors are clustered by fund.

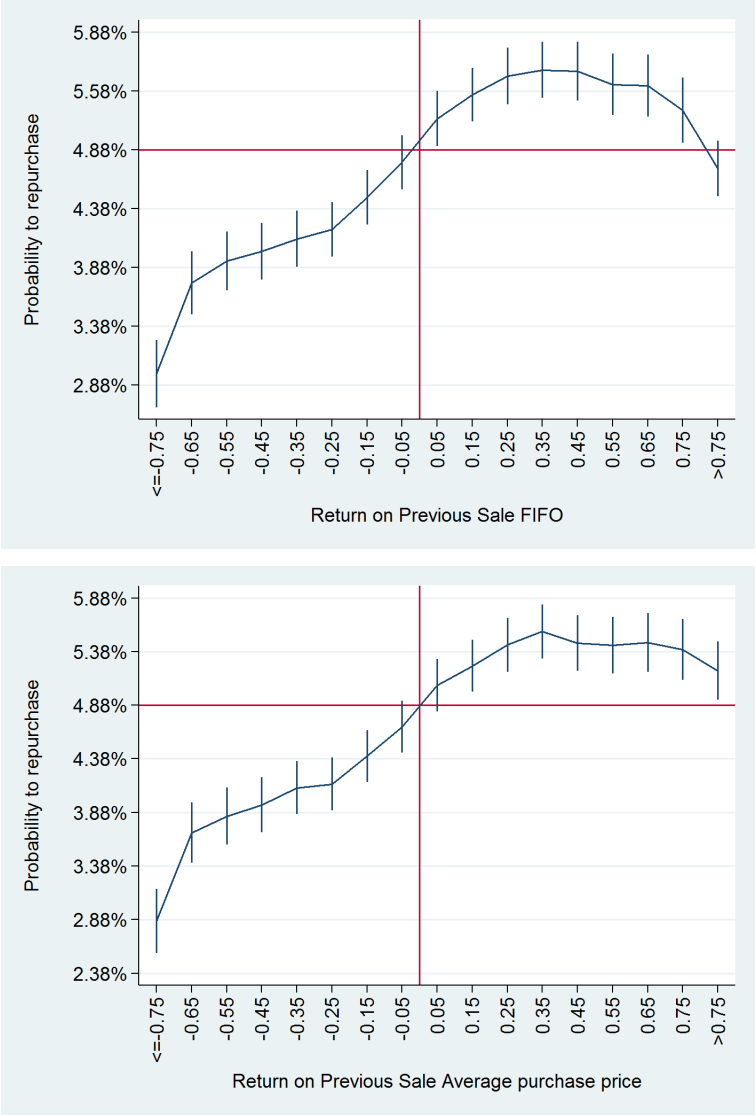

Figure 3: Market-excess returns of repurchased stocks around the repurchase

This figure plots the average market-adjusted abnormal return of repurchased stocks against the months around the repurchase in a 60-month window. A stock is defined as repurchased if it has been sold completely and then is repurchased by the same fund within one year. Repurchased winners are stocks previously sold by mutual funds for a gain and repurchased winners are stocks previously sold by mutual funds for a loss. Returns are computed by the first-in-first-out principle.

Table 1: Summary statistics and mean comparisons

Panel A of this table shows descriptive statistics of all variables in our sample of stocks sold completely at least once by a U.S actively managed equity fund. The sample runs from January 1980 to December 2014. The number of observations (Obs), means, medians, and standard deviations (Std. Dev.) are reported in columns (1) to (4). A detailed description of all variables is provided in Appendix A. Panel B shows the average winner dummies as well as average characteristics of funds who sold and repurchased a stock (column (1)), or sold but not repurchased a stock (column (2)). Panel C shows the average repurchase dummy as well as average fund characteristics for previous winner stocks and previous loser stocks, defined by the WinnerFIFO measure. Differences between groups are reported in column (3). Significance based on a two-sided t-test is reported in column (4). Standard errors are clustered by fund and time.

Panel A: Descriptive Statistics

	Obs (1)	Mean (2)	Median (3)	Std. Dev. (4)
Variables on the stock-fund-quarter level				
Repurchase	7,521,881	0.052	0	0.222
Winner (first-in-first-out)	6,845,158	0.501	1	0.500
Winner (average purchase price)	6,849,812	0.507	1	0.500
Price up	5,703,662	0.565	1	0.496
Team managed	6,131,280	0.608	1	0.488
Manager change	7,521,881	0.023	0	0.148
Variables on the fund-quarter level				
Fund size	148,386	5.508	5.428	1.729
Fund age	156,763	13.905	9.833	13.310
Fund turnover Ratio	139,753	0.899	0.660	0.892
Fund expense ratio	143,936	0.013	0.012	0.004
Fund return volatility	145,580	0.169	0.152	0.087
Fund performance rank	156,879	0.516	0.519	0.282

Panel B: Mean comparison of stocks that are (not) repurchased

	Repurchased (1)	Not Repurchased (2)	Diff (3)	t-statistic (4)
Winner (first-in-first-out)	0.557	0.498	0.059	7.08
Winner (average purchase price)	0.553	0.500	0.053	7.74
Price up	0.626	0.561	0.064	9.37
Team managed	0.639	0.606	0.033	3.05
Manager change	0.020	0.023	-0.003	-2.26
Fund size	5.874	5.697	0.177	5.82
Fund age	13.781	13.664	0.116	0.51
Fund turnover ratio	1.408	1.236	0.172	3.49
Fund expense ratio	0.012	0.013	-0.001	-2.88
Fund return volatility	0.168	0.175	-0.007	-2.50
Fund performance rank	0.503	0.514	-0.010	-3.17

Panel C: Mean comparison of stocks sold for a gain (loss)				
	Previous Winner (1)	Previous Loser (2)	Diff (3)	t-statistic (4)
Repurchase	0.058	0.047	0.012	6.59
Price up	0.574	0.557	0.017	1.02
Team managed	0.614	0.610	0.004	0.57
Manager change	0.022	0.023	-0.001	-0.78
Fund size	5.821	5.692	0.129	5.91
Fund age	14.351	13.732	0.620	4.47
Fund turnover Ratio	1.213	1.266	-0.051	-3.93
Fund expense ratio	0.012	0.013	-0.001	-3.16
Fund return volatility	0.156	0.189	-0.033	-7.30
Fund performance rank	0.526	0.500	0.026	4.97

Table 2: Preferences for repurchasing stocks previously sold for a gain versus a loss

This table presents the difference between the Proportion of Winners Repurchased (PWR) and the Proportion of Losers Repurchased (PLR) aggregated over the sample period. PWR (PLR) is the ratio between NWR (NLR) and ORW (OLR). NWR (NLR) and ORW (OLR) reflect the number of winners (losers) repurchased, and the number of opportunities to repurchase winners (losers). All variables are defined in detail in Appendix A. In column (1), winner stocks are defined based on the WinnerFIFO measure. In column (2), winner stocks are defined based on the value-weighted average of all purchase prices before the sale. We assume that realized repurchases are independent observations when computing standard errors.

	First-in-first-out (1)	Average purchase price (2)
No. of winners repurchased (NWR)	201,680	204,917
Opportunities to repurchase winners (ORW)	3,430,223	3,470,308
Proportion of winners repurchased (PWR)	0.059	0.059
No. of losers repurchased (NLR)	160,508	157,445
Opportunities to repurchase losers (ORL)	3,414,935	3,379,504
Proportion of losers repurchased (PLR)	0.047	0.047
Diff (PWR-PLR)	0.012	0.012
t-stats (PWR=PLR)	15.75	16.61

Table 3: Repurchasing bias in a multivariate regression framework

This table contains the results of linear probability models. The dependent variable is Repurchase, a dummy variable equal to one if a stock is repurchased by the same fund within one year after it was sold, and zero otherwise. The main independent variable, Winner, is equal to one if a stock was sold for a gain, and zero otherwise. The winner dummy is based on the difference between selling price and average purchase price. The average purchase price is calculated either following the first-in-first-out principle or by taking the value-weighted average of all purchase prices before the sale. Control variables include fund characteristics (Fund size, Fund age, Fund turnover ratio, Fund expense ratio, Fund return volatility, Fund performance rank), which are all defined in detail in Appendix A. Columns (1), (2), (4) and (5) include stock, fund, and time fixed effects. Columns (3) and (6) include stock and fund×time fixed effects. t-statistics are provided in parentheses. Standard errors are clustered by fund. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

	First-in-first-out			Average purchase price		
	(1)	(2)	(3)	(4)	(5)	(6)
Winner	0.009***	0.009***	0.009***	0.009***	0.010***	0.009***
	(24.13)	(22.77)	(29.36)	(25.22)	(23.77)	(30.32)
Fund size		0.003***			0.003***	
		(3.22)			(3.20)	
Fund age		0.000			0.000	
		(0.16)			(0.15)	
Fund turnover ratio		0.005***			0.005***	
		(7.19)			(7.21)	
Fund expense ratio		-0.175			-0.176	
		(-0.50)			(-0.51)	
Fund return volatility		-0.008			-0.008	
		(-0.70)			(-0.69)	
Fund performance rank		-0.005***			-0.005***	
		(-2.93)			(-2.92)	
Stock fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Fund fixed effects	Yes	Yes	No	Yes	Yes	No
Time fixed effects	Yes	Yes	No	Yes	Yes	No
Fund×Time fixed effects	No	No	Yes	No	No	Yes
Observations	6,844,959	5,592,522	6,837,715	6,849,613	5,596,088	6,842,386
Adjusted R^2	0.039	0.040	0.115	0.039	0.040	0.115

Table 4: Repurchasing bias controlling for time-varying stock and fund characteristics

This table contains the results of a linear probability model with stock×time fixed effects. The dependent variable is Repurchase, a dummy variable equal to one if a stock is repurchased by the same fund within one year after it was sold, and zero otherwise. The main independent variable, Winner, is equal to one if a stock was sold for a gain, and zero otherwise. The winner dummy is based on the difference between selling price and average purchase price. The average purchase price is calculated either following the first-in-first-out principle or by taking the value-weighted average of all purchase prices before the sale. Control variables include fund characteristics (Fund size, Fund age, Fund turnover ratio, Fund expense ratio, Fund return volatility, Fund performance rank), which are all defined in detail in Appendix A. In columns (1), (2), (4) and (5), Fund and stock×time fixed effects are included. Columns (3) and (6) include fund×time and stock ×time fixed effects. t-statistics are provided in parentheses. Standard errors are clustered by fund. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

	First-in-first-out			Average purchase price		
	(1)	(2)	(3)	(4)	(5)	(6)
Winner	0.001***	0.001***	0.001***	0.001***	0.001***	0.002***
	(2.67)	(2.95)	(5.16)	(3.85)	(4.10)	(6.18)
Fund size		0.003***			0.003***	
		(2.97)			(2.96)	
Fund age		0.000			0.000	
		(0.08)			(0.07)	
Fund turnover ratio		0.005***			0.005***	
		(6.53)			(6.56)	
Fund expense ratio		-0.252			-0.255	
		(-0.74)			(-0.75)	
Fund return volatility		-0.012			-0.012	
		(-0.98)			(-0.97)	
Fund performance rank		-0.004***			-0.004***	
		(-2.65)			(-2.65)	
Fund fixed effects	Yes	Yes	No	Yes	Yes	No
Stock×Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Fund×Time fixed effects	No	No	Yes	No	No	Yes
Observations	6,773,424	5,540,218	6,765,602	6,777,986	5,543,716	6,770,188
Adjusted R^2	0.058	0.060	0.134	0.058	0.060	0.134

Table 5: Preferences for repurchasing stocks conditional on their subsequent price changes

This table contains the results of linear probability models including interaction terms of our winner dummies with a dummy reflecting whether a stock's price increased after it was sold by a fund. The dependent variable is Repurchase, a dummy variable equal to one if a stock is repurchased by the same fund within one year after it was sold, and zero otherwise. Price up is equal to one if the price of a stock has increased since it was sold, and zero otherwise. Winner is equal to one if a stock was sold for a gain, and zero otherwise. The winner dummy is based on the difference between selling price and average purchase price. The average purchase price is calculated either following the first-in-first-out principle or by taking the value-weighted average of all purchase prices before the sale. Control variables include fund characteristics (Fund size, Fund age, Fund turnover ratio, Fund expense ratio, Fund return volatility, Fund performance rank), which are all defined in detail in Appendix A. Columns (1), (2), (4) and (5) include stock, fund, and time fixed effects. Columns (3) and (6) include stock and fund×time fixed effects. t-statistics are provided in parentheses. Standard errors are clustered by fund. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

	First-in-first-out			Average purchase price		
	(1)	(2)	(3)	(4)	(5)	(6)
Winner× Price up	-0.012***	-0.012***	-0.012***	-0.011***	-0.011***	-0.012***
	(-20.74)	(-19.65)	(-23.17)	(-19.32)	(-18.41)	(-21.77)
Winner	0.016***	0.017***	0.017***	0.016***	0.017***	0.017***
	(34.31)	(33.05)	(40.97)	(34.41)	(33.29)	(40.68)
Price up	0.020***	0.021***	0.021***	0.020***	0.021***	0.021***
	(32.79)	(32.01)	(34.60)	(33.16)	(32.37)	(35.09)
Fund size		0.003***			0.003***	
		(2.72)			(2.71)	
Fund age		0.000			0.000	
		(0.28)			(0.27)	
Fund turnover ratio		0.005***			0.006***	
		(6.82)			(6.84)	
Fund expense ratio		-0.346			-0.344	
		(-0.95)			(-0.94)	
Fund return volatility		-0.009			-0.009	
		(-0.67)			(-0.67)	
Fund performance rank		-0.005***			-0.005***	
		(-3.10)			(-3.09)	
Stock fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Fund fixed effects	Yes	Yes	No	Yes	Yes	No
Time fixed effects	Yes	Yes	No	Yes	Yes	No
Fund×Time fixed effects	No	No	Yes	No	No	Yes
Observations	5,303,062	4,571,412	5,295,512	5,305,972	4,573,986	5,298,445
Adjusted R^2	0.042	0.044	0.121	0.042	0.044	0.121

Table 6: Preferences for repurchasing stocks in team- versus single- managed funds

This table contains the results of linear probability models including interaction terms of our winner dummies with a dummy reflecting whether a fund is team-managed. The dependent variable is Repurchase, a dummy variable equal to one if a stock is repurchased by the same fund within one year after it was sold, and zero otherwise. Team managed is a dummy variable equal to one if the fund is managed by a team in a given quarter, and zero otherwise. Winner is equal to one if a stock was sold for a gain, and zero otherwise. The winner dummy is based on the difference between selling price and average purchase price. The average purchase price is calculated either following the first-in-first-out principle or by taking the value-weighted average of all purchase prices before the sale. Control variables include fund characteristics (Fund size, Fund age, Fund turnover ratio, Fund expense ratio, Fund return volatility, Fund performance rank), which are all defined in detail in Appendix A. All regressions include stock, fund, and time fixed effects. t-statistics are provided in parentheses. Standard errors are clustered by fund. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

	First-in-first-out		Average purchase price	
	(1)	(2)	(3)	(4)
Winner × Team managed	0.002**	0.002**	0.002*	0.002*
	(2.07)	(2.01)	(1.92)	(1.86)
Winner	0.008***	0.008***	0.008***	0.008***
	(11.63)	(11.10)	(12.01)	(11.48)
Team managed	-0.001	-0.001	-0.001	-0.000
	(-0.56)	(-0.37)	(-0.51)	(-0.32)
Fund size		0.003***		0.003***
		(2.96)		(2.95)
Fund age		0.000		0.000
		(0.79)		(0.78)
Fund turnover ratio		0.005***		0.005***
		(6.84)		(6.86)
Fund expense ratio		-0.228		-0.230
		(-0.61)		(-0.62)
Fund return volatility		-0.006		-0.006
		(-0.51)		(-0.51)
Fund performance rank		-0.005***		-0.005***
		(-3.02)		(-3.01)
Stock fixed effects	Yes	Yes	Yes	Yes
Fund fixed effects	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes
Observations	5,608,530	5,287,957	5,612,030	5,291,120
Adjusted R^2	0.040	0.041	0.040	0.041

Table 7: Repurchasing bias after a manager change

This table contains the results of linear probability models including interaction terms of our winner dummies and a dummy variable reflecting manager changes. The dependent variable is Repurchase, a dummy variable equal to one if a stock is repurchased by the same fund within one year after it was sold, and zero otherwise. Manager change is a dummy variable equal to one if a complete manager change took place at a fund after a stock was sold, but before the repurchasing decision is made, and zero otherwise. A complete manager change is defined for the time period starting when the first new manager arrives and ending when the last incumbent manager leaves (Jin and Scherbina (2010)). Winner is equal to one if a stock was sold for a gain, and zero otherwise. The winner dummy is based on the difference between selling price and average purchase price. The average purchase price is calculated either following the first-in-first-out principle or by taking the value-weighted average of all purchase prices before the sale. Control variables include fund characteristics (Fund size, Fund age, Fund turnover ratio, Fund expense ratio, Fund return volatility, Fund performance rank), which are all defined in detail in Appendix A. Columns (1), (2), (4) and (5) include stock, fund, and time fixed effects. Columns (3) and (6) include stock and fund×time fixed effects. t-statistics are provided in parentheses. Standard errors are clustered by fund. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

	First-in-first-out			Average purchase price		
	(1)	(2)	(3)	(4)	(5)	(6)
Winner × Manager change	-0.004**	-0.004**	-0.002*	-0.004**	-0.004*	-0.002
	(-2.34)	(-2.12)	(-1.71)	(-2.12)	(-1.90)	(-1.45)
Winner	0.009***	0.009***	0.009***	0.009***	0.010***	0.009***
	(24.01)	(22.61)	(29.07)	(25.04)	(23.55)	(30.00)
Manager change	-0.001	-0.000	-0.001	-0.002	-0.001	-0.001
	(-0.83)	(-0.21)	(-0.67)	(-0.97)	(-0.34)	(-0.80)
Fund size		0.003***			0.003***	
		(3.22)			(3.20)	
Fund age		0.000			0.000	
		(0.17)			(0.17)	
Fund turnover ratio		0.005***			0.005***	
		(7.21)			(7.23)	
Fund expense ratio		-0.174			-0.176	
		(-0.50)			(-0.50)	
Fund return volatility		-0.008			-0.008	
		(-0.70)			(-0.69)	
Fund performance rank		-0.005***			-0.005***	
		(-2.93)			(-2.92)	
Stock fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Fund fixed effects	Yes	Yes	No	Yes	Yes	No
Time fixed effects	Yes	Yes	No	Yes	Yes	No
Fund×Time fixed effects	No	No	Yes	No	No	Yes
Observations	6,844,959	5,592,522	6,837,715	6,849,613	5,596,088	6,842,386
Adjusted R^2	0.039	0.040	0.115	0.039	0.040	0.115

Table 8: Repurchasing bias after a manager leaves a single-managed fund

This table contains the regression results of linear probability models on the fund manager level. The sample is restricted to single-managed funds and cases where fund managers switch to another fund after selling a stock, but before making a repurchase decision. The dependent variable is Repurchase, a dummy variable equal to one if a stock is repurchased by the fund manager in a new fund within one year after it was sold at the previous fund the manager was in charge of, and zero otherwise. Winner is equal to one if a stock was sold for a gain, and zero otherwise. The winner dummy is based on the difference between selling price and average purchase price. The average purchase price is calculated either following the first-in-first-out principle or by taking the value-weighted average of all purchase prices before the sale. In Panel A, winner stocks are defined based on the average return of a stock across all funds through which a manager previously sold the stock. Panel B includes only cases where a fund manager was in charge of just one single-managed fund when they sold the stock. Columns (1) and (3) include manager and time fixed effects, and columns (2) and (4) include manager×time fixed effects. t-statistics are provided in parentheses. Standard errors are clustered by fund. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

	First-in-first-out		Average purchase price	
	(1)	(2)	(3)	(4)
Panel A: Single-managed funds				
Winner	0.003***	0.002***	0.003***	0.003***
	(3.95)	(4.06)	(4.03)	(4.12)
Observations	105,289	105,119	105,367	105,195
Adjusted R^2	0.093	0.196	0.093	0.196
Panel B: Single-managed funds and only managers in charge of one fund				
Winner	0.003***	0.002***	0.003***	0.003***
	(3.92)	(3.89)	(3.84)	(3.79)
Observations	94,855	94,656	94,931	94,730
Adjusted R^2	0.109	0.211	0.109	0.211
Manager fixed effects	Yes	No	Yes	No
Time fixed effects	Yes	No	Yes	No
Manager×Time fixed effects	No	Yes	No	Yes

Table 9: Memory salience and repurchasing bias

This table contains the results of linear probability models with interaction terms of our winner dummies and quintiles of memory salience measures. The dependent variable is Repurchase, a dummy variable equal to one if a stock is repurchased by the same fund within one year after it was sold, and zero otherwise. Winner is equal to one if a stock was sold for a gain, and zero otherwise. The winner dummy is based on the difference between selling price and average purchase price. The average purchase price is calculated either following the first-in-first-out principle or by taking the value-weighted average of all purchase prices before the sale. Memory salience is measured by the number of other stocks sold at the same time as a given stock (columns (1) and (4)), the holding period (in quarters) of a stock before it is sold (columns (2) and (5)), and the fund's turnover ratio (columns (3) and (6)). All measures are defined in detail in Appendix A. Stock, fund, and time fixed effects are included in all models. t-statistics are provided in parentheses. Standard errors are clustered by fund. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

	First-in-first-out			Average purchase price		
	Number of other stocks sold (1)	Holding period (2)	Turnover ratio (3)	Number of other stocks sold (4)	Holding period (5)	Turnover ratio (6)
Winner × Quintile 2	-0.004***	-0.002***	-0.003**	-0.005***	-0.002***	-0.004**
	(-3.95)	(-3.18)	(-2.03)	(-4.07)	(-3.20)	(-2.14)
Winner × Quintile 3	-0.004***	-0.002***	-0.002	-0.004***	-0.002***	-0.003
	(-3.11)	(-3.14)	(-1.48)	(-3.06)	(-3.20)	(-1.52)
Winner × Quintile 4	-0.005***	-0.002**	-0.003*	-0.005***	-0.002**	-0.004**
	(-3.99)	(-2.55)	(-1.95)	(-3.72)	(-2.37)	(-2.05)
Winner × Quintile 5	-0.002*	-0.002***	-0.001	-0.002	-0.001	-0.001
	(-1.70)	(-2.62)	(-0.83)	(-1.24)	(-1.42)	(-0.85)
Winner	0.012***	0.011***	0.011***	0.012***	0.011***	0.011***
	(12.98)	(17.44)	(8.45)	(12.06)	(17.49)	(8.19)
Quintile 2	-0.002	-0.003***	0.005***	-0.002	-0.003***	0.006***
	(-1.16)	(-5.74)	(3.92)	(-1.00)	(-5.73)	(3.99)
Quintile 3	-0.002	-0.003***	0.006***	-0.002	-0.003***	0.006***
	(-1.41)	(-4.85)	(3.88)	(-1.33)	(-4.81)	(3.88)
Quintile 4	-0.004*	-0.001	0.011***	-0.004*	-0.001	0.011***
	(-1.93)	(-1.19)	(6.19)	(-1.91)	(-1.36)	(6.19)
Quintile 5	-0.005**	-0.001	0.014***	-0.005**	-0.002**	0.014***
	(-2.13)	(-1.01)	(8.05)	(-2.22)	(-2.06)	(7.95)
Stock fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Fund fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	6,844,959	6,844,959	5,848,361	6,849,613	6,849,613	5,852,500
Adjusted R^2	0.039	0.039	0.040	0.039	0.039	0.040

Table 10: Portfolios sorts based on PWR/PLR

This table presents raw returns and risk-adjusted returns of quintile portfolios based on a fund's PWR/PLR ranking. PWR (PLR) is the proportion of winners (losers) repurchased, calculated by scaling the number of winners (losers) repurchased with the opportunities to repurchase winners (losers). At the beginning of each quarter, we sort funds into quintiles based on their PWR/PLR ratio in the previous quarter (Panel A), or in the current quarter (Panel B). Funds with the highest PWR/PLR are included in the top quintile and funds with the lowest PWR/PLR are included in the bottom quintile, respectively. Winner stocks are defined based on the WinnerFIFO measure. Portfolios are held for three months on a rolling basis. Column (1) reports the number of observations in each portfolio. In column (2), Monthly return reflects equal-weighted fund returns for each portfolio. In columns (3) to (5), CAPMα, FF3α and Carhartα refer to CAPM, Fama-French three-factor (Fama and French (1993)) and Carhart four-factor (Carhart (1997)) alphas for each portfolio. Returns are expressed in annual percentages.

Panel A: Sorting based on PWR/PLR of the previous quarter					
Quintile	Obs. (1)	Monthly return (2)	CAPMα (3)	FF3α (4)	Carhartα (5)
1 (bottom)	319	10.99%	-0.84%	-1.18%	-1.18%
2	261	10.03%	0.08%	-0.09%	-0.16%
3	302	11.21%	0.02%	-0.37%	-0.52%
4	312	11.31%	-0.65%	-0.81%	-1.03%
5 (top)	329	10.03%	-1.20%	-1.10%	-1.15%
Diff (top-bottom)	319	-0.16%	-0.44%	0.00%	-0.05%
t-statistics		-0.33	-0.91	-0.01	-0.10
Panel B: Sorting based on PWR/PLR of the current quarter					
Quintile	Obs. (1)	Monthly return (2)	CAPMα (3)	FF3α (4)	Carhartα (5)
1 (bottom)	319	11.12%	-0.45%	-0.71%	-0.64%
2	265	7.82%	-0.42%	-0.98%	-1.36%
3	306	11.28%	-0.74%	-0.99%	-1.19%
4	313	10.35%	-1.59%	-1.80%	-2.12%
5 (top)	331	9.89%	-1.56%	-1.31%	-1.55%
Diff (top-bottom)	319	-0.65%	-1.05%	-0.65%	-0.96%
t-statistics		-1.25	-2.07	-1.33	-2.01

Table 11: Returns of repurchased winner and loser stocks

This table contains calendar time portfolio returns and risk-adjusted returns of repurchased winner and loser stocks. At the beginning of each quarter, we assign repurchased stocks in each mutual fund portfolio (based on the report at the previous quarter end) to one of two portfolios: repurchased winners (column (1)) and repurchased losers (column (2)). Repurchased winners (losers) are stocks that are repurchased within one year after the sale with a gain (loss). Winner stocks are defined based on the WinnerFIFO measure. We compute monthly returns on the repurchased winners and repurchased losers until the quarter end if a stock is still in the fund's portfolio. Portfolios are re-balanced every quarter and within a given fund portfolio, stocks are weighted by the fund's dollar holdings. Finally, we compute time portfolios by taking the equal-weighted average across funds. In column (3), "Diff" represents a portfolio long in repurchased winners and short in repurchased losers. Returns are expressed in annual percentages.

	Repurchased winners (1)	Repurchased losers (2)	Diff (3)	t-statistic (4)
Return	13.98%	19.34%	-5.35%	-2.00
CAPMα	2.48%	7.52%	-5.04%	-1.88
FF3α	2.15%	5.48%	-3.32%	-1.27
Carhart4α	2.57%	7.38%	-4.81%	-1.85

Table 12: Stock returns between sale and repurchase

This table contains calendar time portfolio returns and risk-adjusted returns of stocks after they have been sold and before they are repurchased. In Panel A, we form a portfolio with repurchased stocks in each mutual fund portfolio in the months between the previous sale and the repurchase of the stock. We compute monthly returns on the repurchased stocks in the fund portfolio, weighted by the fund's dollar holdings. Then, we compute time portfolios by taking the equal-weighted average across funds and tests the returns of the portfolio on repurchased stocks in the months between the sale and the repurchase against zero. In Panels B, we assign the repurchased stocks to one of two portfolios: repurchased winners and repurchased losers. Repurchased winners (losers) refer to the stocks that were previously sold for a gain (loss) and were repurchased by the fund within one year. Winner stocks are defined based on the WinnerFIFO measure. We compute time portfolios in the same way as in Panel A. In column (3), "Diff" represents a portfolio long in repurchased winners and short in repurchased losers. Returns are expressed in annual percentages.

Panel A: Portfolio of repurchased stocks between the sale and the repurchase				
	Return (1)	CAPMα (2)	FF3α (3)	Carhart4α (4)
Portfolio return	17.61%	3.00%	2.20%	3.94%
t-statistic	4.85	2.02	1.52	2.83
Panel B: Portfolio returns between the sale and the repurchase				
	Repurchased winners (1)	Repurchased losers (2)	Diff (3)	t-statistic (4)
Return	21.68%	11.58%	10.10%	2.03
CAPMα	8.85%	-2.41%	11.26%	2.30
FF3α	8.59%	-3.98%	12.56%	2.27
Carhart4α	8.39%	-0.42%	8.81%	2.31

Appendix

A Variable description

This table describes all variables used in our empirical analyses. Data sources are as follows:

1. TR Holdings: Thomson Reuters Mutual Funds Holdings Database
2. CRSP Stock: CRSP U.S. Stock Database
3. CRSP Fund: CRSP Survivorship-Bias-Free Mutual Fund Database
4. MS Fund: Morningstar Direct
5. FF: Data Library on Kenneth French's website
6. MC: Variable is manually constructed by the authors.

Variable name	Description	Data Source
CAPMα	α from the regression of fund returns under CAPM.	CRSP Fund, CRSP stock, FF, MC
Carhart4α	α from the regression of fund returns under Carhart four-factor model.	CRSP Fund, CRSP stock, FF, MC
Fund age$_{i,q}$	Fund age in quarter q.	CRSP Fund
Fund expense ratio$_{i,q}$	Annual expense ratio of a fund.	CRSP Fund
FF3α	α from the regression of fund returns under Fama-French three-factor model.	CRSP Fund, CRSP stock, FF, MC
Fund performance rank$_{i,q}$	Annual rank of a fund by ordering all funds with the same CRSP objective code.	CRSP Fund
Fund return volatility$_{i,q}$	Annualized volatility of fund monthly net returns.	CRSP Fund
Fund size$_{i,q}$	Logarithm of the total net assets of fund i of million dollars in quarter q.	CRSP Fund
Fund turnover ratio$_{i,q}$	Fund turnover over a year.	CRSP Fund
Holding period$_{i,j,q}$	The number of quarters for which fund i has held stock j before the stock is completely sold.	TR Holdings, MC
Manager Change$_{i,j,q}$	Dummy variable equal to one if stock j was sold by fund i before a complete manager change and a repurchase decision is made after the complete manager change in fund i. A complete manager change begins when the first new manager arrives and ends when the last old manager leaves (Jin and Scherbina (2010)).	MS Fund, TR Holdings, MC

Variable name	Description	Data Source
Number of other stocks sold$_{i,j,q}$	The number of other stocks sold by fund i when stock j is completely sold. For example, assume a mutual fund sold all stocks of company A, 200 stocks of company B, and 300 stocks of company C in the same quarter. Then, the number of other stocks sold is 500, defined at the time when the decision on whether to repurchase stock A is made.	TR Holdings, MC
NWR (NLR)	No. of winners (losers) repurchased accumulated across the sample.	CRSP Stock, TR Holdings, MC
ORW (ORL)	No. of opportunities to repurchase winners (losers) accumulated across the sample.	CRSP Stock, TR Holdings, MC
Price up$_{i,j,q}$	Dummy variable equal to one if the price of stock j has increased in quarter q compared to the price when it was completely sold by fund i.	CRSP Stock, TR Holdings, MC
PWR (PLR)	Proportion of winners (losers) repurchased accumulated across the sample.	CRSP Stock, TR Holdings, MC
Repurchase$_{i,j,q}$	Dummy variable equal to one if stock j sold by fund i is repurchased in quarter q within one year after the sale.	TR Holdings, MC
Return	Annualized returns of a portfolio	CRSP Fund, CRSP stock
Team managed$_{i,q}$	Dummy variable equal to one if fund i is managed by a team in quarter q	CRSP Fund, MC
Winner$_{i,j,q}$	Dummy variable equal to one if the stock j was sold by fund i for a gain before quarter q. It compares the selling price of the stock and the average purchase price. The average purchase price is calculated either following first-in-first-out principal or taking value-weighted average of all purchase prices before the sale.	CRSP Stock, TR Holdings, MC

B Top 20 funds repurchasing and Top 20 stocks repurchased

This table lists the Top 20 funds that repurchase most stocks (Panel A) and the top 20 stocks that are most frequently repurchased (Panel B). In Panel A, No. of Repurchases accumulates the number of times that a fund repurchases stocks within one year after the sale and No. of Sales accumulates the number of sales of a fund across the whole sample period from 1980 to 2014. Repurchase rate is equal to No. of Repurchases divided by No. of Sales. The funds with the bottom 10% No. of Sales (less than 7) are excluded to avoid an abnormally high Repurchase rate because of the extremely low number of observations in sales of the fund. Funds are sorted according to Repurchase rate. In Panel B, No. of Repurchases accumulates the number of times a stock is repurchased and No. of Sales accumulates the number of sales of a stock across the whole sample period from 1980 to 2014. Repurchase rate is equal to No. of Repurchases divided by No. of sales. Stocks are sorted according to No. of Repurchases.

Panel A: Top 20 funds repurchasing most

Fund Name	No. of Repurchases	No. of Sales	Repurchase rate
VOYA PARTNERS, INC: VY OPPENHEIMER GLOBAL PORTFOLIO	28	34	82%
EQ ADVISORS TRUST: EQ/INVESCO COMSTOCK PORTFOLIO	53	88	60%
OLYMPIC TRUST–SMALL CAP FUND	5	9	56%
INVESTMENT HOUSE FUNDS: INVESTMENT HOUSE GROWTH FUND	34	65	52%
CREDIT SUISSE WARBURG PINCUS VALUE II FUND	27	52	52%
ALLIANCEBERNSTEIN BLENDED STYLE SERIES, INC: ALLIANCEBERNSTEIN 2040 RETIREMENT STRATEGY	900	1877	48%
AMG FUNDS I: AMG FRONTIER SMALL CAP GROWTH FUND	73	153	48%
COLUMBIA FUNDS SERIES TRUST II: COLUMBIA GLOBAL EQUITY VALUE FUND	58	123	47%
UNION INVESTORS VALUE MOMENTUM	7	15	47%
ALLIANCEBERNSTEIN BLENDED STYLE SERIES, INC: ALLIANCEBERNSTEIN 2055 RETIREMENT STRATEGY	241	530	45%
VOYA INVESTORS TRUST: VOYA MULTI-MANAGER LARGE CAP CORE PORTFOLIO	66	148	45%
VOYA PARTNERS, INC: VY AMERICAN CENTURY SMALL-MID CAP VALUE PORTFOLIO	217	494	44%
DAVIS SERIES, INC: DAVIS APPRECIATION & INCOME FUND	23	54	43%
BLACKROCK FUNDS: BLACKROCK ENERGY & RESOURCES PORTFOLIO	62	156	40%
VOYA EQUITY TRUST: VOYA LARGE CAP VALUE FUND	44	114	39%
JACKSON NATIONAL CAP MGMT:GROWTH FUND	153	397	39%
CREDIT SUISSE TRUST: US EQUITY FLEX II PORTFOLIO	6	16	38%
MEMBERS MUTUAL FUNDS: SMALL CAP FUND	43	115	37%
VOYA INVESTORS TRUST: VOYA LARGE CAP GROWTH PORTFOLIO	40	107	37%
BLACKROCK FUNDS: GLOBAL RESOURCES PORTFOLIO	86	231	37%

Panel B: Top 20 stocks most frequently repurchased

Company Name	No. of Repurchases	No. of Sales	Repurchase rate
INTERNATIONAL BUSINESS MACHS COR	1272	11940	11%
TEXAS INSTRUMENTS INC	1241	11771	11%
INTEL CORP	1238	10593	12%
HEWLETT PACKARD CO	1228	12413	10%
MICROSOFT CORP	1067	7730	14%
PFIZER INC	1066	11425	9%
GENERAL ELECTRIC CO	1065	9598	11%
JOHNSON & JOHNSON	1052	10797	10%
MOTOROLA INC	1042	12266	8%
E M C CORP MA	1026	10503	10%
PROCTER & GAMBLE CO	995	9183	11%
HALLIBURTON COMPANY	966	10312	9%
QUALCOMM INC	936	7110	13%
AMGEN INC	935	8770	11%
MORGAN STANLEY DEAN WITTER D & C	931	8268	11%
GILEAD SCIENCES INC	914	6021	15%
HOME DEPOT INC	900	9330	10%
DISNEY WALT PRODUCTIONS	895	10335	9%
GOLDMAN SACHS GROUP INC	886	7130	12%
BANK OF AMERICA CORP	880	7203	12%

C Correlations

This table shows pairwise correlation coefficients between all variables used in our analysis. A detailed description of all variables is contained in Appendix A. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

	Winner (first-in -first-out)	Winner (average purchase price)	Price up	Team managed managed	Manager change	Fund size	Fund age	Fund turnover ratio	Fund expense ratio	Fund return volatility	Fund perfor- -mance rank
Winner (first-in-first-out)	1.000										
Winner (average purchase price)	0.955***	1.000									
Price Up	0.017***	0.017***	1.000								
Team managed	0.004***	0.003***	0.010***	1.000							
Manager Change	-0.002***	-0.002***	0.000	-0.033***	1.000						
Fund Size	0.038***	0.042***	0.021***	-0.013***	-0.004***	1.000					
Fund Age	0.024***	0.028***	0.018***	-0.062***	0.016***	0.388***	1.000				
Fund Turnover Ratio	-0.025***	-0.025***	-0.011***	-0.052***	0.019***	-0.196***	-0.109***	1.000			
Fund Expense Ratio	-0.027***	-0.028***	-0.019***	-0.031***	0.009***	-0.352***	-0.213***	0.295***	1.000		
Fund Return Volatility	-0.192***	-0.194***	-0.071***	-0.015***	0.005***	-0.081***	-0.078***	0.098***	0.074***	1.000	
Fund Ranking	0.047***	0.046***	0.043***	-0.017***	0.002***	0.053***	0.027***	-0.064***	-0.096***	-0.137***	1.000

D The abnormal returns in excess of market returns and repurchasing bias

This table examines whether mutual funds are more likely to repurchase previous winners compared with previous losers using market-adjusted returns. The model used is the same as in Table 3. The dependent variable is Repurchase, a dummy variable equal to one if the stock sold is repurchased by the fund in the quarter within one year after the sale. The variable of interest is Winner, which equals one if the returns from the previous stock sale were higher than the S&P 500. The average purchasing price is calculated either following first in first out principal or taking value-weighted average of all purchase price before the sale. Control variables include fund characteristics (Fund Size, Fund Age, Fund Turnover Ratio, Fund Expense Ratio, Fund Return Volatility, Fund Ranking), which are all defined in Appendix A. Column (1) and (4) are univariate models. Column (2) and Column (5) control for all the fund characteristics. Stock, fund, and time fixed effects are included in these regressions. Column (3) and Column (6) further control for fund×time fixed effects. t-statistics are provided in parentheses. The standard errors are clustered by fund. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

	First-in-first-out			Average purchasing price		
	(1)	(2)	(3)	(4)	(5)	(6)
Winner	0.008***	0.009***	0.009***	0.009***	0.009***	0.009***
	(22.59)	(21.47)	(27.99)	(23.67)	(22.45)	(28.75)
Fund Size		0.003***			0.003***	
		(3.26)			(3.24)	
Fund Age		0.000			0.000	
		(0.16)			(0.15)	
Fund Turnover Ratio		0.005***			0.005***	
		(7.18)			(7.20)	
Fund Expense Ratio		-0.186			-0.187	
		(-0.53)			(-0.53)	
Fund Return Volatility		-0.008			-0.008	
		(-0.70)			(-0.69)	
Fund Ranking		-0.005***			-0.005***	
		(-2.92)			(-2.92)	
Stock Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Fund Fixed Effects	Yes	Yes	No	Yes	Yes	No
Time Fixed Effects	Yes	Yes	No	Yes	Yes	No
Fund×Time Fixed Effects	No	No	Yes	No	No	Yes
Observations	6,925,749	5,643,802	6,918,625	6,929,090	5,646,569	6,921,982
Adjusted R^2	0.038	0.040	0.115	0.039	0.040	0.115

E The tax saving wash-sale rule and repurchasing bias

This section examines whether the finding that previous winners are more likely to be repurchased by mutual funds than previous losers is driven by the wash-sale rule. The "wash-sale rule" refers to the fact that if a stock sold for a loss is repurchased within 30 days, taxpayers cannot claim the capital loss. If mutual funds try to minimize tax consequences to fund investors, they may be less likely to repurchase previous losers in the month after selling the stocks. We, therefore, exclude all observations in the first quarter after the sale to address the possibility of this tax saving behavior. Results are presented below.

The table contains results of the same linear probability models as in Table 3. Observations within the first quarter after a stock is sold have been excluded from the sample. t-statistics are provided in parentheses. The standard errors are clustered by fund. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

	First-in-first-out			Average purchase price		
	(1)	(2)	(3)	(4)	(5)	(6)
Winner	0.006***	0.007***	0.007***	0.007***	0.007***	0.008***
	(18.78)	(18.22)	(23.36)	(19.78)	(19.00)	(24.22)
Fund size		0.003***			0.003***	
		(3.86)			(3.85)	
Fund age		-0.000**			-0.000**	
		(-2.06)			(-2.07)	
Fund turnover ratio		0.004***			0.004***	
		(6.48)			(6.51)	
Fund expense ratio		0.120			0.114	
		(0.50)			(0.48)	
Fund return volatility		-0.006			-0.006	
		(-0.62)			(-0.62)	
Fund performance rank		-0.005***			-0.005***	
		(-3.68)			(-3.67)	
Stock fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Fund fixed effects	Yes	Yes	No	Yes	Yes	No
Time fixed effects	Yes	Yes	No	Yes	Yes	No
Fund×Time fixed effects	No	No	Yes	No	No	Yes
Observations	4,896,131	3,988,699	4,887,814	4,899,471	3,991,197	4,891,169
Adjusted R^2	0.031	0.032	0.084	0.031	0.032	0.084

F Current flows and repurchasing bias

This table contains the results of the linear probability models with interaction terms of winner dummies and the current inflow dummy. The dependent variable is Repurchase, a dummy variable equal to one if the stock sold is repurchased by the fund in the quarter within one year after the sale. Current Inflow is a dummy variable equal to one if the fund encountered an inflow when selling the stock. Winner is equal to one if a stock was sold for a gain, and zero otherwise. The winner dummy is based on the difference between selling price and average purchase price. The average purchase price is calculated either following first-in-first-out, low-in-first-out, high-in-first-out, and last-in-first-out principles or by taking the value-weighted average of all purchase prices before the sale. We also use the last holding period return to measure the previous trading experience. We include an interaction term between Current Inflow and the winner dummies in the regressions. Control variables include fund characteristics (Fund size, Fund age, Fund turnover ratio, Fund expense ratio, Fund return volatility, Fund performance rank), which are all defined in Appendix A. t-statistics are provided in parentheses. The standard errors are clustered by fund. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

	first-in-first-out			Average price			Low in first out			High in first out			Last in first out			Last holding period return		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(17)	(18)	(15)	(15)
Winner × Current Inflow	0.001*	0.002*	0.001	0.001	0.001	0.001	0.001	0.002*	0.001	0.001*	0.002*	0.001	0.002*	0.002*	0.001	0.002**	0.002**	0.00
	(1.66)	(1.68)	(0.90)	(1.55)	(1.54)	(0.95)	(1.62)	(1.66)	(0.91)	(1.70)	(1.70)	(1.10)	(1.77)	(1.76)	(1.09)	(2.28)	(2.27)	(0.88
Winner	0.008***	0.009***	0.009***	0.009***	0.009***	0.009***	0.009***	0.009***	0.009***	0.008***	0.009***	0.009***	0.009***	0.009***	0.009***	0.006***	0.006***	0.007*
	(15.62)	(16.18)	(22.24)	(16.78)	(17.38)	(22.81)	(16.63)	(17.14)	(22.85)	(16.60)	(17.12)	(22.98)	(16.67)	(17.14)	(22.90)	(10.33)	(10.81)	(16.8
Current Inflow	-0.000	-0.001	-0.002***	0.000	-0.001	-0.003***	-0.000	-0.001	-0.003***	-0.000	-0.001	-0.003***	-0.000	-0.001	-0.003***	-0.000	-0.001	-0.002
	(-0.02)	(-1.03)	(-4.19)	(0.02)	(-0.96)	(-4.28)	(-0.03)	(-1.05)	(-4.33)	(-0.03)	(-1.03)	(-4.34)	(-0.00)	(-1.01)	(-4.24)	(-0.05)	(-1.07)	(-4.23
Fund Size		0.003***			0.003***			0.003***			0.003***			0.003***			0.003***	
		(3.24)			(3.22)			(3.23)			(3.22)			(3.30)			(3.18)	
Fund Age		0.000			0.000			0.000			0.000			0.000			0.000	
		(0.13)			(0.12)			(0.20)			(0.21)			(0.23)			(0.11)	
Fund Turnover Ratio		0.005***			0.005***			0.005***			0.005***			0.005***			0.005***	
		(7.13)			(7.15)			(7.09)			(7.08)			(7.07)			(7.23)	
Fund Expense Ratio		-0.157			-0.159			-0.169			-0.170			-0.176			-0.153	
		(-0.45)			(-0.46)			(-0.49)			(-0.49)			(-0.51)			(-0.45)	
Fund Return Volatility		-0.007			-0.007			-0.007			-0.007			-0.007			-0.008	
		(-0.62)			(-0.61)			(-0.63)			(-0.64)			(-0.64)			(-0.66)	
Fund Ranking		-0.005***			-0.005***			-0.004***			-0.004***			-0.004***			-0.005***	
		(-2.91)			(-2.91)			(-2.84)			(-2.83)			(-2.78)			(-3.02)	
Stock fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fund fixed effects	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No
Time fixed effects	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No
Fund×Time fixed effects	No	No	Yes	No	No	Yes	No	No	Yes	No	No	Yes	No	No	Yes	No	No	Yes
Observations	6,018,515	5,567,672	6,012,949	6,022,947	5,571,229	6,017,400	5,942,433	5,497,965	5,936,805	5,905,287	5,462,193	5,899,613	5,853,685	5,413,289	5,847,929	6,236,372	5,754,394	6,231,0
Adjusted R^2	0.039	0.040	0.111	0.039	0.040	0.111	0.039	0.040	0.111	0.039	0.040	0.111	0.039	0.040	0.111	0.039	0.040	0.110

G Robustness checks with different winner measures

This section contains robustness checks using various winner measures. We calculate the purchase price of stocks with low-in-first-out and high-in-first-out principles following Cici (2012) and compare the purchase price with the selling price to determine whether the stock was sold for a gain or a loss. We further use the last-in-first-out principle to calculate the purchase price. Prior studies on the disposition effect find that investors tend to sell stocks with recent gains, thus, they seem to focus on recent performance rather than historical averages (Odean (1998), Grinblatt and Keloharju (2001) and Jackson (2003)). Therefore, we additionally use the last holding period returns of a stock by a mutual fund to measure the previous trading experience: a stock is defined to be a previous winner if the last holding period return of the stock by the fund is positive. We rerun all the analyses from Table 2 to Table 8 and present the results as follows.

Table F.1: Repurchase of stocks previously sold for a gain versus stocks previously sold for a loss

	(1) Low-in-first-out	(2) High-in-first-out	(3) Last-in-first-out	(4) Last holding period return
No. of winners repurchased	200,464	199,715	196,385	192,616
Opportunities to repurchase winners	3,382,109	3,392,342	3,330,870	3,378,140
Proportion of winners repurchased (PWR)	0.059	0.059	0.059	0.057
No. of Losers Repurchased	156,987	154,855	154,577	180,420
Opportunities to repurchase losers	3,373,128	3,320,660	3,324,279	3,731,132
Proportion of losers repurchased (PLR)	0.047	0.047	0.046	0.048
Diff (PWR-PLR)	0.013***	0.012***	0.012***	0.009***
t-stats (PWR=PLR)	(16.87)	(16.16)	(16.40)	(11.86)

Table F.2: Are previous winners more likely to be repurchased by funds?

	Low in first out			High in first out			Last in first out			Last holding period winner		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Winner	0.009***	0.010***	0.009***	0.009***	0.010***	0.009***	0.009***	0.010***	0.009***	0.006***	0.007***	0.007***
	(25.31)	(23.76)	(30.45)	(25.56)	(24.06)	(30.82)	(25.46)	(23.79)	(30.69)	(16.33)	(15.87)	(21.71)
Fund size		0.003***			0.003***			0.003***			0.003***	
		(3.21)			(3.21)			(3.29)			(3.16)	
Fund age		0.000			0.000			0.000			0.000	
		(0.23)			(0.24)			(0.26)			(0.12)	
Fund turnover ratio		0.005***			0.005***			0.005***			0.005***	
		(7.16)			(7.15)			(7.13)			(7.28)	
Fund expense ratio		-0.187			-0.189			-0.193			-0.167	
		(-0.54)			(-0.55)			(-0.56)			(-0.49)	
Fund return volatility		-0.008			-0.008			-0.008			-0.008	
		(-0.71)			(-0.72)			(-0.72)			(-0.72)	
Fund performance rank		-0.005***			-0.004***			-0.004***			-0.005***	
		(-2.85)			(-2.85)			(-2.78)			(-3.03)	
Stock fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fund fixed effects	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No
Time fixed effects	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No
Fund×Time fixed effects	No	No	Yes	No	No	Yes	No	No	Yes	No	No	Yes
Observations	6,755,036	5,522,582	6,747,697	6,712,804	5,486,756	6,705,416	6,654,949	5,437,816	6,647,472	7,109,075	5,782,484	7,102,299
Adjusted R^2	0.039	0.040	0.115	0.039	0.040	0.115	0.038	0.040	0.114	0.038	0.040	0.114

Table F.3: The impact of subsequent price changes of sold stocks on repurchasing probability

	Low in first out			High in first out			Last in first out			Last holding period winner		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Winner × Price up	-0.011***	-0.011***	-0.011***	-0.011***	-0.011***	-0.012***	-0.011***	-0.011***	-0.011***	-0.009***	-0.009***	-0.009***
	(-19.10)	(-18.11)	(-21.49)	(-19.24)	(-18.33)	(-21.84)	(-18.96)	(-17.98)	(-21.20)	(-17.08)	(-16.18)	(-18.76)
Winner	0.016***	0.017***	0.017***	0.016***	0.017***	0.017***	0.016***	0.017***	0.017***	0.012***	0.013***	0.013***
	(34.50)	(33.42)	(40.85)	(34.70)	(33.49)	(41.45)	(34.49)	(33.15)	(40.92)	(25.83)	(25.05)	(32.70)
Price up	0.020***	0.021***	0.021***	0.020***	0.021***	0.021***	0.020***	0.021***	0.021***	0.018***	0.019***	0.019***
	(32.79)	(32.01)	(34.66)	(33.00)	(32.26)	(34.87)	(32.92)	(32.21)	(34.82)	(29.34)	(28.57)	(31.15)
Fund size		0.003***			0.003***			0.003***			0.003***	
		(2.72)			(2.71)			(2.80)			(2.66)	
Fund age		0.000			0.000			0.000			0.000	
		(0.34)			(0.37)			(0.37)			(0.30)	
Fund turnover ratio		0.005***			0.005***			0.005***			0.005***	
		(6.78)			(6.76)			(6.74)			(6.86)	
Fund expense ratio		-0.362			-0.368			-0.366			-0.341	
		(-1.00)			(-1.02)			(-1.02)			(-0.96)	
Fund return volatility		-0.009			-0.009			-0.009			-0.009	
		(-0.67)			(-0.67)			(-0.67)			(-0.71)	
Fund performance rank		-0.005***			-0.005***			-0.005***			-0.005***	
		(-3.03)			(-3.04)			(-2.99)			(-3.22)	
Stock fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fund fixed effects	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No
Time fixed effects	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No
Fund×Time fixed effects	No	No	Yes	No	No	Yes	No	No	Yes	No	No	Yes
Observations	5,239,401	4,519,043	5,231,797	5,202,932	4,487,850	5,195,278	5,155,677	4,446,844	5,147,916	5,469,479	4,703,834	5,462,128
Adjusted R^2	0.042	0.043	0.120	0.042	0.043	0.120	0.041	0.043	0.120	0.041	0.043	0.120

Table F.4: Team- or single- managed funds and repurchasing behavior

	Low in first out		High in first out		Last in first out		Last holding period winner	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Winner × Team managed	0.002*	0.002*	0.002**	0.002**	0.002**	0.002**	0.001	0.001
	(1.93)	(1.87)	(2.07)	(1.99)	(2.06)	(1.99)	(0.68)	(0.58)
Winner	0.008***	0.008***	0.008***	0.008***	0.008***	0.008***	0.006***	0.007***
	(12.01)	(11.47)	(11.95)	(11.43)	(11.91)	(11.38)	(9.78)	(9.45)
Team managed	-0.001	-0.000	-0.001	-0.000	-0.001	-0.001	0.000	0.000
	(-0.51)	(-0.32)	(-0.53)	(-0.33)	(-0.55)	(-0.35)	(0.04)	(0.23)
Fund size		0.003***		0.003***		0.003***		0.003***
		(2.94)		(2.95)		(3.01)		(2.92)
Fund age		0.000		0.000		0.000		0.000
		(0.87)		(0.89)		(0.87)		(0.74)
Fund turnover ratio		0.005***		0.005***		0.005***		0.005***
		(6.81)		(6.80)		(6.78)		(6.93)
Fund expense ratio		-0.242		-0.244		-0.246		-0.231
		(-0.66)		(-0.67)		(-0.68)		(-0.64)
Fund return volatility		-0.006		-0.007		-0.007		-0.006
		(-0.53)		(-0.54)		(-0.55)		(-0.54)
Fund performance rank		-0.005***		-0.005***		-0.005***		-0.005***
		(-2.95)		(-2.94)		(-2.87)		(-3.10)
Stock fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fund fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5,538,255	5,222,301	5,503,401	5,188,464	5,454,957	5,141,630	5,811,030	5,464,624
Adjusted R^2	0.040	0.041	0.040	0.041	0.040	0.040	0.039	0.040

Table F.5: Repurchasing behavior after manager change

	Low in first out			High in first out			Last in first out			Last holding period winner		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Winner × Manager change	-0.004**	-0.004*	-0.002	-0.004*	-0.004*	-0.002	-0.004**	-0.004*	-0.002	-0.002	-0.002	-0.000
	(-2.09)	(-1.87)	(-1.38)	(-1.93)	(-1.77)	(-1.29)	(-1.96)	(-1.76)	(-1.29)	(-1.05)	(-1.10)	(-0.14)
Winner	0.009***	0.010***	0.009***	0.009***	0.010***	0.009***	0.009***	0.010***	0.009***	0.006***	0.007***	0.007***
	(25.05)	(23.46)	(30.09)	(25.38)	(23.83)	(30.49)	(25.22)	(23.50)	(30.35)	(16.28)	(15.77)	(21.31)
Manager change	-0.002	-0.001	-0.001	-0.002	-0.001	-0.001	-0.002	-0.001	-0.001	-0.003*	-0.001	-0.002
	(-1.12)	(-0.51)	(-0.94)	(-1.17)	(-0.55)	(-0.91)	(-1.25)	(-0.65)	(-0.95)	(-1.73)	(-0.91)	(-1.51)
Fund size		0.003***			0.003***			0.003***			0.003***	
		(3.21)			(3.21)			(3.29)			(3.16)	
Fund age		0.000			0.000			0.000			0.000	
		(0.25)			(0.26)			(0.27)			(0.14)	
Fund turnover ratio		0.005***			0.005***			0.005***			0.005***	
		(7.18)			(7.17)			(7.15)			(7.30)	
Fund expense ratio		-0.186			-0.188			-0.192			-0.166	
		(-0.54)			(-0.54)			(-0.56)			(-0.49)	
Fund return volatility		-0.008			-0.008			-0.008			-0.008	
		(-0.71)			(-0.72)			(-0.72)			(-0.72)	
Fund performance rank		-0.005***			-0.004***			-0.004***			-0.005***	
		(-2.85)			(-2.85)			(-2.78)			(-3.03)	
Stock fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fund fixed effects	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No
Time fixed effects	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No
Fund×Time fixed effects	No	No	Yes	No	No	Yes	No	No	Yes	No	No	Yes
Observations	6,755,036	5,522,582	6,747,697	6,712,804	5,486,756	6,705,416	6,654,949	5,437,816	6,647,472	7,109,075	5,782,484	7,102,299
Adjusted R^2	0.039	0.040	0.115	0.039	0.040	0.115	0.038	0.040	0.114	0.038	0.040	0.114

Table F.6: Repurchasing behavior after a manager leaves a single-managed fund

	Low in first out		High in first out		Last in first out		Last holding period winner	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Single-managed funds								
Winner	0.003***	0.003***	0.003***	0.003***	0.003***	0.003***	0.002***	0.002***
	(4.34)	(4.52)	(4.24)	(4.41)	(4.08)	(4.26)	(3.01)	(3.11)
Observations	103,970	103,796	103,306	103,135	102,433	102,261	109,453	109,282
Adjusted R^2	0.092	0.193	0.092	0.194	0.091	0.192	0.091	0.191
Panel B: Single-managed funds and only managers in charge of one fund								
Winner	0.003***	0.003***	0.003***	0.003***	0.003***	0.002***	0.002***	0.002***
	(4.02)	(4.00)	(3.95)	(3.93)	(3.71)	(3.71)	(2.79)	(2.98)
Observations	93,627	93,422	93,003	92,801	92,198	91,995	98,859	98,657
Adjusted R^2	0.107	0.208	0.107	0.209	0.105	0.207	0.106	0.205
Manager fixed effects	Yes	No	Yes	No	Yes	No	Yes	No
Time fixed effects	Yes	No	Yes	No	Yes	No	Yes	No
Manager×Time fixed effects	No	Yes	No	Yes	No	Yes	No	Yes

H Stock returns on repurchased stocks after the repurchase after controlling for stock characteristics

This section examines whether the underperformance of repurchased winners compared to repurchased losers after the repurchase is due to the difference in stock characteristics. The sample includes the repurchased winner and loser stocks that are used to form portfolios in Table 11. The dependent variable is the quarterly stock returns in the quarter after the repurchase. The main independent variable, Winner, is equal to one if a stock was sold for a gain, and zero otherwise. The winner dummy is based on the difference between selling price and average purchase price. The average purchase price is calculated either following the first-in-first-out principle or by taking the value-weighted average of all purchase prices before the sale. Control variables are stock characteristics including firm size (Log of market capitalization), book-to-market ratio, earning-to-asset ratio, cash flow per share, debt ratio, liquidity ratio, stock volatility (standard deviation of monthly returns in the previous 12 months), and market beta. t-statistics are provided in parentheses. Standard errors are clustered by stock. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Winner measure:	First-in-first-out (1)	Average purchase price (2)
Winner	-0.005***	-0.006***
	(-3.29)	(-3.40)
Size	-0.009***	-0.009***
	(-10.42)	(-10.38)
Book/Market	-0.041***	-0.041***
	(-8.65)	(-8.62)
Earning power	-0.160***	-0.150***
	(-2.74)	(-2.62)
Cash flow per share	0.001***	0.001***
	(4.62)	(4.67)
Debt ratio	0.008	0.008
	(1.26)	(1.25)
Liquidity ratio	-0.055***	-0.056***
	(-5.53)	(-5.54)
Stock volatility	0.125***	0.126***
	(4.40)	(4.43)
Market beta	0.008***	0.008***
	(4.09)	(4.07)
Industry fixed effects	Yes	Yes
Time fixed effects	Yes	Yes
Observations	53,622	53,643
Adjusted R^2	0.236	0.236