JOURNAL OF FINANCIAL AND QUANTITATIVE ANALYSIS Vol. 50, No. 4, Aug. 2015, pp. 729–755
COPYRIGHT 2015, MICHAEL G. FOSTER SCHOOL OF BUSINESS, UNIVERSITY OF WASHINGTON, SEATTLE, WA 98195
doi:10.1017/S0022109015000125

https://doi.org/10.1017/S0022109015000125 Published online by Cambridge University Press

You're Fired! New Evidence on Portfolio Manager Turnover and Performance

Leonard Kostovetsky and Jerold B. Warner*

Abstract

We study managerial turnover for both internally managed mutual funds and those managed externally by subadvisors. We argue that turnover of subadvisors provides sharper tests and helps address several unresolved issues and puzzles from the previous literature. We find dramatically stronger inverse relations between subadvisor departures and lagged returns, and new evidence on how past flow predicts turnover. We find no evidence of improvements in return performance related to departures, but flow improvements are associated with departures of poor past performers. Our findings represent new evidence on how investors, sponsors, and boards learn about and evaluate mutual fund management performance.

I. Introduction

This paper examines manager departures for both internally managed mutual funds and those managed externally by subadvisors. Our sample focuses on actively managed domestic equity funds over the 1995–2009 period and contains a large number of departures (11,405 departures for internal managers and 695 for subadvisors). A new and central feature of our experimental design is the study of subadvisor departures and the comparison to internal manager departures. This feature allows us to fill a big gap in our understanding of the motivation for and consequences of turnover, and helps us to address several unresolved issues and puzzles from the previous literature.

First, while previous work shows an inverse relation between the likelihood of fund manager turnover and lagged fund performance measures (e.g., Khorana (1996), Chevalier and Ellison (1999b)), it is notable that the relation is very weak. For example, even conditional on return performance in the bottom decile, annual portfolio manager turnover is only 14% (Khorana (1996), Tab. 4) and

*Kostovetsky (corresponding author), kostovet@bc.edu, Boston College, Carroll School of Management, Chestnut Hill, MA 02467; Warner, warner@simon.rochester.edu, University of Rochester, Simon School, Rochester, NY 14627. We thank Stephen Brown (the editor), Dan Burnside (Federated Clover Capital), Robert Novy-Marx, Jonathan Reuter (the referee), Bill Schwert, Toni Whited, and seminar participants at the University of Rochester and the 2013 American Finance Association (AFA) San Diego meetings for helpful comments. This paper was written while Kostovetsky was at the University of Rochester.

only recent (i.e., 1 or 2 years) performance matters. One possible explanation for these findings is that mutual fund manager turnover data are noisy: it is difficult to distinguish between forced and voluntary departures, biasing downward any estimate of the true turnover–performance relation. We argue that subadvisor turnover provides sharper tests of any underlying board and sponsor monitoring, because these data are heavily weighted toward involuntary turnover, which is key in understanding monitoring. Departures by in-house managers are more likely to be voluntary, because good performance gives in-house managers better opportunities, such as joining hedge funds (see Kostovetsky (2010)), causing them to leave. In contrast, outperforming subadvisors can take advantage of expanded opportunities by simply adding clients. Thus, subadvisor data reduce classification error in distinguishing between voluntary and involuntary turnover, a well-known problem that has vexed management turnover researchers. About 15% of mutual funds employ subadvisors, and the outsourcing of portfolio management to subadvisors has recently received much attention (e.g., Cashman and Deli (2009), Chen, Hong, Jiang, and Kubik (2013), Del Guercio, Reuter, and Tkac (2009), Kuhnen (2009), and Duong (2010)), but our perspective on subadvisors is unique.

Consistent with these arguments for examining subadvisor turnover, we find that turnover–performance sensitivity is dramatically stronger for subadvisors. For example, cumulative turnover rates for internal managers in the top and bottom quintiles of 6-year performance differ only modestly: 73.3% versus 54.0%, respectively. In contrast, the corresponding figures for subadvisor turnover are 57.2% and 19.5%, respectively, showing far more sensitivity of turnover to past performance. The overall level of turnover is higher for managers than for subadvisors, because individuals, unlike firms, might stop managing a fund due to retirement, illness, death, change of responsibilities within the firm, or moving to another firm. Furthermore, we take care to ensure that any differences in the internal and subadvisor turnover patterns are not driven by differences in fund characteristics and the choice of whether to outsource. We also show that the use of subadvisors to focus on involuntary turnover is far more informative than the standard classification method (see Chevalier and Ellison (1999b), Hu, Hall, and Harvey (2000)).

A second area we address is which performance metrics are used by sponsors and boards. The literature suggests that only past return performance, but not flow, is an independent predictor of departures. We examine the potential importance of flow in more detail, with the subadvisor data having an important role. Our tests show that a fund's abnormal flow ("flow alpha"), defined as the abnormal flow after adjusting for the fact that flow chases past returns, is an independent negative predictor of internal manager turnover, at least for newer managers. The results suggest that the perceived ability of a manager to attract flow ("marketing ability") above and beyond flow resulting from return chasing is an additional aspect of performance to which boards and sponsors pay attention. Flow alpha should not predict subadvisor departures, however. The subadvisor is generally in charge of money management but not marketing the fund to attract investors. This prediction is borne out by our results. Collectively, these various pieces of evidence on how past performance metrics predict departures extend our understanding of how learning about active management takes place (e.g., Lynch and

https://doi.org/10.1017/S0022109015000125 Published online by Cambridge University Press

Musto (2003), Berk and Green (2004), and Dangl, Wu, and Zechner (2006)), where much remains unknown (Pastor and Stambaugh (2012)).

Third, prior work presents a somewhat puzzling picture of the consequences of portfolio manager changes. In particular, Khorana (2001) shows that return performance reverses following these changes. This is inconsistent with many papers that raise doubts about whether, in the cross section of individual portfolio managers, there is much ability to generate true (as opposed to measured) alpha (e.g., Jensen (1969), Fama and French (2010)). In addition, Goyal and Wahal (2008) show that pension plan sponsors that fire investment managers do not get higher returns from new managers than they would have acquired if they had stayed with their prior fired managers. Our tests show that manager turnover has no effect on future return performance, even when we focus on subadvisor departures, where any underlying effect is more likely to appear. This evidence calls into question whether improvement of return performance is a sensible motivation for replacement decisions and suggests that the learning about performance taking place is mainly about measured alpha, rather than true alpha.

To provide complementary evidence on board and sponsor motivation, we also examine the consequences of internal manager and subadvisor turnover for future flow. Even if boards believe that there exists no true nonzero alpha, it can be rational for them to monitor and respond to measured return performance and to past flow. Investors are return chasers (see, e.g., Sirri and Tufano (1998)). This should be important to fund sponsors and boards, because advisor compensation is generally specified as a linear function of fund net assets and positive flow mechanically increases net assets. We show that turnover is associated with economically significant increases in future flow for poor past performers. The effect is especially strong for subadvised funds. This evidence suggests rational "window dressing" behavior on the part of fund boards (see Chevalier and Ellison (1999b)). Boards appear to be close monitors of performance, in part, because investors chase returns and expect an improvement if management of a poorly performing fund is changed.

Section II discusses the paper's main testable propositions. Section III presents the data. Section IV discusses our main results on the turnover-lagged performance relation, first for internal managers and then for subadvisors. Section V examines fund performance subsequent to turnover. Section VI presents several robustness checks. Section VII concludes.

II. Background and Hypothesis Tests

A. Fund Structure and Portfolio Manager Monitoring

Mutual funds rely on an "investment adviser" or "management company." Adviser responsibilities include portfolio management, as well as marketing the fund, selling and redeeming fund shares, overseeing the fund's transfer agent, and regulatory compliance. The adviser is typically the sponsor who established the fund, but as discussed below, portfolio management is sometimes outsourced to subadvisors. The adviser or subadvisor is, in reality, a firm with a number

https://doi.org/10.1017/S0022109015000125 Published online by Cambridge University Press

of individuals, including analysts, support personnel, and one or more portfolio managers.

The fund's board of directors has a fiduciary responsibility to its shareholders. The board can have both inside and independent outside directors, but the majority usually consists of independent outside directors.[1] Monitoring of the adviser or subadvisor can take place through various mechanisms. Board meetings take place quarterly or sometimes more often. Under Section 15 (c) of the Investment Company Act of 1940, an annual meeting of the fund's board of directors is required to evaluate the advisory contract and to decide whether to change or renew it. The advisory contract with the management company specifies a fee, which is usually a fixed percentage of fund total net assets. As part of the board's monitoring and the 15 (c) renewal process, third party providers, such as Lipper, often provide a variety of benchmarking analyses of the fund's expenses, advisory fees, and investment performance.

Monitoring can lead to a number of actions. For example, the contractual fee in the advisor contract, which is the advisor's marginal compensation rate, can be changed, and both asset growth and return performance are predictors of these changes (Warner and Wu (2011)). However, we cannot study how monitoring affects portfolio manager compensation. Compensation data for portfolio managers are hard to obtain, so we cannot study how the managers' discretionary bonuses and terms of their future compensation contracts are affected by past performance.

In this paper, we focus on departures. We define these as occurring when a portfolio manager leaves or (later in the paper) when a portfolio subadvisor contract is not renewed. The subadvisors are particularly important, because subadvisor departures are less likely to be voluntary. For this reason, the subadvisor data could yield more powerful tests of the paper's hypotheses about board monitoring.

A caution, however, is that a fund's decision to outsource is endogenous. It could be inherently more difficult to monitor portfolio managers of outsourced funds, and they may require steeper incentives (see Chen et al. (2013)), in which case subadvisor departures would be more strongly linked to past performance than for in-house managed funds. As discussed later, we select our subadvisor sample to address this issue, and additional checks suggest that differences in results are not driven by such considerations.

B. Turnover and Lagged Performance

Our initial empirical tests examine which return metrics (and what lag structure of these metrics) predict departures. As in many previous turnover studies, these tests use standard statistical procedures (e.g., probit) and focus on prediction of turnover events.

Our perspective on the economic mechanism underlying turnover prediction is broader than that of many other studies, however. A standard hypothesis implying an inverse relation between turnover and lagged performance is

[1]How board structure and the fraction of independent directors affect turnover is examined elsewhere (e.g., Adams, Mansi, and Nishikawa (2010)).

https://doi.org/10.1017/S0022109015000125 Published online by Cambridge University Press

that the relation reflects the solution to an agency problem between fund managers and fund shareholders and reflects disciplining of management misbehavior (e.g., Khorana (1996)). We test a related but somewhat different economic hypothesis, which is based on the assumption that most if not all of the cross-sectional variation in returns is due to luck rather than skill. Under this hypothesis, an inverse turnover-lagged performance relation would apply even in the absence of agency costs and learning about manager ability. Given that fund investors are return chasers, a close inverse relation between turnover and lagged performance may simply reflect a basic level of board monitoring and marketing skill, if replacing managers of a poorly performing fund improves flow. Under this view, when monitoring occurs, it is a response to external perceptions about manager quality, which may not be reflective of managerial actions that reduce investor wealth.

There are two additional cautions about our examination of the turnover-lagged performance relation. First, the predictions are only directional. Thus, whether an empirical relation can be characterized as strong or weak (and what it implies about whether board monitoring is "optimal") can be judged only relative to a theoretical model, which is beyond the scope of this paper. Interestingly, however, recent work in the practitioner literature by Donoho, Crenian, and Scanlan (2010) argues for the optimality of patience and slow learning in hiring and firing decisions. Using simulation procedures where managers vary in their true skill levels, Donoho et al. show that a minimum of 5 years is required to distinguish among them. Second, our tests examine turnover decisions to make inferences about learning. Turnover decisions require both learning about performance and the decision to act on this learning, but our tests do not disentangle these two related processes.

C. Turnover and Future Performance

To gain additional economic insight into the reasons behind the turnover-lagged performance relation, we study the relation between turnover and future fund variables. First, we examine future return performance. We condition on past return performance and ask if manager turnover at a fund predicts future return performance. We find that turnover does not improve future returns, regardless of the horizon we examine.

Second, we investigate whether turnover has any marginal explanatory power to predict future flow. Our predictive model focuses on flow surprises, taking into account both past return and past flow. The general finding from these tests is that turnover is associated with improved flow for poor performing funds. This suggests that investors pay attention not only to past returns, but also to management changes. Thus, turnover in response to prior poor performance benefits sponsors, even though the underlying mechanism is not improved return performance. The finding that investor flow responds to manager changes is consistent with evidence presented elsewhere. For example, Massa, Reuter, and Zitzewitz (2010) show that flow falls when the manager of a good performing fund departs.

Although flow may largely reflect irrational return chasing, it would not be surprising to also find that such irrational investors pay attention to manager changes. Investor costs of monitoring manager changes seem low; the changes are

https://doi.org/10.1017/S0022109015000125 Published online by Cambridge University Press

tracked by Morningstar and, until recently, fundalarm.com (which closed in Apr. 2011). Anecdotal evidence also supports the plausibility of the view that investors pay attention to mutual fund manager changes. Morningstar sometimes has articles about specific changes, and their analysts give facts and opinions about both departing managers and their replacements.[2] Furthermore, changes in Morningstar fund ratings predict fund flow (Del Guercio and Tkac (2008)), so what Morningstar says appears to influence some investors. The general importance of fund manager changes is also highlighted in news articles elsewhere.[3]

III. Data and Descriptive Statistics

The paper studies domestic, diversified, actively managed mutual funds that are found in both the Morningstar and Center for Research in Security Prices (CRSP) databases. The main data sources are Morningstar Principia CD-ROM, the CRSP survivor-bias-free mutual fund database, and the Thompson Financial mutual fund holdings database, which is linked to CRSP with Mutual Fund Links (MFLINKS). This section discusses fund characteristics and the sample of internal manager changes. Section IV shows the turnover–performance relation for internal managers and compares these baseline results against a sample of subadvisor departures.

A. Sample Selection

1. Funds

We obtain our final sample of mutual funds using the following process. First, the CRSP and Morningstar databases are matched by ticker symbol or (if ticker symbol is missing) by fund name. We then exclude all mutual funds outside the following six objective classes: aggressive growth (AGG), growth (GRO), growth and income (GRI), mid cap (GMC), small cap (SCG), and equity income (ING). We eliminate index funds by looking for the words "index," "S&P," "Dow Jones," and "NASDAQ" in the fund name and by excluding all funds in the Dimensional Fund Advisors (DFA), Direxion, Potomac, ProFunds, and Rydex fund families. We aggregate funds across fund classes into portfolios using the Morningstar portfolio identifier (PORTCODE) or Mutual Fund Links (MFLINKS) variable (WFICN). Finally, we remove incubated funds by excluding all portfolio–month observations for which a fund has never previously had at least $5 million in assets under management, and those observations without a fund name in the CRSP Annual Database. The paper's sample has 329,464 portfolio–month observations, with the number of funds growing from 986 in Jan. 1995 to 2,042 in Dec. 2009.

[2]See, for example "Four Questions to Ask When a Manager Leaves," by David Kathman at Morningstar (June 6, 2007), "Top International Manager Leaves Oppenheimer for TCW," by Ryan Leggio at Morningstar (Mar. 3, 2011).

[3]See, for example, "When Mutual Fund Managers Change Managers," by Michael Maiello at forbes.com (Mar. 6, 2009), "Changing of the Guard," by Jonathan Burton at marketwatch.com (Jan. 30, 2010).

https://doi.org/10.1017/S0022109015000125 Published online by Cambridge University Press

https://doi.org/10.1017/S0022109015000125 Published online by Cambridge University Press

2. Managers

The total number of internal manager changes we examine is 11,405. Our source for information on manager names and tenures is the Annual Morningstar Principia CD-ROM. A departure from a fund occurs (*Manager left* equals 1) when a particular manager is managing the fund in the current month and not managing the fund in the subsequent month. This could occur when the fund closes and its assets are liquidated or merged into a different fund (*Fund closed* equals 1) or when the manager exits while the fund continues operating under different management (*Manager left/fund survived* equals 1). Our focus throughout this paper is on the latter case, because we are interested in understanding the determinants of the decision to replace the manager rather than the decision to close the fund.

Many papers have documented the growth in team management at mutual funds over the last decade (e.g., Massa et al. (2010)). Team management is relevant for us because it is not self-evident how to treat fund–month observations where some but not all of the managers depart. Our approach is to look at fund-manager–month observations so that each manager at each fund (in each month) is a separate observation. The paper's conclusions are not sensitive to how we handle the issue, but our procedure increases the proportion of sample departures (and the effect on our results) from funds with large teams. We neutralize this bias by attaching a weight equal to 1 divided by the fund's *Team Size* to each observation. As a result, if the sole manager of a mutual fund leaves that fund, that observation is 5 times more important in our regressions than if one manager from a team of five leaves. If all managers leave a fund with a team of five (5 observations with weight of 0.2), this has equal weight in our tests to one manager leaving a single-managed fund.

3. Other Variables

We use the CRSP database to obtain information on mutual fund net (after expenses) returns, assets under management (used for calculating fund flow), and inception dates (used for calculating fund age). We use a hand-gathered data set for manager characteristics such as age and education (see Kostovetsky (2010) for a description). Thompson Financial provides information on stock holdings of mutual funds, which we use to calculate characteristic-adjusted returns (Daniel, Grinblatt, Titman, and Wermers (DGTW) (1997) adjusted returns).

Portfolio net return is the weighted average (using prior month's assets as weights) of fund-level net returns. We then average this quantity for each portfolio for the prior 12 months to calculate *Net monthly returns, prior 12 months* (and similarly for the other *Net monthly returns* variables). We calculate the *Expected return* and *4-factor alpha* by first using daily fund returns data (only available after 1999) from the previous calendar quarter to calculate the factor loadings on the MKTMRF (market return minus risk-free return), SMB (small stocks' return minus large stocks' return), HML (high book-to-market stocks' return minus low book-to-market stocks' return), and MOM (high past performing stocks' return minus low past performing stocks' return) factors. We use these loadings and realized factor returns in the current month to calculate that month's *Expected return*. We subtract this value from the actual net returns to calculate *4-factor*

alpha. *DGTW-adjusted returns* are calculated using the return of each stock held in the mutual fund's portfolio relative to the return (in the same month) of a typical stock in the same size, book-to-market ratio, and momentum quintile. The fund's *DGTW-adjusted return* is just the weighted average (using portfolio weights) of the stock characteristic-adjusted returns.

B. Summary Statistics

Table 1 presents summary statistics on the main variables. On average, 1.56% of managers leave per month (18.72% per year). Approximately 75% of these departures (1.19% of manager per month) are due to departures, while the

TABLE 1

Summary Statistics for Fund-Level and Manager-Level Variables

Table 1 presents summary statistics for the major fund-level and manager-level variables used in this study. First, we tabulate cross-sectional statistics by month, and then take the time-series average of each statistic across the 180 months of our sample period from Jan. 1995 to Dec. 2009. *Fund assets* is the market value of assets held by the fund at the start of the month, and *Ln fund assets* is the natural logarithm of *Fund assets*. *Family assets* is the market value of assets held by all funds in the fund family at the start of the month, and *Ln family assets* is the natural logarithm of *Family assets*. *Fund age* is the number of years since the fund was first offered, and *Ln fund age* is the natural logarithm of 1 plus *Fund age*. *Team size* is the number of named managers who are managing the fund. *Team size_w* equals *Team size* for values less than or equal to 5 and equals 5 when *Team size* exceeds 5. *Fund closed* is a dummy variable, which equals 1 if the fund ceased operations during that month, and 0 otherwise. *Net monthly returns, prior 12 months* equals the average monthly fund return, net of expenses, over the past 12 months (for 13to24 and 25to36, it is the average return in each of the 2 years preceding the prior 12 months). *4-factor alpha, prior 12 months* equals the average monthly 4-factor alpha over the prior 12 months (using market, size, value, and momentum factors), where factor loadings are calculated using daily fund returns in the prior calendar quarter. *DGTW-adj. returns, prior 12 months* equals the average monthly DGTW-adjusted return over the prior 12 months. *Mgr tenure* is the number of years (rounded down to the nearest integer) that the manager has been managing the fund, and *Mgr tenure_w* equals *Mgr tenure* for values less than or equal to 10 and equals 10 when *Mgr tenure* exceeds 10. *Manager age* is the age of the manager, while *Manager female* is a dummy variable, which equals 1 if the manager is a female, and 0 otherwise. *Mgr graduate degree* is a dummy variable, which equals 1 if the manager has a graduate degree, and 0 otherwise. *Mgr undegrad median SAT* equals the median SAT (as of 2005) of new entrants at the undergrad institution attended by the manager. *Manager left* is a dummy variable, which equals 1 if the manager left the fund by the end of the month, and 0 otherwise. *Manager left/fund survived* is a dummy variable, which equals 1 if the manager left the fund but the fund did not close, and 0 otherwise. For manager-level variables, each manager-fund-date observation is weighted by 1/*Team size* so that each fund has equal weight.

Variable	Mean 1	Median 2	Std. Dev. 3	10% 4	90% 5
Fund assets ($Mil)	1,027	161	4,058	14	1,944
Ln fund assets ($Mil)	5.10	5.06	1.88	2.63	7.55
Family assets ($Mil)	20,441	3,236	59,159	91	39,226
Ln family assets ($Mil)	7.67	7.92	2.37	4.44	10.52
Fund age (years)	10.34	7.07	10.07	1.68	24.59
Ln fund age (years)	2.07	2.07	0.84	0.96	3.23
Team size	2.07	1.50	1.67	1.00	3.59
Team size_w (=1 if ≤5, =5 if >5)	1.94	1.50	1.14	1.00	3.59
Fund closed (monthly dummy variable)	0.39%	0.00%	5.62%	0.00%	0.00%
Net monthly returns, prior 12 months	0.61%	0.57%	0.86%	−0.40%	1.67%
Net monthly returns, prior 13to24	0.82%	0.79%	0.84%	−0.16%	1.87%
Net monthly returns, prior 25to36	0.97%	0.92%	0.84%	−0.01%	2.01%
4-factor alpha, prior 12 months	−0.13%	−0.12%	0.67%	−0.84%	0.58%
4-Four factor alpha, prior 13to24	−0.11%	−0.11%	0.64%	−0.79%	0.58%
4-factor alpha, prior 25to36	−0.09%	−0.10%	0.64%	−0.77%	0.61%
DGTW-adj. returns, prior 12 months	0.03%	0.02%	0.62%	−0.63%	0.72%
DGTW-adj. returns, prior 13to24	0.05%	0.03%	0.60%	−0.60%	0.73%
DGTW-adj. returns, prior 25to36	0.06%	0.05%	0.59%	−0.51%	0.48%
Mgr tenure	3.94	2.41	4.50	0.00	9.39
Mgr tenure_w (= if ≤10, =10 if >10)	3.50	2.41	3.16	0.00	9.32
Manager age	46.3	44.8	9.6	35.0	60.0
Manager female (dummy variable)	0.102	0.000	0.302	0.000	0.553
Mgr graduate degree (dummy variable)	0.711	1.000	0.453	0.000	1.000
Mgr undegrad median SAT	1,246	1,241	143	1,047	1,437
Manager left (monthly)	1.56%	0.00%	11.92%	0.000%	0.000%
Manager left/fund survived (monthly)	1.19%	0.00%	10.22%	0.000%	0.000%

https://doi.org/10.1017/S0022109015000125 Published online by Cambridge University Press

https://doi.org/10.1017/S0022109015000125 Published online by Cambridge University Press

remaining exits are due to fund closures. *Fund assets* are positively skewed, with a mean of $1.027 billion and a median of $161 million, so we use the natural log of this variable (as well as *Family assets* and *Fund age*) in all the empirical tests. We also use the winsorized version of *Team size* (more than five managers is set to 5) to limit the effect of outliers.

The average fund has earned 0.61% per month (or 7.32% on an annual basis) in net returns over the prior 12 months. The average net returns are higher for the prior 2 years (13 to 24 months and 25 to 36 months) because better-performing funds are more likely to have survived.[4] Average 4-factor alphas (after expenses) over the past year are negative at −0.13% per month, while average DGTW-adjusted returns over the past year (which are buy-and-hold returns and do not include fund expenses or transaction costs) are positive at 0.03% per month.

Finally, we take a look at our manager-level variables. A typical manager at a mutual fund has been managing the fund for 4 years. The average manager's age is about 46 years and 10.2% of managers are women. About 71% of fund managers have an advanced degree such as an MBA or a PhD. The typical Scholastic Aptitude Test (SAT) score (using the old SAT, which was out of 1600 points) of incoming graduates at the undergraduate institution attended by the manager is approximately 1250. These statistics are comparable to prior papers, which use mutual fund manager characteristics (Chevalier and Ellison (1999a)).

IV. Results

A. Manager Turnover and Prior Performance at In-House Managed Funds

In Table 2, we run probit regressions of manager departures (*Manager left/fund survived* dummy variable) on past fund performance and present a set of firm and manager characteristics. Our main goal is to examine whether (and how far back) funds look at past performance when they decide whether to replace the manager. From Table 2, we find a negative relation between manager turnover and prior fund performance, as in previous studies. However, we find that performance going as far back as 5 years is a statistically significant determinant of manager replacements; the regression coefficients are always negative, with *t*-statistics ranging from 1.82 to 5.96. The results are in sharp contrast to the prior literature on manager turnover (e.g., Khorana (1996), Chevalier and Ellison (1999b)), which finds statistically significant results for only the prior 2 years.

One explanation for the different results is our test procedure. Rather than just aggregating all departures, Table 2 forms subsamples that condition on the manager's tenure. For example, when we regress manager replacements on the performance in each of the preceding 4 years (column 4 of Table 2), we include

[4]While this type of survivorship bias is an important concern when estimating average mutual fund returns, it is less of an issue when using prior performance to predict future decisions (as we do in this paper).

TABLE 2

Probit Regressions of Manager Separation on Lagged Returns

Table 2 presents estimated coefficients from probit regressions of the *Manager left/fund survived* variable on lagged performance after controlling for fund and manager controls. Past performance is measured using lagged average monthly DGTW-adjusted returns. All variables are defined in Table 1. Each specification includes time dummies (for each month–year). Each manager-fund-date observation is weighted by 1/*Team size*, so that each fund has equal weight. Observations in which the fund has operated for less than 2 years are dropped. Heteroskedasticity-robust *t*-statistics, allowing for clustering by date, are reported in square brackets. * and ** indicate statistical significance at the 5% and 1% levels, respectively.

	Probit (dependent variable: Manager left/fund survived)				
Predictor Variables	1	2	3	4	5
DGTW-adj. returns, prior 12 months	−7.763**	−8.484**	−10.542**	−13.050**	−13.552**
	[5.71]	[5.74]	[5.77]	[5.96]	[5.76]
DGTW-adj. returns, prior 13to24		−7.800**	−8.226**	−9.236**	−10.354**
		[5.44]	[5.25]	[4.53]	[4.26]
DGTW-adj. returns, prior 25to36			−4.408**	−5.074**	−6.498*
			[2.65]	[2.63]	[2.53]
DGTW-adj. returns, prior 37to48				−4.435*	−3.864
				[2.48]	[1.82]
DGTW-adj. returns, prior 49to60					−4.708*
					[2.30]
Ln fund assets	−0.049**	−0.053**	−0.060**	−0.058**	−0.062**
	[7.13]	[6.75]	[7.01]	[5.84]	[5.76]
Ln family assets	0.051**	0.056**	0.062**	0.066**	0.073**
	[8.73]	[8.79]	[8.63]	[7.80]	[7.63]
Team size_w	0.053**	0.057**	0.054**	0.056**	0.056**
	[7.04]	[7.02]	[5.83]	[5.60]	[4.77]
Ln fund age	0.100**	0.109**	0.115**	0.113**	0.123**
	[6.86]	[6.73]	[6.02]	[4.88]	[4.35]
Mgr tenure_w	−0.018**	−0.021**	−0.025**	−0.030**	−0.035**
	[5.42]	[5.22]	[5.04]	[4.90]	[4.11]
Manager age	−0.002	−0.002	−0.001	−0.002	−0.001
	[1.63]	[1.60]	[1.09]	[1.09]	[0.85]
Manager female	0.043	0.063*	0.038	0.050	0.031
	[1.61]	[2.09]	[1.09]	[1.32]	[0.68]
Mgr grad degree	0.022	0.011	0.005	−0.007	0.028
	[1.14]	[0.55]	[0.22]	[0.24]	[0.84]
Mgr undegrad median SAT	0.000	0.000	0.000	−0.000	−0.000
	[0.47]	[0.14]	[0.24]	[0.52]	[1.52]
Time Dummies	YES	YES	YES	YES	YES
Observations	348,709	275,299	209,893	158,814	116,122
Minimum *Mgr tenure*	1 year	2 year	3 year	4 year	5 year

manager-fund-date observations only where the manager has been at the fund for at least 4 years. A test that includes all managers would clearly reduce the estimated coefficients, since, for example, funds are unlikely to use the performance 4 years back for a manager that has only been at the fund for 2 years. Another explanation for our findings is that we have many more observations than earlier studies, which were done when the mutual fund industry was younger, smaller, and less competitive (Wahal and Wang (2011)), so our tests have significantly more statistical power.

Results of the regressions in Table 2 also yield a standard set of controls to be used throughout the rest of the paper. Four significant fund-level determinants are fund assets (−), family assets (+), team size (+), and fund age (+). Two significant manager-level determinants are manager tenure (−) and manager female (+). Interestingly, most manager characteristics such as age and education are not significant explanatory variables.

https://doi.org/10.1017/S0022109015000125 Published online by Cambridge University Press

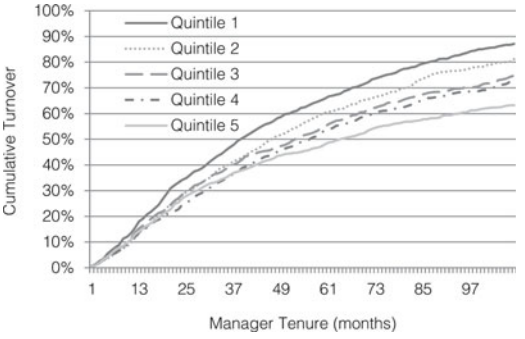
https://doi.org/10.1017/S0022109015000125 Published online by Cambridge University Press

While the results of the probit regressions shown in Table 2 confirm a statistical negative turnover–performance relation, the economic significance is unimpressive. This is easy to see by sorting managers into groups by their prior performance and examining the difference in cumulative turnover rates between the best and worst past performers. Figure 1 shows the cumulative probability that a manager leaves a fund as the manager's tenure increases. Each of the five curves represents cumulative turnover for a different prior-performance quintile, where managers are sorted into quintiles by their DGTW-adjusted returns since they began managing the fund.[5] After 3 years of managing a mutual fund, 46.9% of managers in the bottom (worst) quintile of performers leave while 36.0% of managers in the top (best) quintile of performers leave. After 6 years, the corresponding figures are 73.3% for the worst performers and 54.0% for the best performers. While the difference between top and bottom performers is statistically significant, it seems economically modest. It is informative that so many top performers are, nevertheless, leaving their positions. This strongly suggests that the internal manager turnover data could suffer from a classification problem, which we will attempt to resolve by using subadvised funds.

FIGURE 1

Cumulative Manager Separations for Quintiles Based on DGTW-Adjusted Returns

Figure 1 shows the cumulative probability that a manager leaves a fund as the manager's tenure at the fund increases. Each of the five curves represents cumulative turnover for a different prior-performance quintile, where managers are sorted into quintiles by their DGTW-adjusted returns since they began managing the fund. Procedures for constructing the quintiles are discussed in the Appendix.



B. The Subadvisor Sample and Turnover Results

We use Morningstar data for determining whether a fund is "outsourced" (i.e., managed by a subadvisor). We include only funds in families where the advisors focus on marketing, distribution, and choosing subadvisor(s) to manage the assets and do not perform any money management functions of their own. This reduces any problems with endogeneity from the decision of which funds' management a family will choose to outsource. A mutual fund enters our subadvisor

[5]The turnover-lagged performance regression coefficients in Table 2 suggest that prior years' returns are not weighted equally. As discussed in the Appendix, in estimating a manager's multiyear performance, we weight each year's lagged returns to reflect the weights implicit in the turnover-lagged performance relation.

sample (*Outsource* equals 1) if the fund's advisor is different from the fund's subadvisor, the subadvisor is not a subsidiary of the advisor, and the fund's advisor does not manage any actively managed domestic equity mutual funds in the same year.

1. Manager Departures

Before moving to subadvisor departures, in Table 3, we examine whether the relation between individual manager turnover and prior performance is different for *managers who work for subadvisors*. This provides an additional check on whether our subadvised funds are subject to a different monitoring technology. In Table 3, we regress manager replacements on measures of prior performance, an *Outsource* dummy, and interaction terms. We also include interaction terms between prior performance and team size, since outsourced funds have, on average, more managers. The coefficients on past performance are similar in sign and magnitude to those in Table 2. The relation between *Outsource* and turnover performance (the interaction term) is negative but not statistically or economically

TABLE 3

Probit Regressions of Manager Separation at Subadvisors on Prior Performance and Outsource Interactions

Table 3 presents estimated coefficients from probit regressions of the *Manager left/fund survived* variable on lagged performance and interactions of prior performance with an *Outsource* dummy variable and *Team size_w*. For columns 1 and 2, net returns are used as a measure of prior performance, while for columns 3 and 4, DGTW-adjusted returns are used as a measure of prior performance. All regressions also include time dummies (for each month–year) and controls (*Ln fund assets*, *Ln family assets*, *Team size_w*, *Ln fund age*, *Mgr tenure_w*, and *Manager female*). Each manager-fund-date observation is weighted by 1/*Team size* so that each fund has equal weight. Observations in which the fund has operated for less than 2 years or the manager's tenure is less than 3 years are dropped. Heteroskedasticity-robust *t*-statistics, allowing for clustering by date, are reported in square brackets. * and ** indicate statistical significance at the 5% and 1% levels, respectively.

	Dependent Variable: Manager left/fund survived				
	Probit			Probit	
Predictor Variables	1	2	Predictor Variables	3	4
Net, prior 12 months × Outsource	−1.614 [1.04]	−1.618 [1.02]	DGTW, prior 12 months × Outsource	−4.291 [0.74]	−5.749 [0.97]
Net, 13to24 × Outsource	−0.460 [0.28]	−0.303 [0.18]	DGTW, 13to24 × Outsource	−7.296 [1.44]	−7.964 [1.57]
Net, 25to36 × Outsource	2.755 [1.14]	2.448 [1.02]	DGTW, 25to36 × Outsource	−0.358 [0.08]	−1.695 [0.39]
Net, prior 12 months × Team size_w		−0.091 [0.22]	DGTW, prior 12 months × Team size_w		2.488 [1.86]
Net, 13to24 × Team size_w		−0.305 [0.63]	DGTW, 13to24 × Team size_w		1.379 [1.24]
Net, 25to36 × Team size_w		0.811 [1.82]	DGTW, 25to36 × Team size_w		2.931* [2.28]
Net, prior 12 months	−6.234** [5.28]	−6.087** [4.35]	DGTW, prior 12 months	−9.678** [5.19]	−14.518** [4.04]
Net, 13to24	−6.461** [6.09]	−5.861** [3.93]	DGTW, 13to24	−7.550** [5.10]	−10.335** [3.63]
Net, 25to36	−5.580** [4.76]	−7.125** [4.98]	DGTW, 25to36	−4.787** [2.87]	−10.474** [3.07]
Outsource Dummy	0.080* [1.96]	0.081* [1.98]	Outsource Dummy	0.107** [2.74]	0.109** [2.77]
Time Dummies	YES	YES		YES	YES
Fund/Mgr Controls	YES	YES		YES	YES
Observations	285,092	285,092		235,526	235,526
Minimum *Mgr tenure*	3 year	3 year		3 year	3 year

https://doi.org/10.1017/S0022109015000125 Published online by Cambridge University Press

significant, so the effect of prior performance on *manager* separations at outsourced funds is similar to that in in-house funds.

In contrast, Chen et al. (2013) find that *fund closure* is more strongly related to past performance at outsourced funds, which they argue implies that managers for their sample of outsourced funds face stronger incentives. One potential reason for the difference in results is that our sample of outsourced funds explicitly excludes families that also contain competing in-house actively managed domestic stock funds. It makes sense that advisors of such families are probably more likely to close an underperforming outsourced fund and transfer the assets to a fund that they are managing themselves (thus gaining the fees from the advisory relationship). In addition, fund closures do not simply reflect monitoring. They also include the decision of entire families to quit the business and sell fund assets to other fund families (that often close the old funds and merge the assets into their own funds) or to liquidate them.

2. Subadvisor Departures

We use SEC filings on EDGAR to determine the dates (month and year) of subadvisor departures. In the few cases in which there is no mention of a subadvisor change, we use the month and year of the first filing that refers to the new subadvisor. There are 695 subadvisor departures. We show summary statistics for the sample of outsourced funds in Table 4. About 13% of our fund observations (with 12% of all assets under management) are outsourced funds, slightly lower than the 17.8% (as of 2002) found in Del Guercio et al. (2009). The average outsourced fund has assets of $713 million, about 30% less than the average fund in the entire sample ($1.027 billion, see Table 1). A comparison of family size and fund age shows that a typical outsourced fund is in a smaller fund family and is slightly younger than the typical fund. The average number of subadvisors is 1.7,

TABLE 4

Summary Statistics for Outsourced Funds

Table 4 presents summary statistics for the subsample of funds that outsource their management to subadvisors. First, we tabulate cross-sectional statistics by month, and then we take the time-series average of each statistic across the 180 months of our sample period from Jan. 1995 to Dec. 2009. *Outsource* is a dummy variable, which equals 1 if the fund is outsourced, and 0 otherwise. All other summary statistics are measured within the sample of funds with *Outsource* equal to 1. *Fund assets*, *Family assets*, and *Fund age* measure the fund's assets under management, the family's assets under management, and the number of years since the fund's inception, and are defined in Table 1. *Number of subadvisors* is the total number of subadvisors managing the fund (analogous to *Team size* in Table 1). *Single subadvisor* is a dummy variable, which equals 1 if the number of subadvisors equals 1, and 0 if the number of subadvisors is greater than 1. *Advisor tenure_w* is the number of years (rounded down to the nearest integer) that the subadvisor has been managing the fund and equals 10 if the subadvisor's tenure exceeds 10 years (analogous to *Mgr tenure_w* in Table 1). *Advisor left/fund survived* is a dummy variable, which equals 1 if the advisor left the fund (and the fund continued operating) in that month, and 0 otherwise. For the two advisor-level variables, each advisor-fund-date observation is weighted by 1/*Number of advisors* so that each fund has equal weight.

Variable	Mean 1	Median 2	Std. Dev. 3	10% 4	90% 5
Outsource (dummy)	12.7%	0.0%	32.9%	0.0%	73.7%
Fund assets ($Mil)	713	130	2,607	12	1,227
Family assets ($Mil)	9,773	2,639	25,110	183	20,693
Fund age (years)	7.59	5.39	7.38	1.19	15.99
Number of subadvisors	1.71	1.00	1.43	1.00	3.30
Single subadvisor (dummy)	0.69	1.00	0.46	0.00	1.00
Advisor tenure_w	3.13	2.39	2.93	0.07	8.04
Advisor left/fund survived (monthly)	0.70%	0.00%	7.26%	0.00%	0.00%

https://doi.org/10.1017/S0022109015000125 Published online by Cambridge University Press

https://doi.org/10.1017/S0022109015000125 Published online by Cambridge University Press

although almost 70% of outsourced funds have only one subadvisor. Median tenure is similar for subadvisors and managers. Overall, the sample of outsourced funds differs from that of in-house funds, which is not surprising since the outsourcing decision is endogenous.

Table 5 shows the influence of prior performance on subadvisor departures, after controlling for fund characteristics. As before, characteristic-adjusted DGTW returns from the prior 5 years are our measures of performance. We also report the estimated coefficients on fund and subadvisor variables as we did in Table 2 for manager replacements. Not surprisingly, prior performance is a statistically significant predictor of subadvisor turnover. Furthermore, the estimated coefficients on the characteristic-adjusted DGTW returns are much more negative than the analogous coefficients for manager turnover in Table 2. For instance, the regression coefficient on 1-year lagged DGTW-adjusted returns is −33.0 (column 3 of Table 5) compared to the corresponding figure of −10.5 in column 3 of Table 2.

TABLE 5

Probit Regressions of Advisory Separations on Lagged Returns among Subadvised Funds

Table 5 presents estimated coefficients of probit regressions of 695 *advisory* separations on lagged average monthly DGTW-adjusted returns among the subsample of mutual funds that outsource their management to subadvisors. The dependent variable *Advr left/fund survived* is a dummy variable, which equals 1 if the advisor left the fund (and the fund continued operating) in that month, and 0 otherwise. All other variables are as defined in Tables 1 and 4. All regressions also include time dummies (for each year). Each advisor-fund-date observation is weighted by 1/*Number of advisors* so that each fund has equal weight. Observations in which the fund has operated for less than 2 years are dropped. Heteroskedasticity-robust *t*-statistics, allowing for clustering by date, are reported in square brackets. * and ** indicate statistical significance at the 5% and 1% levels, respectively.

	Probit (dependent variable: Advr left/fund survived)				
Predictor Variables	1	2	3	4	5
DGTW-adj. returns, prior 12 months	−19.989**	−31.299**	−33.009**	−35.321**	−35.496**
	[7.05]	[6.49]	[5.56]	[5.33]	[4.63]
DGTW-adj. returns, prior 13to24		−10.359*	−15.710**	−14.419*	−9.142
		[2.13]	[2.62]	[1.96]	[1.03]
DGTW-adj. returns, prior 25to36			−6.998	−6.789	−9.387
			[1.21]	[0.93]	[0.80]
DGTW-adj. returns, prior 37to48				−12.534**	−13.297*
				[3.05]	[2.36]
DGTW-adj. returns, prior 49to60					−8.094
					[0.90]
Ln fund assets	−0.087**	−0.091**	−0.094**	−0.106**	−0.124**
	[4.44]	[4.14]	[3.64]	[3.68]	[3.91]
Ln family assets	0.038*	0.035	0.046*	0.061*	0.061*
	[2.15]	[1.67]	[1.96]	[2.40]	[2.12]
Number of advisors	0.066**	0.070**	0.071**	0.077**	0.078**
	[6.16]	[6.40]	[6.03]	[5.45]	[4.70]
Ln fund age	−0.006	0.022	0.010	0.012	0.048
	[0.13]	[0.40]	[0.16]	[0.16]	[0.54]
Advisor tenure_w	0.011	0.002	−0.004	−0.008	−0.006
	[1.32]	[0.20]	[0.26]	[0.40]	[0.26]
Time Dummies	YES	YES	YES	YES	YES
Observations	44,236	35,241	26,797	19,852	13,843
Minimum *Advisor tenure*	1 year	2 year	3 year	4 year	5 year

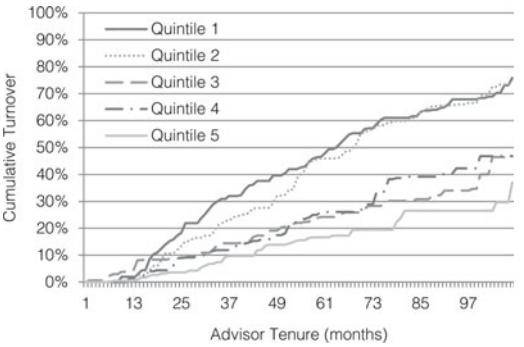
3. Comparisons

Figure 2 shows the cumulative turnover probability as the subadvisor's tenure increases, and this figure can be compared directly to Figure 1, which performs

FIGURE 2

Cumulative Subadvisor Separations for Quintiles Based on DGTW-Adjusted Returns

Figure 2 shows the cumulative probability that a subadvisor leaves a fund as the subadvisor's tenure at the fund increases. Each of the five curves represents cumulative turnover for a different prior-performance quintile, where subadvisors are sorted into quintiles by their DGTW-adjusted returns since they began managing the fund. Procedures for constructing the quintiles are discussed in the Appendix.



the same analysis at the manager level. A side-by-side comparison of Figures 1 and 2 shows the value of using subadvisor changes to reduce misclassification. After 3 years of managing a mutual fund, 30.9% of subadvisors in the bottom (worst) quintile of performers leave while only 9.3% of subadvisors in the top (best) quintile of subadvisors leave. After 6 years, the corresponding figures are 57.2% for the worst performers and 19.5% for the best performers. These differences between top and bottom performers are approximately twice as large as the analogous differences in cumulative departure rates for managers. Notice that most of the difference between Figures 1 and 2 comes from a reduction in the probability of exits by top-performing subadvisors, which suggests that focusing on outsourced funds successfully eliminates voluntary departures ("promotions") by successful managers.

One potentially important difference between manager changes and subadvisor changes is that mutual funds could face higher adjustment costs when changing subadvisors than when changing managers. The "switching costs" hypothesis predicts a lower absolute level of subadvisor changes as well as a lower sensitivity of subadvisor changes to past returns.[6] While a lower unconditional turnover rate of subadvisors is consistent with our evidence, it could also be attributed to a higher frequency of voluntary turnover (e.g., due to retirement or death) of mutual fund managers. Furthermore, it is striking that subadvisor turnover is actually *more* sensitive to past performance than internal manager turnover, even in the face of potentially higher switching costs.

Our use of subadvisors to classify departures as involuntary yields different results than using standard methods. In Table 6, we conduct a horse race, comparing the estimated turnover–performance relation using different classification methods on our sample. Columns 1 and 4 include all manager depar-

[6]For a discussion of the costs of switching investment managers, see, for example, Goyal and Wahal (2008).

https://doi.org/10.1017/S0022109015000125 Published online by Cambridge University Press

TABLE 6

Terminations and Prior Performance: Comparing Different Methodologies

Table 6 presents estimated coefficients from probit regressions of separations on prior performance under three different methodologies for determining terminations. Columns 1 and 4 include the entire sample of manager separations (after which the fund continued to operate). Columns 2 and 5 exclude promotions from manager separations where a *promotion* is defined as a separation where the manager is managing more assets (adjusted for growth in mutual fund industry assets) 12 months later. For columns 2 and 5, the sample period is from 1995 to 2008, since we need a subsequent year to define *promotion*. All regressions also include time dummies and appropriate controls. Each manager(advisor)-fund-date observation is weighted by 1/*Team size(Number of Advisors)* so that each fund has equal weight. Observations in which the fund has operated for less than 2 years or the manager(advisor)'s tenure is less than 3 years (for columns 1–3) or less than 5 years (for columns 4–6) are dropped. Heteroskedasticity-robust *t*-statistics, allowing for clustering by date, are reported in square brackets. * and ** indicate statistical significance at the 5% and 1% levels, respectively.

	Probit (dependent variable: Manager/advisor separations)					
	Subsample					
	All	Excludes Promotions	Advr Only	All	Excludes Promotions	Advr Only
Predictor Variables	1	2	3	4	5	6
DGTW-adj. returns, prior 12 months	−9.901** [5.49]	−10.667** [5.67]	−33.009** [5.56]	−12.847** [5.60]	−14.353** [6.14]	−35.496** [4.63]
DGTW-adj. returns, prior 13to24	−8.111** [5.60]	−8.219** [5.39]	−15.710** [2.62]	−10.247** [4.61]	−10.295** [4.24]	−9.142 [1.03]
DGTW-adj. returns, prior 25to36	−4.772** [2.95]	−4.828** [2.95]	−6.998 [1.21]	−6.560** [2.70]	−7.462** [3.02]	−9.387 [0.80]
DGTW-adj. returns, prior 37to48				−3.854 [1.91]	−3.975 [1.86]	−13.297* [2.36]
DGTW-adj. returns, prior 49to60				−4.798* [2.46]	−4.242* [2.16]	−8.094 [0.90]
Time Dummies	YES	YES	YES	YES	YES	YES
Fund/Mgr/Advr Controls	YES	YES	YES	YES	YES	YES
Observations	235,526	208,011	26,797	128,533	111,744	13,843
Minimum *Mgr tenure*	3 year	3 year	3 year	5 year	5 year	5 year

tures, which was our methodology for Table 2. Columns 2 and 5 eliminate "promotions," which are defined as observations where the departing manager remains in the mutual fund industry and is managing more assets (adjusted for mutual fund industry growth) 12 months after the departure. This is similar to the methodology used previously by Chevalier and Ellison (1999b) and Hu et al. (2000). Columns 3 and 6 use subadvisor changes in the sample of outsourced funds.

Table 6 shows that there is almost no change in the estimated coefficients from eliminating departures classified as promotions, but a very large change (coefficients are 1.5–3 times as large) on the estimated coefficients on characteristic-adjusted returns from the subadvisor methodology. The true relation between departures and lagged performance for subadvisors is likely to be even stronger than our estimate here. Many subadvised funds have multiple subadvisors, each of whom manages a part of the portfolio. Our regressions use only the overall return, because we do not know the return of each subadvisor's portion of the fund. Boards can observe each subadvisor's performance, which is less noisy, so our estimates of sensitivity are biased toward 0.

C. Turnover and Prior Flow

Fund flow (i.e., proportional change in total assets not due to returns) increases assets under management, thus generating more fees for the fund sponsor,

https://doi.org/10.1017/S0022109015000125 Published online by Cambridge University Press

so it is natural that mutual fund companies would want to hire managers who can attract flow. Flow is highly sensitive to past performance because investors chase returns. As a result, the prior performance ⇒ flow ⇒ management replacement channel is one potential explanation for our prior findings.

We examine the explanatory power of flow in predicting departures, using three measures. The first is flow itself. We generate this variable by sorting funds into six size buckets (based on last month's assets) and, for each fund, subtracting off the mean fund flow in the group and dividing by the standard deviation of fund flow across the group. As a result, for each size bucket, flow has a mean of 0 and a standard deviation of 1. The other two measures use abnormal flow ("flow alpha"), which is the abnormal flow after controlling for the predicted relation between flow and lagged returns. Linear flow alpha is obtained by regressing *Total fund flow* on *Net monthly returns, prior 12 months* (and previous annual returns when available, up to 5 years), *Fund age*, and *Ln family assets*, and taking the residual. Nonlinear flow alpha is obtained by regressing *Total fund flow* on return decile dummy variables (from sorting funds on *Net monthly returns, prior 12 months* and separate decile dummies from prior years' returns, up to 5 years), *Fund age*, and *Ln family assets*, and taking the residual.

Positive flow alpha could be a result of superior marketing ability (i.e., ability to attract flow), while negative flow alpha could be a symptom of other problems (e.g., the 2003 market timing scandals) that cause investors to withdraw their money. We do not specify the exact source of the ability to attract (or failure to attract) flow over and above flow-driven net return. Industry professionals use terms such as the manager's "process" or "quality." As one individual told us, a manager needs "a story."

Panel A of Table 7 shows the estimated coefficients from probit regressions of manager replacements on measures of average monthly flow and flow alpha from the prior 3 years, prior return performance measures, and our standard firm and manager controls. We perform our analysis separately for new managers (fewer than 36 months at the fund) and experienced managers (36 or more months of tenure) to examine whether the flow-replacement relation is affected by manager tenure. In columns 1 and 4, we can see that the coefficients on total flow in the prior year (excluding the previous month[7]), *Flow, prior 2to12*, are negative and statistically significant. Funds suffering from outflow relative to their peers are more likely to replace the manager. On the other hand, coefficients on flow lagged more than 1 year are negative but statistically insignificant.

In the other columns, we regress manager replacements on flow alpha. The coefficients on *Flow, prior 2to12* are no longer statistically significant for experienced managers but remain significant for new managers.[8] This is an interesting result because it is contrary to what we saw for prior return performance, where the effect of prior performance on turnover increased with manager tenure.

[7]We separate flow from the previous year into flow from the previous month and flow from the 11 preceding months.

[8]This result that flow is an independent predictor of turnover extends Khorana (1996). He looks at the effect of past growth in assets (PCASSET), which includes both returns and flow, on manager departures. He finds that the effect of this variable becomes insignificant when he controls for returns, suggesting that flow is *not* an independent predictor of departures.

https://doi.org/10.1017/S0022109015000125 Published online by Cambridge University Press

TABLE 7

Probit Regressions of Manager and Advisor Separations on Prior Fund Flow

Table 7 presents estimated coefficients from probit regressions of manager/advisor separations on various lags of average monthly fund flow. In Panel A, the dependent variable is manager separations, while in Panel B, the dependent variable is advisor separations in the sample of subadvised funds. Columns 1–3 of each panel show the results for the sample of managers/subadvisors with at least 36 months of tenure at the fund, while columns 4–6 focus on managers with 35 or fewer months of experience at the fund. Columns 1 and 4 use average monthly flow as the independent variable. Columns 2 and 5 use linear flow alpha (residuals from regressing flow on prior net returns, fund age, and family size) as the independent variable. Columns 3 and 6 use nonlinear flow alpha (residuals from regressing flow on decile dummy variables of prior net returns, fund age, and family size). Monthly flow for each fund is standardized by subtracting the average fund flow in that month for funds of similar size and then dividing by the standard deviation of flows across the funds of similar size. All specifications include three annual lags of average monthly DGTW-adjusted returns, time dummies (for each month–year), and fund/manager controls used in prior tables. Each manager-fund-date observation is weighted by 1/*Team size* so that each fund has equal weight. Observations in which the fund has operated for less than 2 years are dropped. Heteroskedasticity-robust *t*-statistics, allowing for clustering by date, are reported in square brackets. * and ** indicate statistical significance at the 5% and 1% levels, respectively.

	Type of Flow: Probit					
Predictor Variables	Total Flow 1	Linear Flow α 2	Nonlinear Flow α 3	Total Flow 4	Linear Flow α 5	Nonlinear Flow α 6
Panel A. Manager Separations (dependent variable: Manager left/fund survived)						
Flow, month 0	−0.055**	−0.040*	−0.040*	−0.050**	−0.049**	−0.040*
	[3.22]	[2.34]	[2.35]	[2.67]	[2.62]	[2.20]
Flow, prior month	−0.055**	−0.053**	−0.045**	−0.005	−0.004	0.004
	[3.73]	[3.46]	[3.02]	[0.24]	[0.17]	[0.10]
Flow, prior 2to12	−0.060*	−0.056	−0.016	−0.101**	−0.107**	−0.067*
	[2.21]	[1.84]	[0.57]	[3.22]	[3.46]	[2.15]
Flow, prior 13to24	−0.018	−0.005	−0.002			
	[0.73]	[0.19]	[0.07]			
Flow, prior 25to36	−0.011	−0.017	0.017			
	[0.60]	[0.83]	[0.87]			
DGTW-adj. returns, prior 12 months	−6.328**	−9.029**	−10.206**	−4.351	−5.182*	−6.613**
	[3.47]	[4.63]	[5.22]	[1.77]	[2.18]	[2.80]
DGTW-adj. returns, prior 13to24	−5.969**	−7.003**	−8.052**	1.275	0.950	−0.747
	[3.93]	[4.50]	[5.52]	[0.62]	[0.47]	[0.36]
DGTW-adj. returns, prior 25to36	−2.967	−3.217*	−4.348**	−1.430	−1.305	−2.371
	[1.84]	[1.96]	[2.64]	[0.74]	[0.68]	[1.23]
Time Dummies	YES	YES	YES	YES	YES	YES
Fund/Mgr Controls	YES	YES	YES	YES	YES	YES
Observations	231,463	211,509	218,806	162,177	161,044	161,044
Mgr tenure	≥3 year	≥3 year	≥3 year	<3 year	<3 year	<3 year
Panel B. Advisor Separations (dependent variable: Advisor left/fund survived)						
Flow, month 0	0.025	0.021	0.034	−0.183*	−0.181*	−0.170*
	[0.35]	[0.29]	[0.46]	[2.44]	[2.34]	[2.28]
Flow, prior month	0.055	0.050	0.062	−0.023	−0.013	−0.008
	[1.07]	[0.85]	[1.15]	[0.52]	[0.28]	[0.19]
Flow, prior 2to12	−0.382**	−0.352**	−0.215	−0.090	−0.081	0.083
	[3.22]	[2.87]	[1.65]	[0.64]	[0.71]	[0.81]
Flow, prior 13to24	0.144	0.190*	0.174*			
	[1.88]	[2.13]	[2.02]			
Flow, prior 25to36	−0.039	−0.001	0.018			
	[0.54]	[0.01]	[0.34]			
DGTW-adj. returns, prior 12 months	−31.782**	−32.465**	−34.529**	−31.583**	−34.400**	−35.837**
	[5.88]	[5.43]	[5.38]	[3.87]	[4.04]	[4.22]
DGTW-adj. returns, prior 13to24	−14.760*	−16.047*	−21.381**	−2.156	−2.792	−4.360
	[1.74]	[1.79]	[2.39]	[0.23]	[0.29]	[0.45]
DGTW-adj. returns, prior 25to36	−7.205	−6.499	−8.597	4.685	4.596	2.787
	[1.37]	[1.09]	[1.45]	[0.87]	[0.85]	[0.54]
Time Dummies	YES	YES	YES	YES	YES	YES
Fund/Advisor Controls	YES	YES	YES	YES	YES	YES
Observations	26,380	23,601	24,322	14,382	14,206	14,206
Advisor tenure	≥3 year	≥3 year	≥3 year	<3 year	<3 year	<3 year

https://doi.org/10.1017/S0022109015000125 Published online by Cambridge University Press

The results suggest that funds can quickly learn the marketing abilities of managers, unlike with stock-picking talent, and eliminate underperformers early in their tenures.

In Panel A of Table 7, we can also see a negative and significant coefficient on the same month's flow and (for several specifications) prior month's flow. We are reluctant to conclude the direction of causality for these coefficients, because we do not know the exact announcement dates of the manager changes, which likely precede the effective dates provided by Morningstar. There is certainly the possibility that fund outflow is actually a reaction to an announcement of a manager change (or some simultaneous announcement such as misconduct by the manager or fund) rather than the cause.

In Panel B of Table 7, we repeat the tests using subadvisors in the sample of outsourced funds. Interestingly, we do not find the same pattern of results for advisor changes. For subadvisors with 3 or more years of experience (columns 1–3), some of the coefficients on prior year's flow are negative but the coefficients on the flow in the preceding year (flow with a 13- to 24-month lag) are positive. If one averages the flow over the prior 2 years, the two effects roughly cancel out and there is no overall effect of past flow on advisor separations. For subadvisors with fewer than 3 years of experience (columns 4–6), there is also no effect of past flow. These findings, that subadvisor changes do not respond to past flow, make sense because the subadvisor is generally in charge of money management but not marketing the fund to attract investors.

V. Future Performance and Departures

Mutual fund companies would be expected to incur the costs associated with a management change only if they expected some improvement in assets under management from increased flow or increased returns. In Panel A of Table 8, we regress future 2-year DGTW-adjusted returns on *Mgmt separation byfund* (the proportion of managers who left the fund), past performance, and standard fund controls. Unlike in prior tables, we are no longer predicting turnover. We use Fama–MacBeth (1973) regressions with Newey–West (1987) standard errors, and our observations are at the fund–month level. We run the regressions for the entire sample of funds (column 1) and separately for funds sorted by prior-year DGTW-adjusted return quintiles (columns 2–6).[9] It is important to emphasize that we are not simply testing for improvement in returns before and after manager turnover. We would expect to find that due to the selection bias in manager replacement toward funds that happened to have been past poor performers ("mean reversion"). Instead, we control for past performance and compare the future performance of funds that have changed managers to those that have not changed managers to examine whether the manager change had a beneficial effect.

We find little evidence that replacing managers improves future characteristic-adjusted performance relative to funds with similar characteristics that did not replace managers. There is no consistent pattern across quintiles. The coefficient

[9]We also use the same type of methodology to examine whether manager turnover leads to changes in expenses and find no evidence to that effect.

https://doi.org/10.1017/S0022109015000125 Published online by Cambridge University Press

TABLE 8

Manager/Advisor Separations and Future Characteristic-Adjusted Performance

Table 8 presents estimated coefficients of Fama–MacBeth (1973) regressions of future average monthly DGTW-adjusted returns on *Mgmt separations byfund* (is a fund-level variable equal to the fraction of managers who left the fund in any given fund) and prior DGTW-adjusted returns. In Panel A, the dependent variable is average future returns over the next 2 years, and it focuses on the effect of manager separations. Column 1 shows the results for the entire sample, while columns 2–6 display the results from regressions on subsamples (sorted into quintiles by prior year DGTW-adjusted returns). Panel B repeats the tests from Panel A but looks at the effect of *advisor separations byfund* in the sample of subadvised firms. The *t*-statistics using Newey–West (1987) standard errors are reported in square brackets. * and ** indicate statistical significance at the 5% and 1% levels, respectively.

	Fama–MacBeth					
	Sample					
	All	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
Predictor Variables	1	2	3	4	5	6
Panel A. Manager Separations (dependent variable: Future DGTW-adjusted returns over next 2 yrs)						
Mgmt separation byfund	0.004%	0.011%	−0.011%	−0.097%*	0.056%	0.076%
	[0.16]	[0.33]	[0.22]	[2.61]	[1.75]	[1.50]
DGTW-adj. returns, prior 12 months	−0.001	−0.039	−0.022	0.078	0.023	0.026
	[0.09]	[1.09]	[0.33]	[1.83]	[1.00]	[1.00]
DGTW-adj. returns, prior 13to24	−0.028	−0.026	−0.020	−0.031	−0.035	−0.037
	[0.86]	[1.38]	[0.70]	[0.99]	[0.94]	[0.73]
DGTW-adj. returns, prior 25to36	−0.011	−0.009	−0.018	−0.017	−0.014	0.005
	[0.71]	[0.52]	[1.11]	[1.00]	[0.73]	[0.24]
Ln fund assets	−0.004%	−0.001%	−0.004%	−0.006%	0.006%	−0.002%
	[0.66]	[0.08]	[0.62]	[1.76]	[1.10]	[0.43]
Ln family assets	0.001%	0.004%	0.004%	−0.001%	−0.004%	0.001%
	[0.16]	[0.34]	[0.58]	[0.32]	[1.20]	[0.10]
Team size_w	0.000%	−0.005%	0.005%	0.005%	−0.002%	0.000%
	[0.00]	[0.81]	[0.76]	[0.82]	[0.27]	[0.04]
Ln fund age	0.006%	0.014%*	−0.006%	0.002%	−0.003%	0.018%
	[1.34]	[2.36]	[0.98]	[0.37]	[0.24]	[1.49]
Sample period	1995–2007	1995–2007	1995–2007	1995–2007	1995–2007	1995–2007
Newey–West lags	36	36	36	36	36	36

	Fama–MacBeth		
	Next 1 Yr	Next 2 Yrs	Next 3 Yrs
Predictor Variables	1	2	3
Panel B. Advisor Separations (dependent variable: Future DGTW-adjusted returns)			
Advr separation byfund	0.014%	0.011%	0.013%
	[0.49]	[0.56]	[0.95]
DGTW-adj. returns, prior 12 months	0.004	0.021	0.001
	[0.06]	[1.05]	[0.09]
DGTW-adj. returns, prior 13to24	−0.019	−0.048	0.000
	[0.34]	[0.93]	[0.00]
DGTW-adj. returns, prior 25to36	−0.071	0.020	0.046
	[1.59]	[0.40]	[0.77]
Ln fund assets	0.005%	−0.006%	−0.012%
	[0.42]	[0.54]	[1.01]
Ln family assets	0.001%	0.003%	0.002%
	[0.13]	[0.39]	[0.30]
Number of advisors	0.008%	0.012%	0.015%*
	[0.81]	[1.74]	[2.06]
Ln fund age	0.015%	0.028%	0.037%
	[0.94]	[1.44]	[1.50]
Sample period	1995–2008	1995–2007	1995–2006
Newey–West lags	24	36	48

on *Mgmt separation byfund* is not significant for the entire sample or for prior-performance quintiles 1 and 2, which are the most likely to have departures due to terminations (rather than promotions or retirements). Panel B shows analogous

https://doi.org/10.1017/S0022109015000125 Published online by Cambridge University Press

results for subadvisor departures, which are more likely terminations. While the coefficients on *Advr separation byfund* (proportion of subadvisors who left the fund) are positive, suggesting an improvement in performance in the 2 years after a subadvisor change, the *t*-statistics are less than 1, so we are unable to reject the null hypothesis of no improvement.

Overall, the lack of improved performance is not particularly surprising given the substantial body of evidence about the lack of persistence in mutual fund returns. However, it is important to note that while we cannot reject the null hypothesis of no improvement in returns, we also cannot conclude that fund sponsors and boards detect no true improvement. Because they have access to all the manager's trades, they can use much more precise measures of performance (than the DGTW-adjusted returns from quarterly holdings that we use). It is easy to demonstrate that event study type procedures focusing on a manager's trades are far more powerful at detecting abnormal performance than is observing fund alphas (Kothari and Warner (2001)), and industry sources state they use such trade-based procedures.

Regardless of whether a manager change improves future fund performance, it might still be in the best interest of the fund sponsor if a change can increase the assets (and fees) to the fund. For example, a manager change may reduce outflow by mollifying investors who are upset with the old manager's track record or attract new investors who would otherwise be averse to investing in the fund. In Table 9, we repeat the analysis from Table 8, but instead examine whether there are improvements in fund flow after manager changes, controlling for prior fund flow. Note that we do not include any fund-level controls in these regressions, since the construction of nonlinear flow alphas already controls for fund size, family size, and fund age.

Panel A of Table 9 shows the effect on flow from replacing the manager. On average, there is no change. For the bottom quintile of performers (sorted by prior year's flow), which are the funds where the manager's departure is most likely to be due to termination, there is a positive and statistically significant improvement in the fund flow alpha over the next 2 years. In contrast, the third, fourth, and fifth quintiles of performers (based on last year's flow) show no strong evidence of a change.

Panel B of Table 9 repeats the analysis for subadvisor changes. On average, subadvisor changes are associated with a subsequent increase in flow alpha. These findings are consistent with the hypothesis that fund investors pay attention to the manager (or subadvisor) of the fund and are more likely to invest in (or less likely to leave) a poorly performing fund if that manager (or subadvisor) is replaced. This seems to be an important rationale for mutual fund manager replacement.

The results in Table 9 raise an interesting question. If managers are fired for bad luck in their portfolio returns, and investors react to this news positively, then would not the same logic dictate that subadvisors should be fired for bad flow, even if they are not responsible for marketing the fund? The main distinction between returns and flow is that investors care only about *returns* and seem to believe that returns might improve upon a change of management. Therefore, funds rationally fire managers and subadvisors after bad past performance, even if that performance is due to bad luck, to cater to investors. Flow is different

https://doi.org/10.1017/S0022109015000125 Published online by Cambridge University Press

TABLE 9

Manager/Advisor Separations and Future (Abnormal) Flow

Table 9 presents estimated coefficients of Fama–MacBeth (1973) regressions of future nonlinear flow alpha (described in Table 7) on *Mgmt separations byfund* (is a fund-level variable equal to the fraction of managers who left the fund in any given fund) and prior flow. In Panel A, the dependent variable is average future flow over the next 2 years, and it focuses on the effect of manager separations. Column 1 shows the results for the entire sample, while columns 2–6 display the results from regressions on subsamples (sorted into quintiles by prior year average flow). Panel B repeats the tests from Panel A but looks at the effect of *advisor separations byfund* in the sample of subadvised firms. The *t*-statistics using Newey–West (1987) standard errors are reported in square brackets. * and ** indicate statistical significance at the 5% and 1% levels, respectively.

	Fama–MacBeth					
	Sample					
	All	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
Predictor Variables	1	2	3	4	5	6
Panel A. Manager Separations (dependent variable: nonlinear flow alpha over the next 2 years)						
Mgmt separation byfund	0.019	1.122*	0.180	−0.850*	−1.213	−0.370
	[0.07]	[2.27]	[0.52]	[2.15]	[1.32]	[0.25]
Flow, prior 12 months	6.030**	7.586**	8.440**	7.800**	7.968**	4.051**
	[10.13]	[8.35]	[4.24]	[10.76]	[10.09]	[5.39]
Flow, 13to24	−0.319	0.156	0.019	−0.736*	−0.866	−0.441
	[1.60]	[0.74]	[0.09]	[2.48]	[1.94]	[1.13]
Flow, 25to36	−0.960*	−0.424	−1.069**	−1.143*	−0.856	−1.443**
	[2.59]	[1.35]	[3.77]	[2.25]	[1.79]	[2.70]
Sample period	1995–2007	1995–2007	1995–2007	1995–2007	1995–2007	1995–2007
Newey–West lags	36	36	36	36	36	36

	Fama–MacBeth		
	Next 1 Yr	Next 2 Yrs	Next 3 Yrs
Predictor Variables	1	2	3
Panel B. Advisor Separations (dependent variable: nonlinear flow alpha)			
Advr separation byfund	0.685**	0.896*	0.780*
	[3.42]	[2.37]	[1.97]
Flow, prior 12 months	4.860**	7.834**	9.354**
	[11.04]	[17.44]	[17.66]
Flow, 13to24	−0.049	−0.157	0.564
	[0.10]	[0.22]	[1.07]
Flow, 25to36	−0.289	−0.112	−0.308
	[0.89]	[0.13]	[0.24]
Sample period	1995–2008	1995–2007	1995–2006
Newey–West lags	24	36	48

because investors do not care about whether a manager has good marketing ability (i.e., abnormal flow) and is able to attract other people to invest in the fund. Instead, it is the fund advisor and board who care about flow, because their compensation is linked to total assets under management. Therefore, it is rational for the advisor and board to fire a manager (but not a subadvisor) in the hopes that a new manager will do a better marketing job. This is consistent with Table 7, which shows that subadvisor changes are not made in response to flow.

In addition to showing that manager turnover leads to a statistically significant increase in future flow, we explore the economic effects of changing managers for future fund fees using some back-of-the-envelope calculations. We are interested in seeing whether the increase in fees is likely to exceed any adjustment costs associated with finding, hiring, or on-the-job learning of a new manager or managers. From Table 9 (Panel B, column 2), funds that change subadvisors have a flow increase of 0.896 standard deviations. The standard deviation

https://doi.org/10.1017/S0022109015000125 Published online by Cambridge University Press

of flow is 1.9% for large size funds, so the implied increase in flow is 1.7%. For a fund with $10 billion in assets, the implied increase in assets is $170 million. The increase in annual management fees (assuming a 1% fee) is, thus, $1.7 million. For a midsized fund with $1 billion in assets, the same calculation implies that fees increase by $350,000,[10] while for a small fund with only $75 million in assets, the increase in fees would be only about $45,000. These increases in annual fees seem to be economically significant when compared to average mutual fund manager salaries or typical costs associated with hiring and training new managers. A caution, however, is that it is difficult to measure the independent effect of the manager departure if it is associated with a perceived change in fund strategy by the fund sponsor.

VI. Additional Tests and Robustness Checks

Cross-Sectional Variation. We perform a number of additional tests to examine how the relation between prior performance and manager turnover varies in the cross section of mutual funds (tables with results from this section are available from the authors). First, we examine if the turnover–performance relation is a function of fund style. Returns on some styles (small cap, growth) are more volatile than those on other styles (large cap, value), which might make them less informative for monitoring of managerial abilities (Khorana (1996)). We examine this by regressing manager replacement on style dummy variables and interactions of style dummies with prior performance measures. We find no evidence that manager turnover at small-cap funds (relative to large-cap funds) and growth funds (relative to value funds) is less sensitive to past performance. Our results are also robust to inclusion of interactions of time dummies with style dummies. When we also control for past fund volatility and interactions of past volatility with prior performance measures, we find that turnover is less sensitive to past performance at more volatile funds, but style still does not affect the turnover–performance relation.

As we already saw in Table 2, larger families have significantly higher levels of manager turnover. Next, we test whether the size of the fund family also plays a role in the turnover–performance relation. Possible explanations for the importance of family size include better governance at larger families (Ding and Wermers (2009)) and firing of underperforming managers leading to improved reputations of other managers at the family (Gervais, Lynch, and Musto (2005), among others). We regress manager turnover on family size and an interaction term of family size with prior performance, and find that manager turnover is more sensitive to past performance for larger families than for smaller families.

Interestingly, we find no evidence that subadvisor turnover is more sensitive to past performance for larger families. A possible explanation for the different results for managers and subadvisors is that family size might be a rough measure

[10]Flows are more volatile for smaller funds, so the percentage effect of manager turnover on flows is larger.

https://doi.org/10.1017/S0022109015000125 Published online by Cambridge University Press

of the costs of manager replacement. For large organizations, it is easier to find an in-house replacement for the manager so costs are lower and turnover is more sensitive to performance, while smaller organizations would have to look externally so they are more reluctant to replace the manager unless performance is very poor. Outsourced funds in our sample always look externally for new subadvisors so the size of the family has no effect on replacement costs and turnover–performance sensitivity.

We perform three additional robustness checks of our results. First, we use Morningstar "Star" Ratings instead of past fund returns as measures of performance. The Morningstar ratings system uses a complicated formula that adjusts for downside risk and sales charges. However, funds ratings are easy to interpret and are commonly reported in news articles for mutual fund investors, so they might be more important determinants of future flow (and, thus, fees). We find that there is little difference in predicting manager turnover using Morningstar stars relative to using past DGTW characteristic-adjusted returns.

Second, we investigate whether past returns are better at predicting full turnover (of the entire management team) versus partial turnover (where some but not all managers on a team leave). We hypothesize that the turnover of the entire team is more likely to be due to terminations, while partial turnover may happen when one of the managers finds a job elsewhere or retires. We find that past DGTW characteristic-adjusted returns are a slightly better predictor of full turnover, but they also predict partial turnover, in a statistically significant way.

Third, we follow up on the previous test by examining whether investors' reactions (in regard to future flow) are similar for full and partial turnover of managers. We find that only the departures of an *entire* management team have a beneficial effect on future flow for bad past performers or an adverse effect on future flow for good past performers. This result might be due to more media attention when an entire group is replaced or because investors might see a total separation as a "clean slate" rather than just a new member of the team taking over the title of lead manager. Interestingly, we find that a partial replacement actually has a *negative* effect on future flow for funds that have performed poorly in the past. It could be that investors in poorly performing funds see a partial change as evidence of poor monitoring, such that a bad signal is actually worse for flow than no signal at all.

Last, we perform a robustness check of our standard errors. We do a two-way clustering of standard errors instead of just clustering by time. We find that the two-way-clustered standard errors are very similar, which is not surprising, since manager departures, like fund returns, are serially uncorrelated.

VII. Conclusion

We examine the relation between prior performance and manager turnover at mutual funds using several new techniques and focusing on a sample period that has seen increasing competition in the mutual fund industry. We find significantly stronger connections between manager departures and prior underperformance than previous studies. We incorporate the manager's length of tenure into our

https://doi.org/10.1017/S0022109015000125 Published online by Cambridge University Press

tests and show that characteristic-adjusted returns going back as far as 5 years are statistically significant determinants of manager turnover, in marked contrast to previous work.

We tackle the question of how to correctly unravel involuntary terminations from voluntary retirements or promotions. We examine the effect of prior performance on subadvisor changes at outsourced funds and find sensitivity coefficients on past characteristic-adjusted returns that are 1.5–3 times as large as those found for manager changes. We compare our method with a standard method, using growth in managed assets to define promotions, and find that our method does a significantly better job of eliminating voluntary departures.

We attempt to disentangle the effect of flow (marketing) and returns (money management) and provide evidence that prior abnormal flow (flow alpha) is also an important determinant of manager replacements, at least for newer managers. Finally, we examine the rationale for funds to replace their managers or subadvisors. While we do not find significant improvements in returns, we do find evidence that flow improves after management is replaced. This suggests that fund investors react positively to changes in management, and fund sponsors may cater to investors to attract inflow or minimize outflow. Overall, our study fills an important gap and sheds new light on how and why mutual fund boards and fund sponsors make decisions on manager changes.

Appendix. Finding a Weighting Function for Aggregating Past Returns

To construct Figures 1 and 2, we try to identify what weighting function is used by mutual funds to aggregate lagged returns into a single metric that can be used to evaluate the manager's cumulative lagged performance. For example, sponsors and boards may use an equal-weighted average of all past returns (from the start of the manager's tenure) or they can attach more weight to more recent returns if they believe that the manager is learning on the job. We follow Malmendier and Nagel (2011) and Jenter and Lewellen (2010) in using a flexible weighting function and estimating its parameter with our data on each manager's history of DGTW-adjusted returns.

The weighted average of prior returns of a manager at time t with tenure T is

$$\text{(A-1)} \qquad \text{Weighted Return}(t,T,\lambda) = \frac{\sum_{k=1}^{T-1} w(k,T,\lambda) \times r_{t-k}}{\sum_{k=1}^{T-1} w(k,T,\lambda)}$$

$$\text{with weights: } w(k,T,\lambda) = \left(\frac{T-k}{T}\right)^{\lambda}.$$

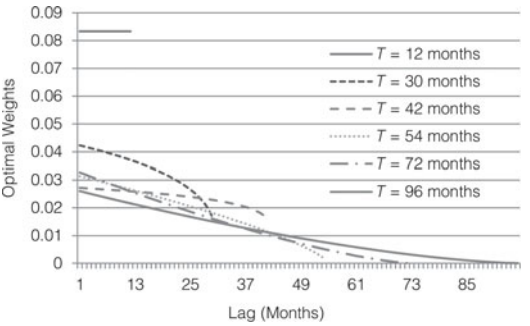
For each T "group," we find the parameter λ, which provides maximum model fit (log-likelihood) in the probit model. Higher values of λ mean that less weight is attached to returns that are farther in the past. For example, a λ of 0 indicates that (on average) firms provide an equal weight to prior returns, while a λ of 1 suggests that weights decline in a linear fashion. Figure A1 shows our results on the optimal weighting function for six types of managers, sorted by manager tenure. The optimal weighting parameter (λ) increases as manager tenure increases. This result suggests that funds use all available information equally in the first few years of tenure to learn about the manager's "initial" talent, but afterward, they attach more weight to recent returns to infer if the manager is improving on the job (or, perhaps, slacking off).

https://doi.org/10.1017/S0022109015000125 Published online by Cambridge University Press

FIGURE A1

Optimal Prior-Performance Weighting Functions for Managers

Figure A1 shows a graph of the optimal weighting function for six types of managers (sorted by manager tenure). The "optimal" weighting function is the function that generates a weighted average of past returns that best predicts manager replacements (maximum log-likelihood) in the cross section of all managers in that tenure group.



References

Adams, A.; S. Mansi; and T. Nishikawa. "Internal Governance Mechanisms and Operational Performance: Evidence from Index Mutual Funds." *Review of Financial Studies*, 23 (2010), 1261–1286.

Berk, J., and R. C. Green. "Mutual Fund Flows and Performance in Rational Markets." *Journal of Political Economy*, 112 (2004), 1269–1295.

Cashman, G., and D. N. Deli. "Locating Decision Rights: Evidence from the Mutual Fund Industry." *Journal of Financial Markets*, 12 (2009), 645–671.

Chen, J.; H. Hong; W. Jiang; and J. D. Kubik. "Outsourcing Mutual Fund Management: Firm Boundaries, Incentives, and Performance." *Journal of Finance*, 68 (2013), 523–558.

Chevalier, J., and G. Ellison. "Are Some Mutual Fund Managers Better Than Others? Cross-Sectional Patterns in Behavior and Performance." *Journal of Finance*, 54 (1999a), 875–899.

Chevalier, J., and G. Ellison. "Career Concerns of Mutual Fund Managers." *Quarterly Journal of Economics*, 114 (1999b), 389–432.

Dangl, T.; Y. Wu; and J. Zechner. "Market Discipline and Internal Governance in the Mutual Fund Industry." *Review of Financial Studies*, 21 (2006), 2307–2343.

Daniel, K.; M. Grinblatt; S. Titman; and R. Wermers. "Measuring Mutual Fund Performance with Characteristic-Based Benchmarks." *Journal of Finance*, 52 (1997), 1035–1058.

Del Guercio, D., and P. A. Tkac. "Star Power: The Effect of Morningstar Ratings on Mutual Fund Flow." *Journal of Financial and Quantitative Analysis*, 43 (2008), 907–936.

Del Guercio, D.; J. Reuter; and P. A. Tkac. "Unbundling the Value of Portfolio Management and Distribution in Retail Mutual Funds: Evidence from Subadvisory Contracts." Working Paper, University of Oregon (2009).

Ding, B., and R. Wermers. "Mutual Fund Performance and Governance Structure: The Role of Portfolio Managers and Boards of Directors." Working Paper, University of Maryland (2009).

Donoho, D. L.; R. A. Crenian; and M. H. Scanlan. "Is Patience a Virtue? The Unsentimental Case for the Long View in Evaluating Returns." *Journal of Portfolio Management*, 37 (2010), 105–120.

Duong, T. "Outsourcing in the Mutual Fund Industry." Working Paper, National University of Singapore (2010).

Fama, E. F., and K. R. French. "Luck versus Skill in the Cross-Section of Mutual Fund Returns." *Journal of Finance*, 65 (2010), 1915–1947.

Fama, E. F., and J. D. MacBeth. "Return and Equilibrium: Empirical Tests." *Journal of Political Economy*, 81 (1973), 607–636.

Gervais, S.; A. W. Lynch; and D. K. Musto. "Fund Families as Delegated Monitors of Money Managers." *Review of Financial Studies*, 18 (2005), 1139–1169.

Goyal, A., and S. Wahal. "The Selection and Termination of Investment Management Firms by Plan Sponsors." *Journal of Finance*, 63 (2008), 1805–1847.

Hu, F.; A. R. Hall; and C. R. Harvey. "Promotion or Demotion? An Empirical Investigation of the Determinants of Top Mutual Fund Manager Changes." Working Paper, Duke University (2000).

Jensen, M. C. "Risk, the Pricing of Capital Assets, and the Evaluation of Investment Portfolios." *Journal of Business*, 42 (1969), 167–247.

https://doi.org/10.1017/S0022109015000125 Published online by Cambridge University Press

Jenter, D., and K. Lewellen. "Performance-Induced CEO Turnover." Working Paper, Stanford University (2010).
Khorana, A. "Top Management Turnover: An Empirical Investigation of Mutual Fund Managers." *Journal of Financial Economics*, 40 (1996), 403–427.
Khorana, A. "Performance Changes Following Top Management Turnover: Evidence from Open End Mutual Funds." *Journal of Financial and Quantitative Analysis*, 36 (2001), 371–393.
Kostovetsky, L. "Brain Drain: Are Mutual Funds Losing Their Best Minds?" Working Paper, University of Rochester (2010).
Kothari, S. P., and J. B. Warner. "Evaluating Mutual Fund Performance." *Journal of Finance,* 56 (2001), 1985–2010.
Kuhnen, C. M. "Business Networks, Corporate Governance, and Contracting in the Mutual Fund Industry." *Journal of Finance*, 64 (2009), 2185–2220.
Lynch, A. W., and D. K. Musto. "How Investors Interpret Past Fund Returns." *Journal of Finance*, 58 (2003), 2033–2058.
Malmendier, U., and S. Nagel. "Depression Babies: Do Macroeconomic Experiences Affect Risk Taking." *Quarterly Journal of Economics*, 126 (2011), 373–416.
Massa, M.; J. Reuter; and E. Zitzewitz. "When Should Firms Share Credit with Employees? Evidence from Anonymously Managed Mutual Funds." *Journal of Financial Economics*, 95 (2010), 400–424.
Newey, W. K., and K. D. West. "A Simple, Positive, Semi-Definite, Heteroskedasticity and Autocorrelation Consistent Covariance Matrix." *Econometrica*, 55 (1987), 703–708.
Pastor, L., and R. F. Stambaugh. "On the Size of the Active Management Industry." *Journal of Political Economy*, 120 (2012), 740–781.
Sirri, E. R., and P. Tufano. "Costly Search and Mutual Funds." *Journal of Finance*, 53 (1998), 1589–1622.
Wahal, S., and A. Y. Wang. "Competition among Mutual Funds." *Journal of Financial Economics*, 99 (2011), 40–59.
Warner, J. B., and J. S. Wu. "Why Do Mutual Fund Advisory Contracts Change: Performance, Growth, and Spillover Effects." *Journal of Finance*, 66 (2011), 271–306.

https://doi.org/10.1017/S0022109015000125 Published online by Cambridge University Press