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Abstract

We use a novel dataset to study the relation between individual portfolio manager compensation and mutual fund performance. Managers with explicit performance-based pay exhibit superior subsequent fund performance, especially when investment advisors link pay to performance over a longer time period. In contrast, alternative compensation arrangements, such as fixed salary, assets-based pay, or advisor-profits-based pay are not associated with superior performance. Our tests further show that the positive relation between performance-based contracts and fund performance is not driven by the selection of talented managers proxied by education background. Lastly, managers with performance-based pay engage less in risk-shifting activities.

JEL Classification: G23, J33
Keywords: Portfolio manager compensation, mutual funds, fund performance, risk shifting

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1. Introduction

Mutual funds are professionally managed investment vehicles that pool money from many investors to purchase securities such as stocks, bonds, and money market instruments. According to the Investment Company Institute, about half of all households in the United States invest in mutual funds, and the assets managed by them totaled $15 trillion at year-end 2013. Given the importance of mutual funds in the economy, understanding fund managers' incentives is a key issue for academics, regulators, practitioners, and individual investors. Due to lack of data on individual fund manager incentives, the literature has focused primarily on the design of the advisory contracts between fund investors and investment advisors (i.e., asset management companies), and its implications for fund performance.[1] Little is known about the layer of incentives that may more directly impact fund performance, that is, the compensation contracts of the actual decision makers – individual portfolio managers hired by advisors to manage the portfolio on a daily basis.

In March 2005, the U.S. Securities and Exchange Commission (SEC) adopted a new rule requiring mutual funds to disclose the compensation structure of their portfolio managers in the Statement of Additional Information (SAI).[2] For instance, mutual funds need to disclose whether portfolio manager compensation is fixed or variable, and whether compensation is based on the fund's investment performance and/or assets under management (AUM). For performance-based compensation, funds are required to identify any benchmark used to measure performance and to state the length of the period over which performance is measured. We analyze this mandatorily disclosed information in this paper to enhance our understanding of managerial incentives in the U.S. mutual fund industry and their effects on fund performance.

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[1] See, e.g., Starks (1987), Grinblatt and Titman (1989), Golec (1992), Tufano and Sevick (1997), Coles, Suay, and Woodbury (2000), Deli (2002), Elton, Gruber, and Blake (2003), Golec and Starks (2004), Dass, Massa, and Patgiri (2008), Massa and Patgiri (2009), and Warner and Wu (2011).

[2] See SEC Rule S7-12-04, Disclosure Regarding Portfolio Managers of Registered Management Investment Companies, http://www.sec.gov/rules/final/33-8458.htm.

We hand-collect the information on portfolio manager compensation structures from the SAIs for a sample of over 3,400 U.S. open-end mutual funds over the period 2006–2011. We uncover the following stylized facts. First, unlike the formulistic AUM-based advisory contract (see, e.g., Coles, Suay, and Woodbury, 2000; Deli, 2002; Warner and Wu, 2011), individual portfolio manager compensation is not formula-based. Second, 98.6% of sample funds report that their portfolio managers receive variable bonus-type compensation as opposed to fixed salary. Third, the bonus component of compensation is explicitly tied to the fund's investment performance for 79.2% of sample funds. The performance evaluation window ranges from one quarter to ten years, and the average evaluation window is three years. Finally, we find that for about half the sample, the manager's bonus is directly linked to the overall profitability of the advisor. Only 18.9% of sample funds explicitly mention that the advisor considers the fund's AUM when deciding manager bonuses.[3] These stylized facts contrast with the evidence on advisory contracts, in which AUM-based advisory fees are the predominant structure, and performance-based compensation is rarely observed (e.g., Elton, Gruber, and Blake, 2003).

We next examine the relation between portfolio managers' compensation contracts and mutual fund performance. We hypothesize that explicit performance-based pay is associated with superior fund performance. There are broadly two alternative, yet not mutually exclusive explanations for this hypothesis. First, as predicted by agency theory (e.g., Li and Tiwari, 2009), performance-based contracts induce portfolio managers to exert more effort. Alternatively, theory based on information asymmetry suggests that advisors may screen out better managers by offering performance-based contracts (e.g., Heinkel and Soughton, 1994) or that skilled portfolio managers may negotiate performance-based contracts to signal their ability (e.g., Das and Sundaram, 2002). In either case, we expect that, other things being equal, funds with performance-based portfolio manager compensation exhibit better performance compared to funds without such compensation scheme.

To test this empirical prediction, we relate portfolio manager compensation structures to subsequent fund performance. We use alpha measures estimated using both gross and net-of-fee

[3] Performance-based, AUM-based, and advisor-profits-based pay structures are not necessarily mutually exclusive in portfolio manager compensation.

fund returns (henceforth referred to as gross and net alphas, respectively) to evaluate performance. While net alpha measures the abnormal return to fund investors net of fees and expenses, gross alpha measures the pre-expense abnormal return and is arguably better suited to assess the effect of portfolio manager incentives on fund performance. To make our analysis comparable to the extant mutual fund literature, we first analyze a sample of actively managed diversified domestic equity funds and measure their performance using gross and net Carhart (1997) four-factor alphas. Next, we form a more comprehensive sample which consists of diversified domestic equity funds, sector funds, bond funds, balanced funds, and global funds (referred to as the full sample hereafter). For this sample of funds, we measure fund performance using gross and net six-factor alphas, estimated using the Carhart (1997) four-factor model augmented with a bond factor and an international factor (e.g., Elton, Gruber, and Blake, 2007; Chen, Hong, Jiang, and Kubik, 2013).

Consistent with the hypothesis, we find that, in the full sample, managers with performance-based pay subsequently outperform managers without such incentive by 86.0 (88.5) basis points per annum as measured by gross (net) six-factor alpha. For the subsample of diversified domestic equity funds, the outperformance is 69.0 (71.7) basis points per annum based on gross (net) four-factor alpha. Such an outperformance is both statistically and economically significant. The fact that we find similar evidence on both gross and net alphas also suggests that the outperformance created by managers on a pre-expense basis gets passed on to fund investors, rather than extracted by fund advisors (e.g., by charging higher fees). In contrast, we do not find that alternative compensation arrangements, such as fixed salary, AUM-based, or advisor-profits-based compensation are associated with superior subsequent performance. We further carry out a "horse race" (i.e., F-tests) among various compensation structures and find that managers with performance-based pay outperform managers with fixed salary, AUM-based pay, or advisor-profits-based pay for both the diversified domestic equity fund sample and the full sample.

As required by the SEC, if portfolio manager compensation is directly linked to fund performance, the fund must disclose the length of the period over which performance is measured, which we refer to as the "evaluation period." Short evaluation periods may damage

fund performance, because they induce managers to engage in such activities as risk shifting and window dressing to boost short-term performance. Longer evaluation periods can mitigate the problem of "short-termism" and help identify and reward managerial skill rather than luck. However, too long an evaluation period can protect managers from dismissal in the short-run and induce self-serving behavior such as shirking and herding, which is detrimental to fund performance. Therefore, it is an empirical issue as to whether and how evaluation period is associated with fund performance.

We focus on the sample of funds that comply with the SEC rule and disclose the evaluation period together with the evaluation benchmark. Our empirical analysis shows a positive relation between evaluation period and fund performance for both the domestic equity fund sample and the full sample. This positive relation is both statistically and economically significant. A one-standard-deviation (i.e., 1.2 years) increase in the average evaluation period is associated with an improvement of 28.2 (27.4) basis points in annualized gross (net) four-factor alpha for the domestic equity fund sample, and 36.4 (34.6) basis points in annualized gross (net) six-factor alpha for the full sample. In addition, we find similar results across two subsamples partitioned by median portfolio manager tenure. This finding suggests that our results are not driven by a survivorship bias whereby managers with longer tenure are associated with both longer evaluation period and better performance.

Our evidence thus far shows that managers with performance-based compensation exhibit superior fund performance, especially when advisors link pay to performance over a longer time period. We conduct several additional tests to assess the robustness of our findings. First, we obtain similar results if we control for funds' liquidity exposure using the Pastor and Stambaugh (2003) liquidity factor. Second, our results are robust to controlling for funds' strategy activeness using Cremers and Petajisto's (2009) active share measure. Lastly, our results remain qualitatively similar if we add family average performance (excluding the fund itself) in the regressions to control for family impact on fund performance. All together, these results help alleviate the endogeneity concern that certain fund strategies (e.g., with illiquid assets or high active share) or family characteristics may positively relate to both the use of performance-based pay and fund performance.

Our last set of tests investigates the channels through which performance-based pay relates to superior performance by studying several explanations proposed in the literature on portfolio delegation based on agency theory, information asymmetry, and risk-shifting incentives. First, we test whether the positive relation between performance-based pay and fund performance is driven by inducing managerial effort or by the selection of talented managers (either through screening or signaling), or by a combination of both. While it is challenging to completely disentangle these explanations, we investigate whether one of them dominates. Specifically, we follow Chevalier and Ellison (1999) and include two proxies of managerial talent (i.e., the average SAT score at the manager's undergraduate institution and whether the manager has an MBA from a top business school) as additional explanatory variables. We find that our baseline results on performance-based pay and evaluation period remain largely unchanged. To the extent that education is a valid proxy for managers' ability (either innate or through better education), this evidence appears rather consistent with the effort induction explanation than with the talent selection alternative. In addition, we find no evidence that managers with longer tenure are more likely to be compensated with performance-based contracts, which is inconsistent with the prediction of the asymmetric information model by Heinkel and Stoughton (1994).

Next, we study how portfolio manager compensation structures affect fund risk-shifting behavior. [4] Given that risk-shifting is detrimental to fund performance (Huang, Sialm, and Zhang, 2011), this could be another venue through which performance-based contracts relate to better fund performance. We examine portfolio managers' intra-year risk-shifting behavior using the stock holdings of diversified domestic equity funds (e.g., Brown, Harlow, and Starks, 1996; Chevalier and Ellison, 1997; Kempf, Ruenzi, and Thiele, 2009). We find that managers with performance-based pay engage less in risk-shifting activities compared to managers without such incentive. In addition, conditional on receiving performance-based pay, managers with longer evaluation periods are associated with less risk shifting than those with shorter evaluation

[4] The prediction in the theoretical literature is inconclusive. Grinblatt and Titman (1989) argue that convex, performance-based contracts lead to value-destroying risk-shifting incentives. Carpenter (2000), Ross (2004), and Basak, Pavlova, and Shapiro (2007), among others, challenge this relation and show that convex contracts do not necessarily lead to higher incentives for risk shifting.

periods. Taken together, our evidence suggests that higher effort induction and lower risk shifting are two potential channels through which performance-based contracts relate to superior fund performance.

Our paper contributes to the vast literature on managerial incentives in the U.S. mutual fund industry. To the best of our knowledge, this paper is the first to empirically study individual portfolio manager compensation based on SEC mandatory disclosures.[5] The literature has thus far focused on advisory contracts between fund shareholders and investment advisors (see footnote 1). Our paper shifts the focus to within the investment advisors and examines the compensation structures of individual portfolio managers, an area overlooked but critical to understand the incentives of mutual fund portfolio managers. Overall, our study suggests that mandatory disclosure of portfolio manager compensation is of great value in assessing managerial incentives in the mutual fund industry.

It is well documented in the prior literature that explicit performance-based incentives rarely exist in advisory contracts (e.g., Elton, Gruber, and Blake, 2003; Golec and Starks, 2004), likely due to the fact that advisory contracts are prohibited from having asymmetric incentive fees. In the meanwhile, there is an extensive literature that studies the implicit incentives embedded in the convex relationship between fund flows and performance.[6] These two pieces of evidence seem to indicate that the U.S. mutual fund industry relies mainly on implicit flow incentives to induce managerial effort. In contrast to this view, our study shows that, as predicted by agency theory (e.g., Li and Tiwari, 2009), explicit, option-type performance-based incentive contracts exist in the U.S. mutual fund industry and are associated with superior fund performance. In particular, we document that, in an unregulated setting, asymmetric, option-like performance-based incentives are the dominant form of compensation for portfolio managers. This stylized fact provides guidance for theoretical models on portfolio delegation in the asset management industry (e.g., Basak and Pavlova, 2013; Buffa, Vayanos, and Woolley, 2014)).

[5] Farnsworth and Taylor (2006) use survey data from 396 portfolio managers to analyze the determinants of portfolio manager compensation structures. Given the nature of the data, their study is subject to self-reporting bias and sample selection bias. In addition, they do not study performance implications of compensation contracts.

[6] See, e.g., Brown, Harlow, and Starks (1996), Chevalier and Ellison (1997), Sirri and Tufano (1998), Basak, Pavlova, and Shapiro (2007, 2008), Huang, Wei, and Yan (2007), and Sialm, Starks, and Zhang (2015). Also see Spiegel and Zhang (2013) and Goldstein, Jiang, and Ng (2015) for evidence on non-convex flow-performance relationship of equity and bond mutual funds, respectively.

Furthermore, these explicit performance-based incentives are associated with superior fund performance, which echoes the evidence in Agarwal, Daniel, and Naik (2009) on managerial incentives in the hedge fund industry, and Elton, Gruber, and Blake (2003) on performance-based advisory contracts.

Our paper also makes a unique contribution to the literature on performance evaluation of mutual fund managers. While it is not uncommon for prior literature to assume that mutual fund managers are evaluated based on their annual performance, we uncover that the most prevalent performance evaluation window is three-year. Further, we document that there is a positive relation between evaluation period and fund performance. This finding is novel not only to the mutual fund literature but also to the broader literature that studies executive compensation.[7]

Lastly, our study is related to the literature on mutual fund risk taking in response to managerial incentives. Prior studies show that implicit incentives embedded in the convex flow-performance relationship may give rise to agency conflicts as they induce fund managers to engage in intra-year risk-shifting activities.[8] Our study suggests that certain compensation contracts of portfolio managers, particularly performance-based contracts with longer evaluation period, can reduce such risk-shifting behavior.

The remainder of this paper proceeds as follows. Section 2 discusses the institutional background. Section 3 presents the data, variable construction, and sample description. Section 4 examines the effects of portfolio manager compensation on fund performance and Section 5 studies the underlying channels for such effects. Section 6 sets forth our conclusions.

2. Institutional background

Mandated by the Investment Company Act of 1940, mutual funds have a distinctive organizational structure. A typical mutual fund consists of fund shareholders and a board of directors. Shareholders, who are the owners of the funds, have specific voting rights to elect a

[7] A related paper by Gopalan, Milbourn, Song, and Thakor (2014) studies the determinants of executive pay duration and shows that some stock and option grants in executive pay are contingent on future firm performance over difference horizons.

[8] See, e.g., Brown, Harlow, and Starks (1996), Chevalier and Ellison (1997), Koski and Pontiff (1999), Busse (2001), Basak, Pavlova, and Shapiro (2007), Kempf and Ruenzi (2008), Kempf, Ruenzi, and Thiele (2009), Hu, Kale, Pagani, and Subramanian (2011), and Schwarz (2012).

board of directors that represents their interests. The board of directors is legally empowered to govern the fund. Its primary responsibility is to review and approve the advisory contract with an investment advisor (i.e., the asset management company) for the fund's management. Portfolio managers, who are employees of the investment advisor, make the day-to-day investment decisions for the fund. Selection, compensation, and removal of portfolio managers occur at the advisor's discretion.

Investment advisors are compensated through advisory fees for providing portfolio management services to fund shareholders. In most cases, the advisory fee is specified as a percentage of the fund's total net assets (e.g., Deli, 2002; Elton, Gruber, and Blake, 2003; Golec and Starks, 2004). Only a small proportion (less than 5%) of mutual funds compensates their investment advisors using incentive fees based on fund investment performance relative to a pre-specified benchmark. The advisory contract between fund shareholders and the investment advisor is constrained by regulation, which prohibits asymmetric incentive fees. According to section 205 (a) (1) of the Investment Advisers Act of 1940, the incentive fees received by an investment advisor must be symmetric relative to the benchmark, with any increase in fees for above-benchmark performance matched by a symmetric decrease in fees for below-benchmark performance. In contrast, the compensation contract between the investment advisor and portfolio managers, which we examine in this study, is not subject to this regulatory restriction.[9]

While the advisory contract between fund shareholders and the investment advisor has been disclosed to the investors for decades (e.g., via the SEC N-SAR Form), little is known about the compensation contract between investment advisors and portfolio managers. Since March 2005, the SEC has required mutual funds to disclose in their SAIs the structure of their portfolio managers' compensation and the method used to determine it. This new disclosure requirement is part of a series of regulations the SEC introduced in 2004 to improve the transparency of the mutual fund industry and to help investors better understand portfolio managers' incentives.

[9] In an SEC memorandum enclosed with Congressional Correspondence on Mutual Funds and Derivative Instruments dated September 26, 1994, footnote 35 states that "the Investment Advisors of 1940 prohibits most types of performance fees for registered investment advisers, but this prohibition does not apply to the compensation arrangements that investment advisers have with their employees, including mutual fund portfolio managers."

Per the disclosure requirement, portfolio manager compensation includes, without limitation, salary, bonus, deferred compensation, and whether the compensation is cash or non-cash. For each type of compensation, a fund is required to specifically describe the criteria on which such compensation is based: for example, whether the compensation is fixed, whether (and how) compensation is based on the fund's pre- or after-tax performance over a certain period, and whether (and how) compensation is based on the value of assets held in the fund's portfolio. In the case of a performance-based bonus, a fund is required to identify any benchmark used to measure performance and to state the length of the period over which performance is measured. It is important to note that mutual funds are required to disclose only the criteria upon which compensation is based, and not the dollar value of compensation received by portfolio managers.

3. Data, variables, and sample overview

3.1. Data

We construct our sample from several data sources. Our first data source is the Morningstar Direct Mutual Fund database, which covers U.S. open-end mutual funds and includes information about fund names, fund net-of-fee returns, AUM, inception dates, expense ratios, turnover ratios, investment objectives, fund tickers, benchmark portfolios, portfolio manager names, advisor names, fund family, and other fund characteristics. We also collect data on fund managers' education backgrounds (e.g., undergraduate institution attended and MBA degrees, if any) from the manager biographical information obtained from Morningstar. Recent studies by Berk and van Binsbergen (2015) and Pastor, Stambaugh, and Taylor (2015) show that there are certain discrepancies in mutual fund data between Morningstar and CRSP mutual fund databases. To ensure data accuracy, we only retain in our sample the funds in the Morningstar and CRSP merged database of Pastor, Stambaugh, and Taylor (2015).[10]

Our sample covers diversified domestic equity funds, sector funds, bond funds, balanced funds, global funds, and funds in miscellaneous categories such as alternative strategy funds. We

[10] Pastor, Stambaugh, and Taylor (2015) create a CRSP and Morningstar merged mutual fund data and check the accuracy of the matched data across the two databases. See the Data Appendix of their paper for detailed matching and cleaning procedures: http://faculty.chicagobooth.edu/lubos.pastor/research/Data_Appendix_Aug_2013_V3.pdf.

exclude money market funds and closed-end funds from our sample. We identify and exclude index funds using their names as well as Morningstar and CRSP index fund identifiers.[11] We also exclude funds with multiple investment advisors. Following Elton, Gruber, and Blake (2001), Chen, Hong, Huang, Kubik (2004), and Pastor, Stambaugh, and Taylor (2015), we exclude funds with less than $15 million in TNA (total net assets). We further use data on fund ticker creation date to address incubation bias (Evans, 2010).[12] For funds with multiple share classes, we compute fund-level variables by aggregating across the different share classes. Specifically, we calculate total AUM as the sum of assets across all share classes and compute the value-weighted average of other fund characteristics across share classes.

Another main data source is the SEC EDGAR (Electronic Data Gathering, Analysis, and Retrieval) database. We retrieve from EDGAR the SAI for each fund in our sample for each year from 2006 to 2011. We then manually collect the information on the structure of and the method used to determine the compensation of portfolio managers. We relate these compensation structures to fund performance in the year following the SAI year. Moreover, we obtain advisory fee information contained in the N-SAR filings available via EDGAR. The N-SAR data set is then matched by fund ticker and fund name to the Morningstar database.

Finally, we obtain stock holdings of domestic equity funds in our sample from the Thomson Reuters Mutual Fund Holdings database, which contains the quarterly equity holdings of U.S. open-end mutual funds. We merge our sample of domestic equity funds and Thomson Reuters Mutual Fund Holdings database using the MFLINKS tables (e.g., Wermers, 2000).

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[11] Similar to Pastor, Stambaugh, and Taylor (2015), we remove funds with Morningstar index fund indicator equal "Yes" or CRSP index fund flag equal to "D" (pure index fund) or "E" (enhanced index fund). We also exclude from our sample funds whose names contain any of the following text strings: Index, Ind, Idx, Indx, Mkt, Market, Composite, S&P, SP, Russell, Nasdaq, DJ, Dow, Jones, Wilshire, NYSE, iShares, SPDR, HOLDRs, ETF, Exchange-Traded Fund, PowerShares, StreetTRACKS, 100, 400, 500, 600, 1000, 1500, 2000, 3000, 5000 (e.g., Busse and Tong, 2012; Busse, Jiang, and Tang, 2014; Ferson and Lin, 2014; Kostovetsky and Warner, 2015).

[12] We address incubation bias as follows. First, as in Evans (2010), we use fund ticker creation date to identify funds that are incubated (i.e., when the difference between the earliest ticker creation date and the date of the first reported monthly return is greater than 12 months). If a fund is classified as incubated, we eliminate all data before the ticker creation date. Second, the ticker creation date data end in January 2008. After that, we obtain the first date in which a fund reports its ticker in Form N-SAR filed to the SEC, which is close to or later than the ticker creation date. We use this N-SAR ticker report date and the same 12 months cutoff to identify funds are potentially incubated and remove the first 3 years of return history for these funds as suggested by Evans (2010). Our two-step procedure minimizes the cost of eliminating useful data for non-incubated funds.

3.2. Variable construction

3.2.1. Compensation structures

As discussed above, mutual funds are not required to disclose the actual dollar amount of compensation received by their portfolio managers. Instead, they must disclose only the structure of and the method used to determine portfolio manager compensation. To capture the different aspects of compensation structures of portfolio managers, we construct the following variables. Note that, except for *Fixed Salary*, the variables that describe compensation structures are not necessarily mutually exclusive.

Fixed Salary: Portfolio manager compensation can be a fixed salary or a fixed salary plus a variable component, commonly referred to as a bonus. To differentiate between these two types of compensation structure, we use an indicator variable, *Fixed Salary*, which equals one if the portfolio manager's compensation is fixed, and zero if the compensation has both fixed and variable components.

Performance Pay: For those portfolio managers who have both a fixed salary and a variable bonus, the SEC requires the fund to disclose whether the bonus is based on the fund's investment performance. The indicator variable *Performance Pay* equals one if the bonus is explicitly linked to fund performance, zero otherwise.

Evaluation Period: In the case of a performance-based bonus, a fund is required to state the length of the period over which performance is measured. In many cases, funds report multiple evaluation periods such as "one-, three-, and five-year window". We construct the following variables: *Evaluation Period Min,* which takes the value, in years, of the shortest evaluation window, and *Evaluation Period Max,* which takes the value, in years, of the longest evaluation window. *Evaluation Period Median* is the median evaluation window if there are three or more evaluation periods disclosed. *Evaluation Period Mean* is calculated as the mean of the shortest and longest evaluation periods.

AUM Pay: For those portfolio managers who have both a fixed salary and a variable bonus, the SEC requires the fund to disclose whether the bonus is based on the value of assets held in the fund's portfolio. We construct an indicator variable, *AUM Pay*, which equals one if the portfolio manager's compensation is explicitly tied to fund AUM, zero otherwise.

Advisor-Profits Pay: Similar to *Performance Pay* and *AUM Pay*, we construct an indicator variable, *Advisor-Profits Pay*, which takes the value of one if portfolio manager compensation is explicitly tied to overall profits of the investment advisor, zero otherwise.

3.2.2. Family, advisor, and manager characteristics

Family Size: The sum of total net assets of all the funds in the family.

Subadvisor: Following Chen, Hong, Jiang, and Kubik (2013), a fund is categorized as externally subadvised (outsourced) if the investment advisor or subadvisor managing the portfolio is not affiliated with the mutual fund family. The SEC defines "affiliated" as either ownership of or some controlling interests in the other party. We first check the family name and advisor name (both obtained from N-SAR filings). When the two names do not match, we use the information in the fund's SAI to check whether there exists any affiliation between the two. The variable *Subadvisor* is set to one if there is no affiliation between the mutual fund family and the investment advisor; zero otherwise.

Owner: This is an indicator variable that equals one if the portfolio manager is the founder, controlling owner, principal partner, or blockholder of the investment advisor, zero otherwise. In other words, a positive value of *Owner* indicates that at least one of the portfolio managers working for the fund has vested interests in the investment advisor. We obtain this information from the portfolio manager biography description in the SAI.

Team Mgmt.: This is an indicator variable equal to one if the fund is managed by a team of portfolio managers and zero if the fund is managed by a single manager.

Manager Tenure: This variable is defined as the number of months that a manager(s) has been at the helm of a mutual fund.

Manager Education: We manually collect portfolio managers' education backgrounds, including their undergraduate institutions and MBA degrees if any, from manager biography in the Morningstar database. Similar to Chevalier and Ellison (1999), we construct two education variables to proxy for managers' ability: (i) the average composite SAT score at the managers'

undergraduate institution (*SAT*), and (ii) an indicator variable, *Top MBA*, that equals one if the portfolio manager holds an MBA degree from a top business school.[13]

Manager Experience: We construct this measure of portfolio managers' industry experience as the interval between sample year and the year when a manager first appears in the Morningstar Direct database. In the case where a fund is managed by a team of portfolio managers, we calculate *Manager Tenure*, *Manager Education* and *Manager Experience* by taking the average of these variables across all team members.

3.2.3. Fund characteristics

Fund Performance: We use both gross and net alphas to evaluate fund performance. Gross alpha is the more relevant measure for our study since it captures the abnormal return before fund expenses are deducted and is arguably better suited to assess the effect of portfolio manager incentives on fund performance. We also examine fund net alpha as it measures the abnormal return delivered to fund investors after fees and expenses.

For the sample of diversified domestic equity funds, we estimate *Gross Four-Factor Alpha (Net Four-Factor Alpha*) using monthly fund gross (net) returns with the Carhart (1997) four-factor model, which adjusts for market, size, book-to-market, and momentum factors. For the full sample of funds, we estimate *Gross Six-Factor Alpha* (*Net Six-Factor Alpha*) using monthly fund gross (net) returns with a six-factor model that augments the Carhart (1997) four-factor model with a bond factor (Barclays U.S. Aggregate Bond Index) and an international factor (MSCI World Ex U.S. Index). Similar factor models are used in prior studies such as Elton, Gruber, and Blake (2007) and Chen, Hong, Jiang, and Kubik (2013). Fund monthly gross returns are calculated by adding back 1/12th of the annual expense ratio to monthly net returns.

Specifically, for each of the alpha measures, we first estimate the factor loadings using the preceding 24 monthly fund returns (gross or net):

$$R_{i,s} = \hat{\alpha}_{i,t-1} + \sum_{k=1}^{N} \hat{\beta}_{i,k,t-1} F_{k,s} + \varepsilon_{i,s}, \quad s = t-24, \ldots, t-1 \tag{1}$$

[13] The SAT information is obtained from the College Board: https://www.collegeboard.org/. We use the SAT score at the end of our sample period, that is, as of the year of 2012. We define top business schools as those in the top 5% based on the average GMAT score in 2012 (i.e., average GMAT score>700).

where *s* and *t* indicate months, *i* indicates funds, R_i is the monthly excess return of fund *i* over one-month T-bill rate, and *F* is the monthly returns of the four or six factors. We then calculate monthly out-of-sample alpha as the difference between a fund's return (gross or net) in a given month and the sum of the product of the estimated factor loadings and the factor returns during that month:

$$\alpha_{i,t} = R_{i,t} - \sum_{k=1}^{N} \hat{\beta}_{i,k,t-1} F_{k,t}. \quad (2)$$

We average the monthly alphas within a year and multiply it by 12 to obtain an annualized alpha measure. Later in our analysis, we also follow the same procedure to estimate gross and net five-factor (seven-factor) alphas with monthly return data by adding Pastor and Stambaugh (2003) liquidity factor to the four-factor (six-factor) model.

We consider several alpha measures estimated using alternative methodologies in our robustness tests. First, we use daily fund return data to estimate in-sample four-factor and six-factor alphas (e.g., Bollen and Busse, 2001, 2005). In particular, we estimate gross and net four-factor (six-factor) alphas each year using daily (gross or net) fund return data with the Carhart (1997) four-factor (six-factor) model. We calculate fund daily gross returns by adding back 1/252th of the annual expense ratio to the daily net returns. To capture any effect of infrequent trading on daily fund returns (e.g., Scholes and Williams, 1977; Dimson, 1979), we include both contemporaneous and lagged daily factor returns in the regressions, following Bollen and Busse (2001, 2005) and Busse and Tong (2012). We annualize the daily alpha estimate by (1+daily alpha)^{252} –1. Moreover, for our analysis on the full sample, we estimate a benchmark-adjusted alpha by regressing monthly excess returns of a fund on the excess returns of its Morningstar-assigned benchmark (i.e., Morningstar Category Index) for each calendar year.[14] We annualize the benchmark-adjusted alpha by multiplying it by 12.

[14] Morningstar assigns each fund to a Morningstar Category and designates a benchmark portfolio, namely Morningstar Category Index, to each category. We follow Pastor, Stambaugh, and Taylor (2015) and use it to estimate a benchmark-adjusted performance measure. Since Morningstar assigns categories based on funds' holdings instead of the objectives reported in the prospectus, this benchmark does not suffer from the cherry-picking bias documented in Sensoy (2009).

Risk Shifting: For the sample of diversified domestic equity funds, we analyze funds' intra-year risk-shifting behavior (e.g., Brown, Harlow, and Starks, 1996; Chevalier and Ellison, 1997; Kempf, Ruenzi, and Thiele, 2009). In particular, we follow Kempf, Ruenzi, and Thiele (2009) and use fund portfolio holdings to construct the risk shift ratio:

$$Risk\ Shift\ Ratio_{i,t} = \sigma_{i,t}^{2,int} / \sigma_{i,t}^{1}. \quad (3)$$

For fund *i* in year *t*, we compute the intended portfolio risk variable, $\sigma_{i,t}^{2,int}$, in the second half of the year based on the actual portfolio weights in the second half of the year and the volatility of a stock in the first half of the year. We then calculate the intended risk shift ratio as in Eq. (3) by taking the ratio of the intended portfolio risk in the second half of the year, $\sigma_{i,t}^{2,int}$, and the realized portfolio risk in the first half of the year, $\sigma_{i,t}^{1}$, computed from the actual portfolio weights and stock volatility in the first half of the year. We use the standard deviation of 26 weekly fund returns to measure fund volatility for each half-year period. By design, this measure captures the effect of active changes in portfolio composition in the second half of the year and is unaffected by changes in stock volatility.

Advisory Contract Features: Performance Adv. Fee is a dummy variable that equals one if the fund employs a fulcrum advisory fee, which rewards and penalizes the advisor for the fund's investment performance, zero otherwise (Elton, Gruber, and Blake, 2003). Following Massa and Patgiri (2009), *Coles Incentive Rate* is defined as the difference between the last and first marginal advisory fee rates divided by the effective marginal advisory fee rate, all as a percentage of fund AUM. A value of zero for this measure represents a linear advisory fee schedule. *Coles Incentive Rate* takes negative values for concave advisory fee structures.

Other Variables: *Fund Size* is the sum of AUM across all share classes of the fund; *Fund Age* is the age of the oldest share class in the fund; *Expense* is determined by dividing the fund's operating expenses by the average dollar value of its AUM; *Turnover* is defined as the minimum of sales or purchases divided by total net assets of the fund; *Net Flows* is the annual average of monthly net growth in fund assets beyond reinvested dividends (Sirri and Tufano, 1998). Lastly, *Active Share* is calculated by aggregating the absolute differences between the weight of a

portfolio's actual holdings and the weight of its closest matching index (Cremers and Petajisto, 2009). It captures the percentage of a fund's portfolio that differs from its benchmark index.

3.3. Sample overview

Our final sample consists of 3,453 unique mutual funds from 412 fund families, covering 15,605 fund-year observations (henceforth, the full sample). These observations are evenly distributed across the sample period of 2006–2011. The sample distributions across investment categories are as follows: diversified domestic equity funds (37.5%), bond funds (30.0%), global funds (14.2%), balanced funds (8.7%), sector funds (8.2%), and other funds (1.5%). To facilitate the comparison with the previous literature on diversified U.S. domestic equity funds, we separately analyze such funds in our study (henceforth, the equity fund sample). In particular, we have 1,311 unique diversified U.S. domestic equity funds from 328 fund families with a total of 5,845 fund-year observations over the 2006-2011 period.[15]

We report summary statistics of portfolio manager compensation structures for the full sample in Table 1 (see Table A1 of the Internet Appendix for summary statistics of the equity fund sample). Overall, we find that the reported compensation structure is subjective and discretionary rather than objective and formula-based. In general, this finding is consistent with the survey evidence documented by Farnsworth and Taylor (2006). Fixed salary is rarely observed in the sample. Only 1.4% of funds in the full sample claim that their managers' compensation does not vary with any factor. In the vast majority of cases, portfolio manager compensation consists of both a fixed base salary and a variable component, namely, a bonus. The weights of the base salary and the bonus in total compensation, however, are generally not available, since the SEC does not require this information to be disclosed. Based on a small proportion of funds that voluntarily release information on bonus size relative to base salary, we observe that the bonus can be as large as one to three times the base salary.

[Insert Table 1 here]

[15] We note that the sample size of diversified domestic equity funds is slightly smaller than some of the prior studies since we require funds in our sample to (i) have portfolio manager compensation data available in SAI, (ii) be in the Morningstar and CRSP merged database of Pastor, Stambaugh, and Taylor (2015), and (iii) can be marched to Thomson Reuters Holdings database. Nevertheless, our domestic equity sample is overall representative based on fund characteristics.

We find that for 79.2% of our sample funds, portfolio manager compensation is directly tied to fund investment performance. We observe that the performance-based incentive is asymmetric: advisors reward managers for outperformance relative to the assigned benchmark, but do not penalize them for underperformance. As for the length of the period over which investment performance is measured, we observe that the vast majority of funds report multiple evaluation periods (e.g., one-, three-, and five-year windows). The average evaluation window is about three years on a rolling-window basis. The variation in evaluation periods is significant, with the longest evaluation window being ten years and the shortest being one quarter.

Contrary to the pattern in advisory contracts, in the majority of cases, portfolio manager compensation is not explicitly tied to the fund's AUM. Only 18.9% of funds in our sample explicitly mention that the investment advisor considers the fund's AUM when deciding the bonus in portfolio manager compensation. Moreover, we find that for 48.7% of our sample funds, portfolio manager compensation is explicitly stated to be linked to the profitability of the investment advisor. Arguably, these portfolio managers' compensation is indirectly tied to the AUM of the fund, since advisor profitability depends on the advisory fee rates and total AUM of the advisor. We note that the prevalence of actual bonuses based on the advisor's profits may be underestimated because it is not required to be disclosed by the SEC.

As mentioned above, performance-based, AUM-based, and advisor-profits-based incentives are not mutually exclusive when compensating a portfolio manager. We further break down the distribution of these three types of bonus in Panel B of Table 1. We find that, out of 15,393 fund-year observations that include variable compensation, 5,733 (37.2%) offer managers a bonus based only on investment performance; 133 (0.9%) offer a bonus based only on AUM; and 2,128 (13.8%) offer a bonus based only on advisor profits. For the remaining funds of the sample, managers receive some combinations of the three types of bonus. There are 1,566 (10.2%) cases where managers receive all three types of bonus simultaneously, and there are 716 (4.7%) cases where the manager's compensation is entirely subjective and does not depend on any specific stated factor. These results speak to the empirical relevance of performance-based bonuses, both in isolation and in combination with other incentives.

We find that cross-sectional variation in portfolio manager compensation structure arises mainly at the fund family or advisor level (a given family may have more than one advisor if one or more funds are outsourced to an unaffiliated subadvisor). In particular, we find that only 101 (24) out of 412 families (644 advisors) exhibit some within-family (within-advisor) variation in the compensation features that we examine. In the case of team-managed funds, we do not observe much variation in the structure of compensation for different managers working for the same fund. The only exception is when one manager in a team is the controlling owner of the advisory firm. In such cases, we consider only the owner's compensation structure in our analysis. Given this data structure, we conduct our analysis at the fund level and cluster the standard errors at the family level in all our regression specifications to account for the within-family residual cross-correlation (Petersen, 2009). We also observe that portfolio manager compensation structures rarely change over time during our sample period (see Table A2 of the Internet Appendix).

In Table 2, we report summary statistics of family, advisor, manager, and fund characteristics. An average fund in our sample has about $1.6 billion AUM, a 15-year history, a 1.2% expense ratio, and an 89.8% turnover ratio. Such fund is part of a family of funds with a total of $136.9 billion AUM. The average manager tenure is 5.8 years. About 30.8% of the sample funds have at least one manager with an MBA degree from a top business school. On average, managers attended an undergraduate institution with an average student SAT score of 1,306 and have about 10 years of industry experience. For 17.9% of our sample funds, there is at least one portfolio manager who is the controlling owner of the investment advisor. Similar to the evidence of Chen, Hong, Jiang, and Kubik (2013) and Kostovetsky and Warner (2015), 18.5% of sample funds are managed by an unaffiliated subadvisor.

[Insert Table 2 here]

Consistent with prior literature (e.g., Jensen, 1968; Elton, Gruber, and Blake, 1996; Carhart, 1997; Wermers, 2000; Fama and French, 2010; Elton and Gruber, 2013), U.S. mutual funds typically have negative factor model alphas on a net-of-fee basis. For the equity fund sample, the average (median) annualized net four-factor alpha is -0.87% (-0.84%); for the full sample, the average (median) annualized net six-factor alpha are -0.31% (-0.35%). We also find

similar evidence for all the alternative alpha measures we consider in our robustness tests (see Table A3 of the Internet Appendix). As for the gross-of-fee fund performance, the averages of gross four-factor alpha of diversified domestic equity funds and gross six-factor alpha of the full sample are both positive. The mean risk shift ratio of our domestic equity fund sample is 1.03. Similar to Elton, Gruber and Blake (2003), we find that only 4.6% of funds have symmetric performance-incentive fees in the advisory contract. Finally, the average *Coles Incentive Rate* measure is -0.12 (i.e., a concave advisory fee structure), which is close to the mean value reported in Massa and Patgiri (2009).

4. Portfolio manager compensation and fund performance

In this section, we study the impact of individual portfolio manager compensation on mutual fund performance. In Section 4.1, we examine the performance difference between managers with and without performance-based compensation. In Section 4.2, we further compare the performance difference among different compensation arrangements. In Section 4.3, we examine the relation between evaluation period and fund performance. Section 4.4 presents several tests to assess the robustness of our results.

4.1. Performance-based pay and fund performance

We define performance-based pay as a reward structure that explicitly links manager compensation to fund investment performance. We hypothesize that such an arrangement can either induce managerial effort or attract skilled managers, or both. Either case, the empirical prediction is the same: a positive relation between performance-based compensation and future fund performance.

To test this prediction, we employ the following ordinary least squares (OLS) specification in our empirical analysis:

$$Y_{i,t} = \alpha + \beta * Performance\ Pay_{i,t-1} + \gamma * Controls_{i,t-1} + \lambda_{category} + \lambda_t + \mu_{i,t}. \qquad (4)$$

The dependent variable $Y_{i,t}$ is the fund performance of fund i in year t, namely, four-factor alpha for domestic equity funds, and six-factor alpha for the full sample. The main

independent variable of interest, $Performance\ Pay$, is an indicator variable that equals one if the portfolio manager receives performance-based compensation in year *t-1*, zero otherwise. The coefficient β, therefore, captures the relation between performance-based pay and fund performance. We include a vector of family, advisor, manager, and fund characteristics to control for their effect on fund performance. Our control variables include family size, subadvisor dummy, controlling owner dummy, team management dummy, manager tenure, fund size, fund age, expense ratio, turnover ratio, fund flow, fund risk, performance advisory fee dummy, and *Coles Incentive Rate*. All the independent variables are measured as of the previous year-end, to address potential reverse causality concerns. We also control for fund investment objective fixed effects and year fixed effects in the regression.[16] Standard errors are clustered at the family level.

We report the estimation results in Table 3. In columns (1) to (4), we analyze domestic equity funds and measure their performance by gross and net four-factor alphas. In columns (5) to (8), we use the full sample and measure fund performance by gross and net six-factor alphas. Consistent with our prediction, we find that managers with performance-based pay significantly outperform those without such compensation scheme on a gross-of-fee basis. We find similar evidence when analyzing fund net performance, which suggests that the outperformance generated by managers on a pre-expense basis is passed on to fund investors, rather than extracted by fund advisors by charging higher fees.

[Insert Table 3 here]

In the baseline analysis, we include only the variable of interest but no control variables. As shown in columns (1), (3), (5), and (7), the estimated coefficients on *Performance Pay* are all positive and significant at the 1% level. When we include the control variables and fund objective and year fixed effects in columns (2), (4), (6), and (8), the estimated coefficients on *Performance Pay* are 0.776, 0.798, 0.843, and 0.863, respectively, all significant at the 1% level.

[16] For our analysis of the full sample, we include the following fund style fixed effects: (i) domestic equity, (ii) bond, (iii) global, (iv) balanced, (v) sector, and (vi) others. For the regressions over the diversified domestic equity fund sample, we obtain funds' investment objectives from Morningstar and include the following objective fixed effects: (i) aggressive growth, (ii) growth, (iii) growth and income, (iv) equity-income, and (v) small company.

[17] These results suggest that, for the equity fund sample, managers with performance-based pay outperform those without such compensation by 77.6 (79.8) basis points per annum as measured by gross (net) four-factor alpha. For the full sample, the outperformance is of similar magnitude, 84.3 (86.3) basis points per annum on a pre-expense (post-expense) basis after adjusting for risk factors. These findings are economically significant, considering that the average annualized gross (net) four-factor alpha for the equity fund sample is 27.5 (-86.6) basis points and the average annualized gross (net) six-factor alphas for the full sample is 73.9 (-30.6) basis points. Furthermore, the dollar magnitude of the economic impact implied by the above-documented outperformance is remarkable given that trillions of dollars of assets in the mutual fund industry are managed by portfolio managers who receive performance-based pay.

4.2. Other compensation structures and fund performance

We next examine whether and how other compensation schemes, such as pay linked to fund AUM, pay linked to advisor profits, and fixed salary relate to fund performance. These tests on alternative compensation arrangements provide us with a "counterfactual" analysis on the relation between performance-based pay and fund performance. They also serve as a "horse race" test on the link between various compensation schemes and fund performance.

In particular, we conduct the same regression analysis as in Eq. (4) except that we include four variables of interests simultaneously: *Performance Pay*, *AUM Pay*, *Advisor-Profits Pay*, and *Fixed Salary*. The base case is the funds whose portfolio manager's compensation is variable, subjective, but does not depend on any specific stated factor. We also carry out F-tests to compare the differences among the coefficients of those four variables. We acknowledge that the different compensation schemes are not mutually exclusive and we do not observe the exact weight of each scheme. However, any noise in the classification of different compensation schemes will likely bias the results against our hypothesis.

[17] Our results are stronger if we repeat the analysis of these four columns in Table 3 after removing any fund that uses performance-based pay in combination with alternative compensation structures. The coefficient estimates on *Performance Pay* become 1.288 (t-stat.=3.76), 1.328 (t-stat.=3.90), 0.966 (t-stat.=3.27), and 1.009 (t-stat.=3.42), respectively.

We present the estimation results in Table 4. Again, in columns (1) to (4), we include only diversified domestic equity funds and use gross and net four-factor alphas to measure fund performance. In columns (5) to (8), we analyze the full sample using gross and net six-factor alphas. We find that, unlike in the case of performance-based compensation, the use of AUM-based, advisor-profit-based, or fixed compensation is not associated with significantly better fund performance. The coefficients on *AUM Pay*, *Advisor-Profits Pay* and *Fixed Salary* are all negative, mostly not significantly different from zero. In contrast, the coefficients on *Performance Pay* remain positive and significant at the 5% level or better in all eight specifications, with magnitudes similar to the figures reported in Table 3. In terms of economic significance, managers with performance-based pay subsequently outperform managers without such incentive by 69.0 (71.7) basis points per annum as measured by gross (net) four-factor alpha for the diversified domestic equity funds, and by 86.0 (88.5) basis points per annum as measured by gross (net) six-factor alpha for the full sample.

[Insert Table 4 here]

Additionally, we compare the coefficient of *Performance Pay* with the coefficient estimates of the other three compensation structures individually or jointly. As shown in the bottom of Table 4, the F-tests on the equality of coefficients are all significant at the 10% level or better. That is, by and large, we reject the null hypothesis that performance-based pay has the same impact on fund performance (gross or net) as the other three compensation schemes. In terms of economic significance, based on our estimates in columns (2) and (6), managers with performance-based pay outperform managers with AUM-based pay, advisor-profits-based pay, and fixed salary by 84.1 (121.9) , 113.0 (115.2) , and 250.0 (205.1) basis points per annum, respectively, as measured by gross four-factor alpha (gross six-factor alpha). These results further suggest that performance-based compensation is associated with better fund performance, and that this positive relation with performance is not shared by other compensation schemes.

4.3. Evaluation period and fund performance

According to SEC Rule S7-12-04, if portfolio manager compensation is linked to fund performance, the fund is required to "identify any benchmark used to measure performance and

state the length of the period over which performance is measured." In this section, we focus on those funds with performance-based compensation and examine the effect of evaluation period on fund performance.

As explained in the Introduction, short evaluation periods can damage fund performance, since they induce managers to engage in such activities as excessive risk taking and window dressing. Longer evaluation periods can mitigate these adverse incentives and help identify portfolio manager skills. However, too long an evaluation period can protect managers from dismissal in the short-run and induce self-serving behavior, such as shirking and herding. Hence, *ex-ante*, the net effect is unclear. It may be argued that the optimal horizon to evaluate managerial investment performance should match shareholders' investment horizon.[18] It is therefore an empirical question whether and how the evaluation period impacts fund performance.

To estimate the impact of evaluation period on fund performance, we use the following regression model:

$$Y_{i,t} = \alpha + \beta * EP_{i,t-1} + \gamma * Controls_{i,t-1} + \lambda_{category} + \lambda_t + \omega_{i,t}. \quad (5)$$

The dependent variable $Y_{i,t}$ is the fund performance of fund i in year t. The main independent variable of interest, EP, is the evaluation period over which investment performance is measured in the case of performance-based compensation. Since most funds report multiple evaluation windows, we use three measures of evaluation period: (i) *Evaluation Period Mean*, (ii) *Evaluation Period Min*, and (iii) *Evaluation Period Max*. The coefficient β captures the impact of the evaluation period on fund performance. Again, we control for the same vector of family, advisor, manager, and fund characteristics as in Eq. (4). We also include fund investment objective and year fixed effects in the regression. Standard errors are clustered at the family level.

Although the SEC rules mandate that funds should disclose the evaluation period and the performance benchmark when portfolio managers receive performance-based compensation,

[18] There exists no direct evidence on the holding periods of mutual fund investors. The consensus is that the typical fund shareholder redeems shares infrequently. According to Sirri and Tufano (1998), the average holding period of equity mutual funds is approximately seven years.

only 10,583, or 85.6%, out of 12,365 fund-year observations with manager performance-based pay report the evaluation period; among those, only 8,319, or 78.6%, identify the benchmark used to measure performance together with the evaluation period. For example, a common benchmark for large-cap value equity funds is the Russell 1000 Value Index. In our main analysis, we focus the subsample of funds that fully comply with the SEC rule and disclose both evaluation period and performance benchmark.[19]

We present the estimation results in Table 5. We analyze domestic equity funds using gross and net four-factor alphas in columns (1) to (6). We examine the full sample using gross and net six-factor alphas in columns (7) to (12). Our results suggest that portfolio managers with longer average evaluation period are associated with better performance. In columns (1), (4), (7), and (10), the coefficient estimates of *Evaluation Period Mean* are 0.235, 0.228, 0.298, and 0.284, respectively, all significant at the 5% level or better. In terms of economic significance, a one-standard-deviation (i.e., 1.2 years) increase in the average evaluation period is associated with an improvement of 28.2 (27.4) basis points in annualized gross (net) four-factor alpha for the domestic equity fund sample, and 36.4 (34.6) basis points in annualized gross (net) six-factor alpha for the full sample. In addition, we find a positive and significant relation between maximum evaluation period and fund performance for both the equity fund sample and the full sample (see columns (3), (6), (9), and (12)). Lastly, we also find some evidence that minimum evaluation period is positively related to fund performance over the full sample.

[Insert Table 5 here]

4.4. Robustness tests

The results in Sections 4.1 to 4.3 together show that portfolio managers with performance-based bonuses exhibit superior subsequent fund performance, especially when advisors link pay to performance over a longer time period. In contrast, alternative compensation arrangements, such as fixed salary, AUM-based pay, or advisor-profits-based pay are not

[19] For robustness check, we repeat our analysis of Table 5 using the 10,583 observations that report the evaluation period, regardless of whether a performance benchmark is disclosed or not. Our results are qualitatively similar, though overall much weaker (see Table A6 of the Internet Appendix).

associated with better performance. In this section, we discuss the results of several additional tests we perform to assess the robustness of these findings.

First, we are concerned about a number of potential forms of endogeneity which may affect the interpretation of our main findings. One concern is that funds with certain types of assets (e.g., illiquid assets) or strategies (e.g., actively deviating from benchmarks) are more likely to call for performance-based contracts due to the difficulty of monitoring. In the meanwhile, these assets or strategies are associated with greater alphas when evaluated using conventional factor models. To address such a concern, we carry out two sets of tests. First, in Panel A of Table 6, we include the active share measure of Cremers and Petajisto (2009) as an additional control variable and find that our main inferences remain unchanged.[20] Second, in Panel B of Table 6, we estimate a five-factor (seven-factor) alpha measure by adding the Pastor and Stambaugh (2003) liquidity factor to our four-factor (six-factor) model and repeat our analysis in Tables 3 and 4 using five-factor and seven-factor alphas as dependent variables. Our main results remain qualitatively similar after we control for funds' illiquidity exposure in our analysis.

[Insert Table 6 here]

Another concern is that our results are driven by some fund families that use certain types of contracts (e.g., performance-based pay contracts) and, at the same time, exert a positive impact on fund performance. To alleviate this concern, we add family average performance in our baseline regressions to control for family influence on fund performance. Specifically, we construct and include the concurrent average alpha each year of all funds in a family excluding the fund itself in the regression. We find that our baseline results remain qualitatively similar after controlling for family impact on performance (see Panel C of Table 6).[21]

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[20] Because the active share measure is calculated using fund's stock holdings, it is not available for all funds in the full sample. For our analysis in columns (5) to (8) of Panel A of Table 6 and columns (7) to (12) of Panel A of Table 7, we only include funds in the diversified domestic equity, sector, and global equity fund categories.

[21] An alternative way to control for family impact is to include family fixed effects in the regression. The nature of the information disclosure required by the SEC limits us from observing much within-family variation. In addition, because our sample period is relatively short (2006-2011), time-series variation is rather low. After introducing family fixed effects, only within-family variation remains, which accounts for less 20% of total dispersion in compensation structures. Our main results remain qualitatively similar once family fixed effects are included (especially for the domestic equity fund sample), although the evidence becomes weaker as one would expect.

In Table 7, we carry out a set of robustness tests regarding our main findings on evaluation period in Table 5. Panel A of Table 7 shows that our results on evaluation period are robust if we control for the Cremers and Petajisto (2009) active share measure. In Panel B, we use five-factor and seven-factor alpha as our performance measures to control for funds liquidity exposure and find our inferences remain unchanged. In Panel C, we add family average performance to our regressions on evaluation period. Again, the results are qualitatively similar to the baseline results.

[Insert Table 7 here]

Furthermore, one potential concern regarding our evaluation period results is that advisors may link pay to performance over a longer window for portfolio managers with longer tenure in the fund. This behavior would introduce a survivorship bias insofar managers who survive longer are also more skilled. To address this concern, first and foremost, we control for manager tenure in all main regression specifications. Second, we perform two robustness tests. First, in Panel D of Table 7, we divide our sample funds into two subsamples based on median manager tenure (i.e., 56 months) and check whether there is any difference in the evaluation period between the two subsamples. We do not find any evidence that portfolio managers with longer tenure are associated with longer evaluation periods. Second, we repeat our main analysis in Table 5 with each of the subsamples and test for the coefficient difference between the two subsamples using an interaction term between the evaluation period and an indicator variable that equals one if a fund's manager tenure is below the median value and zero otherwise. Panel E of Table 7 shows that the coefficient on the interaction term is not significantly different from zero in any of the 12 specifications. In summary, the evidence in Panels D and E suggests that our results on evaluation period are not driven by a survivorship bias in which managers with longer tenure are associated with both longer evaluation period and better performance.

Finally, we carry out additional robustness tests regarding performance measures. Our results are not sensitive to the performance measures we use. In particular, we find similar evidence if we use daily return data to estimate in-sample four- and six-factor alphas, or if we use Morningstar-assigned benchmark index returns to calculate benchmark-adjusted alphas (see Tables A4 and A5 of the Internet Appendix, respectively).

5. Why is performance-based compensation associated with better fund performance?

In this section, we explore through which channel or channels performance-based pay may be associated with better fund performance. In particular, we study several explanations proposed in the literature on portfolio delegation based on agency theory, information asymmetry, and risk-shifting incentives. [22]

5.1. Agency theory and asymmetric information

Building on the classic agency conflict setting of Holmstrom (1979), several recent theory papers on portfolio management compensation (e.g., Li and Tiwari, 2009; Basak and Pavlova, 2013; Buffa, Vayanos, and Woolley, 2014) show that explicitly linking the portfolio manager's compensation to the fund's relative performance aligns the incentives of managers and fund shareholders, decreases managerial shirking and private benefits, and, ultimately, improves fund performance. Thus, these models offer an explanation consistent with the outperformance of funds that use performance based contracts.[23] An alternative explanation may come from asymmetric information models. Advisors could screen out better managers by including performance-based bonuses in the menu of possible contracts (e.g., Heinkel and Soughton, 1994). It is also possible that skilled portfolio managers may negotiate performance-based contracts to signal their ability (e.g., Das and Sundaram, 2002). [24]

Theoretically, therefore, the positive relation between performance-based pay and fund performance could be driven by the effort incentives induced by these contracts or the superior skill of managers who accept/negotiate them, or by a combination of both. It is clearly

[22] In general, the literature has focused on modeling the advisory fee contract between fund investors and fund advisors. Probably due to the absence of empirical evidence on its characteristics, the contract between the advisory firm and portfolio manager that we study in this paper was often assumed to replicate the features of the advisory contract. Hence, the guidance that we obtain from many of these models, especially those based on asymmetric information, has to be interpreted with caution.

[23] The mostly descriptive nature of our data does not allow us to test more specific predictions of these models associated, for instance, with the contract's performance sensitivity (i.e., delta). See Koijen (2014) for a structural model that links fund performance to the manager's risk preferences, the advisor's management fee (as a percentage of fund TNA), and the fund-flow sensitivity.

[24] We note that Das and Sundaram (2002) develop a model on the tradeoff between the signaling and risk-sharing properties of symmetric (i.e., fulcrum) vs. asymmetric (i.e., convex) advisory fee contracts, which is less applicable in the context of contracting between the advisor and individual portfolio managers.

challenging to disentangle these explanations. Also, since the manager-advisor match is not random, any inference on causality is rather limited without exogenous shocks or valid instrumental variables. Given these limitations, we use the following empirical strategy to study the channels through which performance-based pay relates to superior performance. We include education-related proxies in the regressions to control for portfolio managers' ability and study how the results change compared to our baseline specification. The basic premise of this analysis is the following: provided that education is a valid proxy for managerial ability (either innate or due to better education), if performance-based pay is still associated with superior fund performance after controlling for managers' education, it would suggest that our results are not entirely driven by the screening or signaling nature of performance-based contracts but also by effort induction.

To perform such an analysis, we include two manager education variables in our regressions: (i) average SAT score of manager's undergraduate institution and (ii) a dummy for top MBA degrees (i.e., from schools with average GMAT score>700). Similar to Chevalier and Ellison (1999), we use these two variables to proxy for managerial ability, even though we acknowledge that they are, by no means, perfect proxies. For completeness, we also include manager industry experience (i.e., the number of years the manager has worked in the mutual fund industry) as an additional control variable in the regression. The sample for this analysis is slightly smaller compared to the sample in Tables 3 to 5 due to the data availability on managers' education backgrounds.

Table 8 presents the results on performance-based pay in Panel A and evaluation period in Panel B, after controlling for manager education variables. First, for the diversified domestic equity fund sample, we do not find evidence that managers from higher-SAT undergraduate institutions have superior performance as shown in columns (1) to (4) of Panel A. In contrast, we find some evidence that portfolio managers with top MBA degrees are associated with better performance.[25] Second, when we carry out the same analysis over the full sample, consistent with Chevalier and Ellison (1999), the coefficient on *SAT* is positive and significant at the 5%

[25] When we replace the top MBA dummy in column (4) of Panel A in Table 8 with an MBA dummy as in Chevalier and Ellison (1999), the coefficient of the MBA dummy is 0.339, with a *t*-stat. of 1.32.

level (see columns (5) to (8) of Panel A). In addition, the coefficient on *Top MBA* is positive and significant at the 10% level in three out of the four specifications of the full sample. Lastly, the coefficient on manager industry experience is always negative, significant at the 10% level in four out of eight specifications in Panel A. Thus, we find some evidence that later entrees in the fund industry tend to have better performance, probably due to career concerns (e.g., Chevalier and Ellison, 1999; Li, Zhang, and Zhao, 2011).

[Insert Table 8 here]

More relevant for our analysis, we find that the positive relation between performance-based pay and fund performance remains unchanged for both diversified domestic equity funds and the full sample. In particular, across all eight specifications in Panel A, the coefficients on performance-based pay remain positive and significant at the 5% level or better, with similar magnitudes compared to Tables 3 and 4. We also repeat our main analysis on evaluation period by adding manager education variables in the regressions and report the results in Panel B of Table 8. Again, our baseline evidence on evaluation period remains largely unaffected. In other words, after controlling for manager education proxies, the positive relation between evaluation period and fund performance remains significant for both the domestic equity fund sample and the full sample.

Next, to further disentangle the incentives vs. selection explanations, we carry out an additional test on the prediction from the asymmetric information model of Heinkel and Stoughton (1997). In particular, they show that managerial tournaments (through hiring and firing managers) makes performance based contracts optimal only for longer tenured managers. To test this prediction, we relate compensation structures of portfolio managers to manager tenure and various other family, fund, and manager level variables by estimating a linear probability model. We find no empirical support for this prediction. Our evidence shows that the use of performance-based contracts is not significantly related to a portfolio manager's tenure (see Table A7 of the Internet Appendix).

In summary, although we cannot present any direct evidence that performance-based contracts induce higher effort from portfolio managers, we show that our results are robust to

controlling for education and industry experience of portfolio managers. Our data fails to support the predictions from alternative models of information asymmetry.

5.2. Risk-shifting incentives

Compensation contract design could also affect fund risk taking. Building on the original insight on adverse-risk incentives of Jensen and Meckling (1976), Grinblatt and Titman (1989) show that portfolio managers may "game" convex, performance-based contracts by taking on more idiosyncratic risk to increase their payoffs at the expense of shareholders. More recently, Carpenter (2000), Ross (2004), and Basak, Pavlova, and Shapiro (2007), among others, have challenged theoretically the link between convex compensation contracts for fund managers and value-destroying risk-shifting incentives. The manager's risk aversion and his or her inability to perfectly hedge the compensation payoffs make the result uncertain: contrary to the original intuition, a manager compensated with convex, performance-based contracts may become even more risk-averse and engage in less risk shifting. In the context of this inconclusive theoretical debate, we examine empirically how various compensation structures affect fund risk-shifting behavior. Furthermore, we also examine how fund risk-shifting relates to the length of evaluation period for managers receiving performance-based pay. Given that risk-shifting is detrimental to fund performance (Huang, Sialm, and Zhang, 2011), this could be another venue through which performance-based contracts relate to superior fund performance.

In particular, we examine portfolio managers' intra-year risk-shifting behavior by analyzing stock holdings of diversified domestic equity funds. Following Kempf, Ruenzi, and Thiele (2009), we construct funds' risk shift ratio as in Eq. (3), which allows us to capture managers' intended rather than realized changes in portfolio risk.[26] Since this measure requires the availability of fund portfolio holdings, we restrict our analysis to the subsample of diversified domestic equity funds. We estimate the following OLS specification:

[26] Note that we do not use realized changes in risk based on fund returns to measure funds' risk shifting behavior since this measure can be affected by changes in the risk of portfolio stocks in and it does not capture intended changes in fund risk (e.g., Chevalier and Ellison, 1997; Kempf, Ruenzi, and Thiele, 2009; Huang, Sialm, and Zhang, 2011). We obtain similar results if we use the difference between the intended and realized portfolio risk instead of their ratio (see Table A8 of the Internet Appendix).

$$RiskShift_{i,t} = \alpha + \beta * CompStruct_{i,t-1} + \gamma * Controls_{i,t-1} + \lambda_{category} + \lambda_t + \mu_{i,t,} \quad (6)$$

where $Riskshift_{i,t}$ is the risk shift ratio of fund *i* in year *t*. In each specification, $CompStruct_{i,t-1}$ refers to fixed salary, performance-based pay, AUM-based pay, advisor-profits-based pay, or evaluation period. We include a vector of lagged family, advisor, manager, and fund characteristics as control variables. We also control for fund investment objective and year fixed effects in the regression and cluster the standard errors at the family level.

We present the estimation results in Table 9. First, we find that the coefficients on performance-based pay in columns (1) and (2) are both negative and significant at the 5% level, which suggests that managers with performance-based pay engage less in risk-shifting activities compared managers without such incentive. In terms of economic magnitude, a change from zero to one for performance-based pay is associated with a 0.26 standard deviation reduction in funds' risk shift ratio based on the results in column (2). As shown in the bottom of Table 9, the F-tests further show that managers with performance-based pay also engage less in risk-shifting behavior compared to those with AUM-based pay or advisor-profits-based pay. Second, the coefficient on fixed salary in column (2) is negative but insignificant at the conventional level. Third, the results in column (3) show that managers with longer average evaluation periods are associated with lower risk shift ratio, which suggests that longer evaluation windows can reduce managers' incentive to engage in intra-year risk-shifting activities. Finally, we find that it is the maximum evaluation period that drives the relation between average evaluation period and the risk shift ratio. Overall, we find that managers with performance-based contracts and longer evaluation periods are associated with less risk shifting.

[Insert Table 9 here]

5.3. Discussion

Taken together, our evidence in Sections 5.1 and 5.2 suggests that higher effort induction and lower risk shifting are two potential reasons for the positive relation between performance-based contracts and fund performance. Our results beg the question of why, in equilibrium, we observe performance differences across contracts. Obviously, in a complete contract setting

where all contingencies are contractible we should observe no difference: fund advisors would optimally choose the contract that best tackles the underlying conflicts with portfolio managers. If an advisor does not use performance-based compensation, then either agency costs and/or adverse risk-taking incentives are not present or the advisor has alternative mechanisms to control them.

There are reasons to believe such a complete contracting world is not realistic. On the one side, theory predicts that performance-based compensation may be optimal. On the other side, there is little discussion (if any) about the conditions that guarantee the existence of such a contract. It seems reasonable to believe that in reality not all advisors necessarily enjoy a full menu of contracts (including performance-based contracts) that yield a second-best level of fund performance in the presence of moral hazard and/or risk-shifting incentives. The theoretical interaction between effort and risk-shifting incentives is complex and the practical implementation of the optimal contract is far from immediate (see, e.g., Dybvig, Farnsworth, and Carpenter, 2010). For instance, the existence of certain fixed costs associated to adopting performance-based contracts may prevent smaller advisors or fund families from using them.[27] Simultaneously, alternative mechanisms to performance-based contracts (like better fund governance, for instance) may not be perfect substitutes, thus failing to yield the second-best effort incentives and, ultimately, level of performance for these funds.

6. Concluding Remarks

We use a hand-collected data set of over 3,400 funds to study the compensation structures of individual portfolio managers in the U.S. mutual fund industry. Given that the decisions of individual portfolio managers affect the performance of trillions of dollars of assets invested in the mutual fund industry, it is of first order importance to better understand these compensation contracts and their impact on fund performance.

Unlike the advisory contract, which is mostly based on fund AUM, the majority of compensation contracts for individual portfolio managers include a bonus directly linked to

[27] Cadenillas, Cvitanic, and Zapatero (2012) show that stock options may be suboptimal for the compensation of executives in smaller firms. Incidentally, we find that smaller investment advisors or fund families are significantly less likely to use performance-based contracts than their larger counterparts (see Table A7 of the Internet Appendix).

investment performance. Much of the literature assumes that the compensation structure of investment advisors and individual portfolio managers coincides. Our evidence clearly suggests otherwise. In contrast to tight regulation of advisory contracts, the SEC places no specific restriction on the compensation contracts of individual portfolio managers. We show that, in an unregulated setting, asymmetric, option-like performance-based incentives are the dominant form of compensation for individual portfolio managers. Our empirical evidence provides guidance for theoretical models on portfolio delegation in the asset management industry.

Our analysis further shows that managers with performance-based, bonus-type pay exhibit superior future fund performance (both gross and net of fees), especially when advisors link pay to performance over longer time periods. In contrast, we do not find similar results for alternative compensation arrangements, such as fixed salary, AUM-based pay, or advisor-profits-based pay. Lastly, the positive relation between performance-based contracts and fund performance are likely driven by better effort induction and lower risk-shifting incentives. Altogether, we document that the compensation contract between portfolio managers and advisors plays a critical role in mutual fund incentive alignment and affects fund performance and risk taking. Our study also suggests that SEC-mandated disclosure on portfolio manager compensation can help investors in assessing managerial incentives and predicting future fund performance.

References

Agarwal, V., Daniel, N.D., Naik, N.Y., 2009. Role of managerial incentives and discretion in hedge fund performance. Journal of Finance 64, 2221-2256.

Basak, S., Pavlova, A., 2013. Asset prices and institutional investors. American Economic Review 103, 1728-1758.

Basak, S., Pavlova, A., Shapiro, A., 2007. Optimal asset allocation and risk shifting in money management. Review of Financial Studies 20, 1583-1621.

Basak, S., Pavlova A., Shapiro A., 2008. Offsetting the implicit incentives: benefits of benchmarking in money management. Journal of Banking and Finance 32, 1883-1893.

Berk, J., van Binsbergen, J.H., 2015. Measuring managerial skill in the mutual fund industry. Journal of Financial Economics 118, 1-20.

Bollen, N.P., Busse, J.A., 2001. On the timing ability of mutual fund managers. Journal of Finance 56, 1075-1094.

Bollen, N.P., Busse, J.A., 2005. Short-term persistence in mutual fund performance. Review of Financial Studies 18, 569–97.

Brown, K.C., Harlow, W.V., Starks, L.T., 1996. Of tournaments and temptations: an analysis of managerial incentives in the mutual fund industry. Journal of Finance 51, 85-110.

Buffa, A., Vayanos, D., Woolley, P., 2014. Asset management contracts and equilibrium prices, Working paper. Boston University.

Busse, J.A., 2001. Another look at mutual fund tournaments. Journal of Financial and Quantitative Analysis 36, 53-73.

Busse, J.A., Jiang, L., Tang, Y., 2014. Double adjusted mutual fund performance. Working paper. Emory University.

Busse, J.A., Tong, Q., 2012. Mutual fund industry selection and persistence. Review of Asset Pricing Studies 2, 245-274.

Cadenillas, A., Cvitanic, J. Zapatero, F., 2012, Executive Stock Options as a Screening Mechanism. Working paper. Marshall School of Business, USC.

Carhart, M., 1997. On persistence in mutual fund performance. Journal of Finance 52, 57-82.

Carpenter, J.N., 2000. Does option compensation increase managerial risk appetite? Journal of Finance 55, 2311-31.

Chen, J., Hong, H., Huang, M., Kubik, J.D., 2004. Does fund size erode mutual fund performance? The role of liquidity and organization, American Economic Review 94, 1276-1302.

Chen, J., Hong, H., Jiang, W., Kubik, J.D., 2013. Outsourcing mutual fund management: firm boundaries, incentives, and performance. Journal of Finance 68, 523-558.

Chevalier, J., Ellison, G., 1997. Risk taking by mutual funds as a response to incentives. Journal of Political Economy 105, 1167-1200.

Chevalier, J., Ellison, G., 1999. Are some mutual fund managers better than others? Cross-sectional patterns in behavior and performance. Journal of Finance 54, 875–899.

Coles, J.L., Suay, J., Woodbury, D., 2000. Fund advisor compensation in closed-end funds. Journal of Finance 55, 1385-414.

Cremers, M., Petajisto, A., 2009. How active is your fund manager? Review of Financial Studies 22, 3329–3365.

Das, R., Sundaram, R., 2002. Fee speech: signaling, risk-sharing, and the impact of fee structures on investor welfare. Review of Financial Studies 15, 1465-1497.

Dass, N., Massa, M., Patgiri, R., 2008. Mutual funds and bubbles: the surprising role of contractual incentives. Review of Financial Studies 21, 51-99.

Deli, D.N., 2002. Mutual fund advisory contracts: an empirical investigation. Journal of Finance 57, 109-133.

Dimson, E., 1979. Risk measurement when shares are subject to infrequent trading. Journal of Financial Economics 7, 197–226.

Dybvig, P.H., Farnsworth, H.K., Carpenter, J., 2010. Portfolio performance and agency. Review of Financial Studies 23, 21-23.

Elton, E.J., Gruber, M.J., 2013. Mutual Funds, Financial Markets and Asset Pricing: Handbook of Economics and Finance, Part B, vol. 2. Elsevier, pp. 1012–1061.

Elton, E.J., Gruber, M.J., Blake, C.R., 1996. The persistence of risk-adjusted mutual fund performance. Journal of Business 69, 133–157.

Elton, E.J., Gruber, M.J., Blake, C.R., 2001. A first look at the accuracy of the CRSP mutual database and a comparison of the CRSP and Morningstar mutual fund databases. Journal of Finance 56, 2415-2430.

Elton, E.J., Gruber, M.J., Blake, C.R., 2003. Incentive fees and mutual funds. Journal of Finance 58, 779-804.

Elton, E.J., Gruber, M.J., Blake, C.R., 2007. Participant reaction and the performance of funds offered by 401(k) plans. Journal of Financial Intermediation 16, 249-271.

Evans, R.B., 2010. Mutual fund incubation. Journal of Finance 65, 1581-1611.

Fama, E.F., French, K.R., 2010. Luck versus skill in the cross-section of mutual fund returns. Journal of Finance 65, 1915-1947.

Farnsworth, H., Taylor, J., 2006. Evidence on the compensation of portfolio managers. Journal of Financial Research 29, 305-324.

Ferson, W., Lin, J., 2014. Alpha and performance measurement: the effects of investor disagreement and heterogeneity. Journal of Finance 69, 1565-1596.

Goldstein, I., Jiang, H., Ng, D.T., 2015. Investor flows and fragility in corporate bond funds, Working paper. University of Pennsylvania.

Golec, J.H., 1992. Empirical tests of a principal-agent model of the investor-investment advisor relationship. Journal of Financial and Quantitative Analysis 27, 81-95.

Golec, J.H., Starks, L.T., 2004. Performance fee contract change and mutual fund risk. Journal of Financial Economics 73, 93-118.

Gopalan, R., Milbourn, T., Song, F., Thakor, A., 2014. Duration of executive compensation. Journal of Finance 69, 2777-2817.

Grinblatt, M., Titman, S., 1989. Adverse risk incentives and the design of performance-based contracts. Management Science 35, 807-22.

Grossman, S., Hart, O., 1983. An analysis of the principal–agent problem. Econometrica 51, 7-45.

Harris, M., Raviv, A., 1979. Optimal incentive contracts with imperfect information. Journal of Economic Theory 20, 231-259.

Holmstrom, B., 1979. Moral hazard and observability. Bell Journal of Economics 10, 74-91.

Hu, P., Kale, J.R., Pagani, M., Subramanian, A., 2011. Fund flows, performance, managerial career concerns, and risk taking. Management Science 57, 628–646.

Huang, J., Sialm, C., Zhang, H., 2011. Risk shifting and mutual fund performance. Review of Financial Studies 24, 2575-2616.

Huang, J., Wei, K.D., Yan, H., 2007. Participation costs and the sensitivity of fund flows to past performance. Journal of Finance 62, 1273-1311.

Jensen, M.C., 1968. The performance of mutual funds in the period 1945-1964. Journal of Finance 23, 389-416.

Jensen, M.C., Meckling, W.H., 1976. Theory of the firm: Managerial behavior, agency costs, and ownership structure. Journal of Financial Economics 3, 305-360.

Kempf, A., Ruenzi, S., 2008. Tournaments in mutual fund families. Review of Financial Studies 21, 1013–1036.

Kempf, A., Ruenzi, S., Thiele, T., 2009. Employment risk, compensation incentives, and managerial risk taking: Evidence from the mutual fund industry. Journal of Financial Economics 92, 92-108.

Koski, J.L., Pontiff, J., 1999. How are derivatives used? Evidence from the mutual fund industry. Journal of Finance 54, 791-816.

Kostovetsky, L., Warner, J.B., 2015. You're fired! New evidence on portfolio manager turnover. Journal of Financial and Quantitative Analysis 50, 1-27.

Li, C.W., Tiwari, A., 2009. Incentive contracts in delegated portfolio management. Review of Financial Studies 22, 4681-4714.

Li, H., Zhang, X., Zhao, R., 2011. Investing in talents: manager characteristics and hedge fund performances. Journal of Financial and Quantitative Analysis 46, 59-82.

Massa, M., Patgiri, R., 2009. Incentives and mutual fund performance: higher performance or just higher risk taking? Review of Financial Studies 22, 1777-1815.

Pástor, L., Stambaugh, R.F., 2003. Liquidity risk and expected stock returns. Journal of Political Economy 111, 642–685.

Pástor, L., Stambaugh, R.F., Taylor, L.A., 2015. Scale and skill in active management. Journal of Financial Economics 116, 23-45.

Petersen, M., 2009. Estimating standard errors in finance panel data sets: comparing approaches. Review of Financial Studies 22, 435-480.

Ross, S.A., 2004. Compensation, incentives, and the duality of risk aversion and riskiness. Journal of Finance 59, 207-25.

Scholes, M., Williams, J., 1977. Estimating betas from nonsynchronous data. Journal of Financial Economics 5, 309–28.

Schwarz, C.G., 2012. Mutual fund tournaments: the sorting bias and new evidence. Review of Financial Studies 25, 913–936.

Sensoy, B., 2009. Performance evaluation and self-designated benchmark indexes in the mutual fund industry. Journal of Financial Economics 92, 25-39.

Sialm, C., Starks, L.T., Zhang, H., 2015. Defined contribution pension plans: sticky or discerning money? Journal of Finance 70, 805-838.

Sirri, E.R., Tufano, P., 1998. Costly search and mutual fund flows. Journal of Finance 53, 1589-1622.

Spiegel, M., Zhang, H., 2013. Mutual fund risk and market share-adjusted fund flows. Journal of Financial Economics 108, 506-528.

Starks, L.T., 1987. Performance incentive fees: an agency theoretic approach. Journal of Financial and Quantitative Analysis 22, 17-32.

Tufano, P., Sevick, M., 1997. Board structure and fee-setting in the U.S. mutual fund industry. Journal of Financial Economics 46, 321-355.

Warner, J.B., Wu, J.S., 2011. Why do mutual fund advisory contracts change? Performance, growth, and spillover effects. Journal of Finance 66, 271-306.

Wermers, R., 2000. Mutual fund performance: an empirical decomposition into stock-picking talent, style, transactions costs, and expenses. Journal of Finance 55, 1655-1695.

Table 1
Summary statistics of portfolio manager compensation structures

This table reports the distribution of compensation structures (Panel A), further breakdown of non-fixed salary (Panel B), summary statistics of evaluation periods (Panel C), and correlation coefficient matrix of the main variables of portfolio manager compensation structures (Panel D). The sample consists of diversified domestic equity funds, sector funds, bond funds, balanced funds, and global funds, with 15,605 fund-year observations over the period 2006-2011. The variable *Fixed Salary* is an indicator variable that equals one if the portfolio manager receives a fixed amount of compensation from the advisor, zero otherwise. *Performance Pay* is a dummy variable that is set to one if the bonus is tied to the investment performance of the fund, zero otherwise; *AUM Pay* is an indicator variable that equals one if portfolio manager compensation is tied to the fund's assets under management, zero otherwise; *Advisor-Profits Pay* is a dummy variable that is set to one if the portfolio manager's compensation depends on the advisor's profits, zero otherwise; *Evaluation Period Mean* is the average number of years over which investment performance is measured for performance-based pay; most funds report multiple evaluation windows, *Evaluation Period Min* is the shortest evaluation window, *Evaluation Period Max* is the longest evaluation window, and *Evaluation Period Median* is the median evaluation window if there are three or more evaluation periods disclosed. For funds that have multiple reported evaluation windows, we calculate *Evaluation Period Mean* as the mean of *Evaluation Period Min* and *Evaluation Period Max*. *P-values* are in brackets in Panel D.

Panel A: Summary statistics of compensation structures

	# of Obs.	***% of Sample***
Total	15,605	100%
Fixed Salary	212	1.4%
Non-fixed Salary	15,393	98.6%
Performance Pay	12,365	79.2%
AUM Pay	2,956	18.9%
Advisor-Profits Pay	7,605	48.7%

Panel B: Further breakdown of non-fixed salary

Performance Pay	***AUM Pay***	***Advisor-Profits Pay***	***# of Obs.***	***% of Non-fixed Salary Obs.***
1	0	0	5,733	37.2%
1	1	0	1,206	7.8%
1	0	1	3,860	25.1%
1	1	1	1,566	10.2%
0	1	0	133	0.9%
0	0	1	2,128	13.8%
0	1	1	51	0.3%
0	0	0	716	4.7%
Total Non-fixed Salary			15,393	100%

Panel C: Summary statistics of evaluation period

Variables (years)	*Obs.*	*Mean*	*Median*	*Std. Dev.*	*Min*	*Max*
Evaluation Period Mean	10,583	3.07	3	1.22	0.25	7.5
Evaluation Period Min	10,583	1.68	1	1.34	0.25	5
Evaluation Period Max	10,583	4.45	5	1.97	0.25	10
Evaluation Period Median	5,043	3.24	3	0.79	1	5

Panel D: Correlation matrix

	Fixed Salary	***Performance Pay***	***AUM Pay***	***Advisor-Profits Pay***	***Evaluation Period Mean***
Fixed Salary	1.00				
Performance Pay	-0.23	1.00			
	[0.00]				
AUM Pay	-0.06	0.17	1.00		
	[0.00]	[0.00]			
Advisor-Profits Pay	-0.11	-0.19	0.06	1.00	
	[0.00]	[0.00]	[0.00]		
Evaluation Period Mean	.	0.04	-0.13	-0.32	1.00
	.	[0.00]	[0.00]	[0.00]	

Table 2
Summary statistics of family, advisor, portfolio manager, and fund characteristics

This table reports the summary statistics of the family, advisor, portfolio manager, and fund characteristics. The variable *Family Size* is the sum of total net assets of all the funds in the fund family; *Subadviser* is a dummy variable that equals one if the investment advisor is not affiliated with the mutual fund family (i.e., the fund is outsourced to an independent investment firm to manage its assets), zero otherwise; *Owner* is an indicator variable that equals one if the portfolio manager is the founder, controlling owner, partner, or blockholder of the investment advisor, zero otherwise; *Team Mgmt.* is a dummy variable that equals one if a fund is managed by multiple managers, zero otherwise; *Manager Tenure* measures the number of months that a manager(s) has been at the helm of a mutual fund. *SAT* is the average composite SAT score at the manager's undergraduate institution divided by 100; *Top MBA* is an indicator variable that equals one if the portfolio manager holds an MBA degree from a top business school (i.e., average GMAT score>700); *Manager Experience* is calculated as the number of years between the sample year and the year when a manager first appears in the Morningstar database. *Net Four-Factor Alpha* is estimated using monthly fund net returns with Carhart (1997) four-factor model. *Net Six-Factor Alpha* is estimated using monthly fund net returns with a six-factor model that augments the Carhart (1997) four-factor model with a bond factor (Barclays U.S. Aggregate Bond Index) and an international factor (MSCI World Ex U.S. Index). *Net Five-Factor (Seven-Factor) Alpha* is estimated using monthly fund net returns with a five-factor (seven-factor) model that adds Pastor and Stambaugh (2003) liquidity factor to the four-factor (six-factor) model. For each of these alpha measures, we first estimate the factor loadings using the preceding 24 monthly net-of-fee returns as in Eq. (1). We then calculate monthly out-of-sample alpha as the difference between a fund's net-of-fee return in a given month and the sum of the product of the estimated factor loadings and the factor returns during that month as in Eq. (2). We calculate the average of the monthly alphas within a year and multiply it by 12 to annualize the alpha measure. Following the same procedure, we use monthly fund gross-of-fee returns (adding $1/12^{th}$ of the annual expense ratio to monthly net returns) to estimate the gross alpha measures (i.e., *Gross Four-*, *Five-*, *Six-*, and *Seven-Factor Alpha*). *Total Risk* is the standard deviation of monthly net-of-fee returns of a fund in a calendar year; *Risk Shift Ratio* captures funds' intra-year risk-shifting behavior, calculated using data on fund portfolio holdings as in Eq. (3); *Fund Size* is the sum of assets under management across all share classes of the fund; *Fund Age* is the age of the oldest share class in the fund; *Expense* is determined by dividing the fund's annual operating expenses by the average dollar value of its assets under management; *Turnover* is defined as the minimum of sales or purchases divided by the total net assets of the fund; *Net Flows* is the annual average of monthly net growth in fund assets beyond reinvested dividends (Sirri and Tufano, 1998); *Performance Adv. Fee* is a dummy variable that equals one if the fund employs a fulcrum advisory fee, which rewards and penalizes the advisor for the fund's investment performance, zero otherwise; *Coles Incentive Rate* is defined as the difference between the last and first marginal advisory fee rates divided by the effective marginal advisory fee rate. *Active Share* captures the percentage of a manager's portfolio that differs from the benchmark index. It is calculated by aggregating the absolute differences between the weight of a portfolio's actual holdings and the weight of its closest matching index (Cremers and Petajisto, 2009). All variables are winsorized at the 1% and 99% level.

Variables	*Mean*	*Median*	*Std. Dev.*	*1st*	*99th*	*Obs.*
Family, advisor, and manager characteristics						
Family Size *(billions)*	136.9	37.2	265.3	0.04	1,018.7	15,605
Subadviser *(dummy)*	0.185	0	0.388	0	1	15,605
Owner *(dummy)*	0.179	0	0.383	0	1	15,605
Team Mgmt. *(dummy)*	0.651	1	0.477	0	1	15,605
Manager Tenure *(months)*	69.5	56.0	51.3	3.0	244.5	15,605
SAT *(divided by 100)*	13.06	13.00	1.09	10.30	15.00	12,213
Top MBA *(dummy)*	0.308	0	0.380	0	1	12,213
Manager Experience *(years)*	10.4	9.7	5.7	0.5	27.0	12,213
Fund characteristics						
Net Four-Factor Alpha *(in % per year)*	-0.866	-0.840	6.453	-19.147	16.588	5,826
Net Five-Factor Alpha *(in % per year)*	-1.162	-0.990	5.877	-17.955	13.217	5,826
Net Six-Factor Alpha *(in % per year)*	-0.306	-0.351	7.392	-24.245	24.291	15,549
Net Seven-Factor Alpha *(in % per year)*	-0.627	-0.652	6.899	-22.994	20.209	15,549
Gross Four-Factor Alpha *(in % per year)*	0.275	0.258	6.453	-17.821	17.977	5,826
Gross Five-Factor Alpha *(in % per year)*	-0.020	0.110	5.874	-16.866	14.717	5,826
Gross Six-Factor Alpha *(in % per year)*	0.739	0.571	7.399	-22.938	25.474	15,549
Gross Seven-Factor Alpha *(in % per year)*	0.420	0.278	6.921	-21.831	21.682	15,549
Total Risk *(in % per month)*	4.12	3.80	2.63	0.22	11.38	15,561
Risk Shift Ratio	1.03	1.02	0.12	0.78	1.54	5,510
Fund Size *(millions)*	1,558.1	299.3	6,153.8	17.3	23,514.6	15,605
Fund Age *(months)*	188.0	168.0	125.2	26.0	749.0	15,605
Expense *(%)*	1.16	1.16	0.44	0.10	2.28	15,605
Turnover *(%)*	89.76	56.00	113.32	2.00	704.00	15,605
Net Flows *(%)*	0.94	-0.17	4.88	-5.66	28.08	15,595
Performance Adv. Fee *(dummy)*	0.046	0	0.210	0.000	1	15,605
Coles Incentive Rate	-0.117	0.000	0.193	-1.000	0.000	15,599
Active Share *(%)*	85.5	91.0	14.7	39.6	100.0	8,506

Table 3
Performance-based pay and fund performance

This table reports regression results of fund performance on performance-based compensation and other control variables. We use diversified domestic equity funds in columns (1) to (4) and the full sample in columns (5) to (8). The full sample consists of diversified domestic equity funds, sector funds, bond funds, balanced funds, and global funds. *Performance Pay* is a dummy variable that is set to one if the manager's bonus is tied to the investment performance of the fund, zero otherwise. Fund performance is measured by *Gross Four-Factor Alpha* in columns (1) to (2), *Net Four-Factor Alpha* in columns (3) to (4), *Gross Six-Factor Alpha* in columns (5) to (6), and *Net Six-Factor Alpha* in columns (7) to (8). All dependent and independent variables are defined as in Tables 1 and 2. Standard errors are clustered at the family level and *t*-statistics are reported in parentheses. The superscripts ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Gross Four-Factor Alpha$_t$		***Net Four-Factor Alpha$_t$***		***Gross Six-Factor Alpha$_t$***		***Net Six-Factor Alpha$_t$***	
Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
Performance Pay$_{t-1}$	0.809***	0.776***	0.882***	0.798***	0.746***	0.843***	0.822***	0.863***
	(3.37)	(2.98)	(3.63)	(3.04)	(4.05)	(3.92)	(4.52)	(4.02)
Log Family Size $_{t-1}$		0.041		0.048		0.033		0.042
		(0.82)		(0.97)		(0.96)		(1.22)
Subadviser $_{t-1}$		-0.096		-0.076		-0.394**		-0.371**
		(-0.57)		(-0.45)		(-2.31)		(-2.19)
Owner $_{t-1}$		0.069		0.027		0.434**		0.405*
		(0.29)		(0.11)		(1.99)		(1.86)
Team Mgmt. $_{t-1}$		-0.241		-0.227		-0.273**		-0.264**
		(-1.13)		(-1.07)		(-2.06)		(-2.05)
Log Manager Tenure $_{t-1}$		0.089		0.075		0.076		0.069
		(0.76)		(0.64)		(1.15)		(1.07)
Log Fund Size $_{t-1}$		-0.114		-0.097		0.025		0.038
		(-1.55)		(-1.31)		(0.56)		(0.88)
Log Fund Age $_{t-1}$		0.289**		0.290**		-0.049		-0.041
		(2.37)		(2.37)		(-0.54)		(-0.47)
Expense$_{t-1}$		0.484*		-0.284		1.340***		0.551***
		(1.91)		(-1.10)		(7.76)		(3.30)
Log Turnover $_{t-1}$		-0.221*		-0.222*		-0.097		-0.102
		(-1.85)		(-1.86)		(-1.30)		(-1.39)
Total Risk $_{t-1}$		0.100		0.086		-0.032		-0.041
		(0.80)		(0.69)		(-0.46)		(-0.59)

Net Flows $_{t-1}$		0.052**		0.053**		-0.006		-0.004
		(2.30)		(2.35)		(-0.35)		(-0.26)
Performance Adv. Fee $_{t-1}$		-0.268		-0.303		-0.244		-0.268
		(-0.50)		(-0.58)		(-0.85)		(-0.93)
Coles Incentive Rate $_{t-1}$		0.008		0.053		0.309		0.369
		(0.02)		(0.12)		(0.94)		(1.14)
Constant	-0.335	0.196	-1.532***	-0.082	0.149	-3.257***	-0.957***	-3.547***
	(-1.58)	(0.18)	(-7.26)	(-0.07)	(0.95)	(-4.52)	(-6.32)	(-4.98)
Objective & Year FEs	No	Yes	No	Yes	No	Yes	No	Yes
# of Obs.	5,826	5,811	5,826	5,811	15,549	15,478	15,549	15,478
Adj. R^2	0.003	0.093	0.003	0.093	0.002	0.093	0.002	0.090

Table 4
Portfolio manager compensation structures and fund performance

This table reports regression results of fund performance on various compensation structures including performance-based, AUM-based, advisor-profits-based, and fixed salary. We use diversified domestic equity funds in columns (1) to (4) and the full sample in columns (5) to (8). The full sample consists of diversified domestic equity funds, sector funds, bond funds, balanced funds, and global funds. Fund performance is measured by *Gross Four-Factor Alpha* in columns (1) to (2), *Net Four-Factor Alpha* in columns (3) to (4), *Gross Six-Factor Alpha* in columns (5) to (6), and *Net Six-Factor Alpha* in columns (7) to (8). All dependent and independent variables are defined as in Tables 1 and 2. Standard errors are clustered at the family level and *t*-statistics are reported in parentheses. We also perform *F*-tests to compare the coefficients of different compensation structures and report the F-test *p*-values at the bottom of the table. The superscripts ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Gross Four-Factor Alpha$_t$		***Net Four-Factor Alpha$_t$***		***Gross Six-Factor Alpha$_t$***		***Net Six-Factor Alpha$_t$***	
Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
Performance Pay$_{t-1}$	0.576**	0.690**	0.632***	0.717***	0.677***	0.860***	0.751***	0.885***
	(2.40)	(2.56)	(2.60)	(2.63)	(3.25)	(3.54)	(3.67)	(3.64)
AUM Pay$_{t-1}$	-0.116	-0.151	-0.197	-0.173	-0.273	-0.359*	-0.395**	-0.383**
	(-0.44)	(-0.51)	(-0.72)	(-0.58)	(-1.44)	(-1.95)	(-2.18)	(-2.11)
Advisor-Profits Pay $_{t-1}$	-0.414*	-0.440*	-0.471**	-0.420	-0.152	-0.292*	-0.190	-0.277*
	(-1.89)	(-1.71)	(-2.07)	(-1.62)	(-0.95)	(-1.94)	(-1.19)	(-1.87)
Fixed Salary $_{t-1}$	-2.181	-1.810	-2.456*	-1.860	-1.202	-1.191*	-1.409*	-1.225*
	(-1.62)	(-1.36)	(-1.83)	(-1.40)	(-1.64)	(-1.71)	(-1.93)	(-1.75)
Log Family Size $_{t-1}$		0.014		0.020		0.004		0.012
		(0.26)		(0.39)		(0.13)		(0.37)
Subadviser $_{t-1}$		-0.058		-0.041		-0.346**		-0.324**
		(-0.34)		(-0.24)		(-2.10)		(-1.99)
Owner $_{t-1}$		0.184		0.137		0.537**		0.504**
		(0.67)		(0.49)		(2.31)		(2.18)
Team Mgmt. $_{t-1}$		-0.205		-0.191		-0.264**		-0.254**
		(-0.98)		(-0.91)		(-2.06)		(-2.04)
Log Manager Tenure $_{t-1}$		0.099		0.085		0.075		0.068
		(0.85)		(0.72)		(1.13)		(1.04)
Log Fund Size $_{t-1}$		-0.122*		-0.106		0.025		0.039
		(-1.69)		(-1.45)		(0.59)		(0.91)
Log Fund Age $_{t-1}$		0.294**		0.294**		-0.051		-0.044
		(2.47)		(2.47)		(-0.57)		(-0.50)

Expense$_{t-1}$		0.492*		-0.276		1.364***		0.576***
		(1.95)		(-1.07)		(7.93)		(3.46)
Log Turnover $_{t-1}$		-0.195*		-0.196*		-0.093		-0.097
		(-1.73)		(-1.73)		(-1.25)		(-1.33)
Total Risk $_{t-1}$		0.091		0.078		-0.038		-0.047
		(0.72)		(0.62)		(-0.54)		(-0.67)
Net Flows $_{t-1}$		0.051**		0.052**		-0.008		-0.006
		(2.29)		(2.34)		(-0.45)		(-0.37)
Performance Adv. Fee $_{t-1}$		-0.287		-0.319		-0.252		-0.274
		(-0.54)		(-0.62)		(-0.90)		(-0.98)
Coles Incentive Rate $_{t-1}$		-0.146		-0.108		0.290		0.349
		(-0.30)		(-0.22)		(0.90)		(1.09)
Constant	0.116	0.630	-1.016***	0.351	0.345*	-2.812***	-0.715***	-3.101***
	(0.44)	(0.55)	(-3.79)	(0.30)	(1.67)	(-3.94)	(-3.43)	(-4.37)
Objective & Year FEs	No	Yes	No	Yes	No	Yes	No	Yes
# of Obs.	5,826	5,811	5,826	5,811	15,549	15,478	15,549	15,478
Adj. R^2	0.004	0.094	0.006	0.093	0.002	0.093	0.003	0.091
F-tests								
Perf.= AUM	0.069	0.069	0.034	0.057	0.003	0.001	0.000	0.000
Perf. = Profit	0.001	0.004	0.000	0.004	0.000	0.000	0.000	0.000
Perf. = Fix	0.041	0.071	0.022	0.063	0.009	0.003	0.002	0.003
Perf.=AUM=Profit	0.004	0.016	0.001	0.015	0.000	0.000	0.000	0.000
Perf.=AUM=Profit=Fix	0.003	0.024	0.001	0.023	0.000	0.000	0.000	0.000

Table 5
Evaluation period and fund performance

This table reports the regression estimates of fund performance on evaluation period for the funds that report evaluation period and state clearly an evaluation benchmark. We use diversified domestic equity funds in columns (1) to (6) and the full sample in columns (7) to (12). The full sample consists of diversified domestic equity funds, sector funds, bond funds, balanced funds, and global funds. Fund performance is measured by *Gross Four-Factor Alpha* in columns (1) to (3), *Net Four-Factor Alpha* in columns (4) to (6), *Gross Six-Factor Alpha* in columns (7) to (9), and *Net Six-Factor Alpha* in columns (10) to (12). All dependent and independent variables are defined as in Tables 1 and 2. Standard errors are clustered at the family level and *t*-statistics are reported in parentheses. The superscripts ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Gross Four-Factor Alpha$_t$			***Net Four-Factor Alpha$_t$***			***Gross Six-Factor Alpha$_t$***			***Net Six-Factor Alpha$_t$***		
Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**	**(11)**	**(12)**
Evaluation Period Mean$_{t-1}$	0.235**			0.228**			0.298***			0.284**		
	(2.08)			(2.01)			(2.68)			(2.55)		
Evaluation Period Min$_{t-1}$		-0.114			-0.118			0.180**			0.171*	
		(-0.94)			(-0.97)			(2.02)			(1.97)	
Evaluation Period Max$_{t-1}$			0.187***			0.184***			0.105*			0.100*
			(3.34)			(3.24)			(1.91)			(1.83)
Log Family Size $_{t-1}$	0.115	0.179**	0.119*	0.120*	0.184**	0.124*	-0.057	-0.029	-0.002	-0.051	-0.025	0.001
	(1.61)	(2.43)	(1.78)	(1.70)	(2.52)	(1.85)	(-0.94)	(-0.47)	(-0.04)	(-0.84)	(-0.40)	(0.02)
Subadviser $_{t-1}$	0.166	0.108	0.129	0.142	0.084	0.106	0.100	0.158	0.056	0.090	0.145	0.048
	(0.78)	(0.50)	(0.63)	(0.66)	(0.38)	(0.51)	(0.50)	(0.72)	(0.26)	(0.45)	(0.66)	(0.23)
Owner $_{t-1}$	-0.317	-0.348	-0.241	-0.370	-0.398	-0.294	-0.149	-0.295	-0.161	-0.207	-0.345	-0.218
	(-0.86)	(-1.02)	(-0.66)	(-0.99)	(-1.16)	(-0.79)	(-0.58)	(-1.08)	(-0.58)	(-0.81)	(-1.27)	(-0.80)
Team Mgmt. $_{t-1}$	0.324	0.101	0.308	0.329	0.109	0.316	-0.167	-0.228	-0.249	-0.160	-0.218	-0.238
	(0.99)	(0.31)	(1.03)	(1.01)	(0.33)	(1.05)	(-0.89)	(-1.31)	(-1.34)	(-0.88)	(-1.30)	(-1.32)
Log Manager Tenure $_{t-1}$	0.194	0.200	0.169	0.192	0.197	0.167	0.111	0.129	0.095	0.107	0.124	0.092
	(1.32)	(1.49)	(1.19)	(1.32)	(1.48)	(1.18)	(1.29)	(1.48)	(1.08)	(1.26)	(1.45)	(1.06)
Log Fund Size $_{t-1}$	-0.127*	-0.121	-0.122	-0.109	-0.102	-0.104	0.006	0.034	0.010	0.021	0.048	0.026
	(-1.77)	(-1.64)	(-1.63)	(-1.50)	(-1.37)	(-1.37)	(0.13)	(0.74)	(0.24)	(0.51)	(1.06)	(0.60)
Log Fund Age $_{t-1}$	0.274	0.288*	0.257	0.281*	0.295*	0.264	-0.077	-0.084	-0.064	-0.065	-0.072	-0.053
	(1.65)	(1.74)	(1.57)	(1.69)	(1.78)	(1.62)	(-0.62)	(-0.68)	(-0.51)	(-0.54)	(-0.59)	(-0.43)
Expense$_{t-1}$	0.299	0.315	0.361	-0.424	-0.406	-0.363	1.208***	1.130***	1.195***	0.449**	0.375*	0.437*
	(0.88)	(0.88)	(1.05)	(-1.23)	(-1.11)	(-1.04)	(5.12)	(5.17)	(4.91)	(1.98)	(1.77)	(1.86)
Log Turnover $_{t-1}$	-0.103	-0.118	-0.059	-0.101	-0.115	-0.058	-0.090	-0.116	-0.085	-0.100	-0.124	-0.095
	(-0.63)	(-0.71)	(-0.36)	(-0.62)	(-0.69)	(-0.35)	(-0.84)	(-1.04)	(-0.76)	(-0.94)	(-1.12)	(-0.85)

Total Risk $_{t-1}$	0.449***	0.438***	0.451***	0.425***	0.415***	0.427***	0.072	0.071	0.075	0.059	0.058	0.063
	(3.30)	(3.17)	(3.30)	(3.12)	(2.99)	(3.12)	(0.76)	(0.74)	(0.79)	(0.63)	(0.61)	(0.66)
Net Flows $_{t-1}$	0.082**	0.083**	0.080**	0.082**	0.084**	0.080**	0.002	0.002	0.002	0.005	0.004	0.004
	(2.24)	(2.25)	(2.18)	(2.25)	(2.26)	(2.19)	(0.10)	(0.09)	(0.09)	(0.19)	(0.17)	(0.18)
Performance Adv. Fee $_{t-1}$	-0.119	0.153	0.122	-0.160	0.115	0.076	-0.039	-0.215	0.099	-0.044	-0.211	0.087
	(-0.25)	(0.27)	(0.28)	(-0.34)	(0.21)	(0.17)	(-0.17)	(-0.83)	(0.43)	(-0.20)	(-0.82)	(0.38)
Coles Incentive Rate $_{t-1}$	0.284	0.573	0.343	0.332	0.620	0.388	-0.419	-0.377	-0.187	-0.362	-0.322	-0.141
	(0.60)	(1.17)	(0.78)	(0.70)	(1.27)	(0.89)	(-1.09)	(-0.86)	(-0.48)	(-0.96)	(-0.75)	(-0.38)
Constant	-3.029**	-2.681**	-3.307**	-3.354**	-3.019**	-3.634***	-2.946***	-2.561**	-3.035***	-3.191***	-2.824***	-3.274***
	(-2.25)	(-1.99)	(-2.42)	(-2.52)	(-2.26)	(-2.69)	(-3.07)	(-2.56)	(-2.87)	(-3.37)	(-2.86)	(-3.16)
Objective & Year FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
# of Obs.	2,891	2,891	2,891	2,891	2,891	2,891	8,274	8,274	8,274	8,274	8,274	8,274
Adj. R^2	0.100	0.099	0.101	0.099	0.098	0.101	0.104	0.103	0.103	0.102	0.101	0.101

Table 6
Robustness tests: Portfolio manager compensation structures and fund performance

This table reports the results of several robustness tests on the relation between compensation structures and fund performance. We repeat the analysis of Tables 3 and 4 except that we add Cremers and Petajisto's (2009) active share measure as an additional control variable in Panel A; we use five-factor alphas (gross and net) and seven-factor alphas (gross and net) as dependent variables to control for fund's liquidity exposure in Panel B; and we control for the average performance of all the funds in the family (excluding the fund itself) in Panel C. For the sake of brevity, we only report the coefficient estimates of the main variables of interest. Standard errors are clustered at the family level and *t*-statistics are reported in parentheses. We also perform *F*-tests to compare the coefficients of different compensation structures and report the F-test *p*-values at the bottom of the table. The superscripts ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Controlling for Cremers and Petajisto's (2009) Active Share measure

	Gross Four-Factor Alpha$_t$		***Net Four-Factor Alpha$_t$***		***Gross Six-Factor Alpha$_t$***		***Net Six-Factor Alpha$_t$***	
Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
Performance Pay$_{t-1}$	0.779***	0.701**	0.806***	0.732***	1.131***	1.082***	1.147***	1.104***
	(2.94)	(2.54)	(3.02)	(2.61)	(3.65)	(3.15)	(3.67)	(3.19)
AUM Pay$_{t-1}$		-0.124		-0.140		-0.173		-0.200
		(-0.42)		(-0.47)		(-0.68)		(-0.78)
Advisor-Profits Pay $_{t-1}$		-0.412		-0.395		-0.098		-0.087
		(-1.59)		(-1.52)		(-0.44)		(-0.39)
Fixed Salary $_{t-1}$		-1.518		-1.550		-1.746		-1.797
		(-1.26)		(-1.29)		(-1.32)		(-1.36)
Active Share $_{t-1}$	0.021***	0.021***	0.019***	0.019***	0.022***	0.022***	0.020***	0.020***
	(3.50)	(3.43)	(3.15)	(3.10)	(3.77)	(3.70)	(3.42)	(3.36)
Controls$_{t-1}$	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Objective & Year FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
# of Obs.	5,585	5,585	5,585	5,585	8,465	8,465	8,465	8,465
Adj. R^2	0.095	0.096	0.095	0.096	0.040	0.040	0.038	0.038
F-tests								
Perf.= AUM		0.076		0.064		0.013		0.010
Perf. = Profit		0.006		0.005		0.003		0.002
Perf. = Fix		0.076		0.068		0.034		0.030
Perf.=AUM=Profit		0.019		0.018		0.011		0.010
Perf.=AUM=Profit=Fix		0.030		0.027		0.012		0.010

Panel B: Controlling for Pastor and Stambaugh (2003) liquidity factor

	Gross Five-Factor Alpha$_t$		***Net Five-Factor Alpha$_t$***		***Gross Seven-Factor Alpha$_t$***		***Net Seven-Factor Alpha$_t$***	
Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
Performance Pay$_{t-1}$	0.688***	0.562**	0.710***	0.590**	0.728***	0.709***	0.748***	0.734***
	(2.61)	(2.09)	(2.69)	(2.18)	(3.26)	(2.82)	(3.36)	(2.92)
AUM Pay$_{t-1}$		-0.079		-0.102		-0.239		-0.262
		(-0.25)		(-0.32)		(-1.29)		(-1.44)
Advisor-Profits Pay $_{t-1}$		-0.420		-0.402		-0.268*		-0.254
		(-1.56)		(-1.49)		(-1.69)		(-1.63)
Fixed Salary $_{t-1}$		-2.163*		-2.211*		-1.268*		-1.304*
		(-1.83)		(-1.87)		(-1.81)		(-1.86)
Controls$_{t-1}$	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Objective & Year FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
# of Obs.	5,811	5,811	5,811	5,811	15,478	15,478	15,478	15,478
Adj. R^2	0.033	0.035	0.033	0.035	0.052	0.052	0.048	0.048
F-tests								
Perf.= AUM		0.182		0.154		0.009		0.006
Perf. = Profit		0.021		0.019		0.001		0.001
Perf. = Fix		0.028		0.024		0.005		0.004
Perf.=AUM=Profit		0.055		0.056		0.003		0.003
Perf.=AUM=Profit=Fix		0.038		0.036		0.001		0.001

Panel C: Controlling for family average performance (excluding the fund itself)

	Gross Four-Factor Alpha$_t$		***Net Four-Factor Alpha$_t$***		***Gross Six-Factor Alpha$_t$***		***Net Six-Factor Alpha$_t$***	
Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
Performance Pay$_{t-1}$	0.576**	0.544**	0.608***	0.585**	0.436***	0.436**	0.476***	0.477***
	(2.53)	(2.37)	(2.71)	(2.58)	(2.67)	(2.37)	(2.98)	(2.66)
AUM Pay$_{t-1}$		-0.153		-0.175		-0.231		-0.233*
		(-0.56)		(-0.64)		(-1.64)		(-1.66)
Advisor-Profits Pay $_{t-1}$		-0.177		-0.156		-0.218*		-0.207*
		(-0.75)		(-0.66)		(-1.85)		(-1.78)
Fixed Salary $_{t-1}$		-1.750		-1.764		-1.023		-1.025
		(-0.76)		(-0.77)		(-1.56)		(-1.57)
Family Average Alpha$_t$	0.495***	0.492***	0.497***	0.495***	0.505***	0.502***	0.508***	0.505***
	(10.90)	(10.89)	(10.92)	(10.92)	(11.54)	(11.39)	(11.61)	(11.46)
Controls$_{t-1}$	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Objective & Year FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Family FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
# of Obs.	5,218	5,218	5,218	5,218	14,896	14,896	14,896	14,896
Adj. R^2	0.169	0.169	0.169	0.169	0.137	0.137	0.135	0.135
F-tests								
Perf.= AUM		0.102		0.076		0.015		0.009
Perf. = Profit		0.046		0.039		0.004		0.002
Perf. = Fix		0.332		0.317		0.028		0.024
Perf.=AUM=Profit		0.135		0.116		0.015		0.008
Perf.=AUM=Profit=Fix		0.225		0.198		0.013		0.007

Table 7
Robustness tests: Evaluation period and fund performance

This table reports the results of several robustness tests on the relation between evaluation period and fund performance. We repeat the analysis of Table 5 except that we add Cremers and Petajisto's (2009) active share measure as an additional control variable in Panel A; we use five-factor alphas (gross and net) and seven-factor alphas (gross and net) as dependent variables to control for fund's liquidity exposure in Panel B; and we control for the average performance of all the funds in the family (excluding the fund itself) in Panel C. In Panel D, we compare the evaluation period between the subsamples of funds with above- and below-median tenure managers. In Panel E, we repeat the analysis of Table 5 with each of the subsample and test the difference between the coefficients of the evaluation period measures across the two subsamples. We interact evaluation period with an indicator variable, *Short Tenure*, that equals one if a fund's manager tenure is below the median value and zero otherwise. For the sake of brevity, we only report the coefficient estimates of the main variables of interest. Standard errors are clustered at the family level and *t*-statistics are reported in parentheses. The superscripts ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Controlling for Cremers and Petajisto's (2009) Active Share measure

	Gross Four-Factor Alpha$_t$			***Net Four-Factor Alpha$_t$***			***Gross Six-Factor Alpha$_t$***			***Net Six-Factor Alpha$_t$***		
Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**	**(11)**	**(12)**
Evaluation Period Mean$_{t-1}$	0.203*			0.197*			0.358***			0.350***		
	(1.80)			(1.75)			(2.99)			(2.94)		
Evaluation Period Min$_{t-1}$		-0.109			-0.113			0.071			0.065	
		(-0.90)			(-0.93)			(0.63)			(0.60)	
Evaluation Period Max$_{t-1}$			0.169***			0.167***			0.207***			0.204***
			(2.89)			(2.83)			(3.46)			(3.44)
Active Share$_{t-1}$	0.018*	0.019*	0.017*	0.017*	0.017*	0.016	0.010	0.012	0.012	0.008	0.010	0.010
	(1.89)	(1.94)	(1.81)	(1.73)	(1.78)	(1.65)	(1.21)	(1.38)	(1.55)	(1.01)	(1.19)	(1.32)
Controls$_{t-1}$	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Objective & Year FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
# of Obs.	2,771	2,771	2,771	2,771	2,771	2,771	4,431	4,431	4,431	4,431	4,431	4,431
Adj. R^2	0.099	0.099	0.100	0.099	0.098	0.100	0.043	0.041	0.043	0.042	0.040	0.042

Panel B: Controlling for Pastor and Stambaugh (2003) liquidity factor

	Gross Five-Factor Alpha$_t$			***Net Five-Factor Alpha$_t$***			***Gross Seven-Factor Alpha$_t$***			***Net Seven-Factor Alpha$_t$***		
Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**	**(11)**	**(12)**
Evaluation Period Mean$_{t-1}$	0.155			0.149			0.303**			0.285**		
	(1.32)			(1.25)			(2.61)			(2.50)		
Evaluation Period Min$_{t-1}$		-0.211*			-0.215*			0.113			0.103	
		(-1.82)			(-1.83)			(1.20)			(1.14)	
Evaluation Period Max$_{t-1}$			0.172***			0.169***			0.135**			0.129**
			(3.06)			(2.97)			(2.54)			(2.47)
Controls$_{t-1}$	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Objective & Year FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
# of Obs.	2,891	2,891	2,891	2,891	2,891	2,891	8,274	8,274	8,274	8,274	8,274	8,274
Adj. R^2	0.027	0.028	0.029	0.028	0.029	0.030	0.059	0.057	0.058	0.055	0.053	0.054

Panel C: Controlling for family average performance (excluding the fund itself)

	Gross Four-Factor Alpha$_t$			***Net Four-Factor Alpha$_t$***			***Gross Six-Factor Alpha$_t$***			***Net Six-Factor Alpha$_t$***		
Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**	**(11)**	**(12)**
Evaluation Period Mean$_{t-1}$	0.150			0.142			0.140**			0.134*		
	(1.60)			(1.52)			(2.01)			(1.92)		
Evaluation Period Min$_{t-1}$		-0.132			-0.131			0.051			0.053	
		(-1.42)			(-1.45)			(1.03)			(1.11)	
Evaluation Period Max$_{t-1}$			0.143***			0.137***			0.062*			0.058*
			(3.28)			(3.16)			(1.88)			(1.73)
Family Average Alpha$_t$	0.475***	0.480***	0.473***	0.476***	0.480***	0.473***	0.570***	0.575***	0.575***	0.574***	0.577***	0.577***
	(6.20)	(6.35)	(6.22)	(6.16)	(6.31)	(6.17)	(6.69)	(6.83)	(6.79)	(6.69)	(6.82)	(6.78)
Controls$_{t-1}$	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Objective & Year FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
# of Obs.	2,821	2,821	2,821	2,821	2,821	2,821	8,233	8,233	8,233	8,233	8,233	8,233
Adj. R^2	0.141	0.141	0.142	0.141	0.141	0.142	0.138	0.138	0.138	0.137	0.136	0.136

Panel D: Evaluation period and portfolio manager tenure

	Manager Tenure>=56 Months				***Manager Tenure<56 Months***				***Diff. in Mean***
Variables	***Obs.***	***Mean***	***Median***	***Std. Dev.***	***Obs.***	***Mean***	***Median***	***Std. Dev.***	***(t-stat.)***
Evaluation Period Mean	5,005	3.03	3	1.19	5,578	3.10	3	1.24	-0.07 (-0.36)
Evaluation Period Min	5,005	1.51	1	1.14	5,578	1.83	1	1.48	-0.32 (-1.17)
Evaluation Period Max	5,005	4.55	5	2.13	5,578	4.37	5	1.81	0.18 (1.09)

Panel E: Evaluation period and fund performance - subsample analysis

	Gross Four-Factor Alpha$_t$			***Net Four-Factor Alpha$_t$***			***Gross Six-Factor Alpha$_t$***			***Net Six-Factor Alpha$_t$***		
Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**	**(11)**	**(12)**
Evaluation Period Mean$_{t-1}$	0.401***			0.399***			0.360***			0.349***		
	(2.96)			(2.93)			(2.83)			(2.75)		
Evaluation Period Mean$_{t-1}$* Short Tenure$_{t-1}$	-0.305			-0.311			-0.123			-0.129		
	(-1.43)			(-1.45)			(-0.87)			(-0.91)		
Evaluation Period Min$_{t-1}$		0.032			0.030			0.252**			0.248**	
		(0.18)			(0.18)			(2.49)			(2.48)	
Evaluation Period Min$_{t-1}$* Short Tenure$_{t-1}$		-0.229			-0.231			-0.124			-0.132	
		(-0.96)			(-0.98)			(-1.12)			(-1.18)	
Evaluation Period Max$_{t-1}$			0.228***			0.227***			0.120*			0.115*
			(3.24)			(3.21)			(1.89)			(1.82)
Evaluation Period Max$_{t-1}$* Short Tenure$_{t-1}$			-0.075			-0.077			-0.028			-0.028
			(-0.66)			(-0.68)			(-0.37)			(-0.37)
Short Tenure$_{t-1}$	-1.621	-1.912	-1.951	-1.515	-1.816	-1.844	0.341	0.724	0.023	0.277	0.627	-0.027
	(-0.44)	(-0.51)	(-0.53)	(-0.41)	(-0.49)	(-0.50)	(0.14)	(0.27)	(0.01)	(0.11)	(0.24)	(-0.01)
Controls$_{t-1}$	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Objective & Year FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
# of Obs.	2,891	2,891	2,891	2,891	2,891	2,891	8,274	8,274	8,274	8,274	8,274	8,274
Adj. R^2	0.102	0.100	0.103	0.101	0.0995	0.102	0.110	0.109	0.109	0.108	0.108	0.107

Table 8
Management talent vs. effort induction

This table tabulates the results of repeating our analysis of Tables 3, 4, and 5 after controlling proxies for manager's ability. We use two variables to proxy for managerial ability: (i) average SAT score of the manager's undergraduate institution, (ii) an indicator variable that equals one if the manager has an MBA degree from a top business school (i.e., average GMAT score>700), zero otherwise. In addition, we include manager industry experience (i.e., the number of years the manager has worked in the mutual fund industry) as an additional control variable. Panel A (B) reports the results on the relation between compensation structures (evaluation period) and fund performance. For the sake of brevity, we only report the coefficient estimates of the main variables of interest. Standard errors are clustered at the family level and *t*-statistics are reported in parentheses. In columns (2), (4), (6), and (8) of Panel A, we also perform *F*-tests to compare the coefficients of different compensation structures and report the F-test *p*-values at the bottom of the table. The superscripts ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Panel A: Compensation structures and fund performance

	Gross Four-Factor Alpha$_t$		Net Four-Factor Alpha$_t$		Gross Six-Factor Alpha$_t$		Net Six-Factor Alpha$_t$	
Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
Performance Pay$_{t-1}$	0.764***	0.755**	0.791***	0.787***	0.878***	0.924***	0.901***	0.949***
	(2.71)	(2.51)	(2.81)	(2.61)	(3.80)	(3.59)	(3.90)	(3.69)
AUM Pay$_{t-1}$		-0.304		-0.321		-0.375*		-0.390*
		(-0.96)		(-1.00)		(-1.72)		(-1.82)
Advisor-Profits Pay $_{t-1}$		-0.513*		-0.494*		-0.267		-0.250
		(-1.89)		(-1.81)		(-1.61)		(-1.51)
Fixed Salary $_{t-1}$		-0.903		-0.949		-0.876		-0.904
		(-0.88)		(-0.93)		(-1.15)		(-1.19)
SAT	0.036	0.046	0.036	0.045	0.152**	0.161**	0.153**	0.162**
	(0.36)	(0.45)	(0.36)	(0.45)	(2.38)	(2.53)	(2.40)	(2.56)
Top MBA	0.472*	0.487*	0.486*	0.500*	0.333*	0.329*	0.313*	0.309
	(1.84)	(1.88)	(1.90)	(1.93)	(1.75)	(1.71)	(1.66)	(1.61)
Log Manager Experience$_{t-1}$	-0.057	-0.073	-0.080	-0.095	-0.251*	-0.249*	-0.252*	-0.251*
	(-0.26)	(-0.32)	(-0.36)	(-0.42)	(-1.72)	(-1.69)	(-1.73)	(-1.70)
Controls$_{t-1}$	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Objective & Year FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
# of Obs.	4,956	4,956	4,956	4,956	12,111	12,111	12,111	12,111
Adj. R^2	0.089	0.090	0.089	0.090	0.098	0.098	0.095	0.096
F-tests								
Perf.= AUM		0.034		0.028		0.001		0.000
Perf. = Profit		0.003		0.003		0.000		0.000
Perf. = Fix		0.109		0.091		0.016		0.013
Perf.=AUM=Profit		0.013		0.012		0.000		0.000
Perf.=AUM=Profit=Fix		0.024		0.021		0.000		0.000

Panel B: Evaluation period and fund performance

	Gross Four-Factor Alpha$_t$			***Net Four-Factor Alpha$_t$***			***Gross Six-Factor Alpha$_t$***			***Net Six-Factor Alpha$_t$***		
Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**	**(11)**	**(12)**
Evaluation Period Mean$_{t-1}$	0.288**			0.280**			0.349***			0.337***		
	(2.53)			(2.43)			(3.31)			(3.20)		
Evaluation Period Min$_{t-1}$		0.004			-0.002			0.256***			0.246***	
		(0.04)			(-0.02)			(3.09)			(3.06)	
Evaluation Period Max$_{t-1}$			0.176***			0.173***			0.116**			0.112**
			(3.14)			(3.06)			(2.12)			(2.07)
SAT	0.064	0.090	0.037	0.066	0.091	0.039	0.077	0.093	0.100	0.077	0.092	0.099
	(0.42)	(0.60)	(0.24)	(0.42)	(0.60)	(0.25)	(0.95)	(1.15)	(1.25)	(0.96)	(1.15)	(1.26)
Top MBA	0.622*	0.677**	0.637**	0.628**	0.683**	0.643**	0.287	0.298	0.328	0.272	0.282	0.312
	(1.97)	(2.10)	(2.02)	(2.00)	(2.13)	(2.04)	(1.17)	(1.19)	(1.37)	(1.12)	(1.15)	(1.33)
Log Manager Experience$_{t-1}$	-0.075	-0.012	-0.017	-0.092	-0.027	-0.035	-0.254	-0.273	-0.239	-0.251	-0.270	-0.237
	(-0.29)	(-0.04)	(-0.07)	(-0.35)	(-0.11)	(-0.14)	(-1.25)	(-1.32)	(-1.15)	(-1.23)	(-1.29)	(-1.13)
Controls$_{t-1}$	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Objective & Year FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
# of Obs.	2,416	2,416	2,416	2,416	2,416	2,416	6,303	6,303	6,303	6,303	6,303	6,303
Adj. R^2	0.100	0.098	0.100	0.101	0.099	0.101	0.120	0.119	0.118	0.118	0.117	0.117

Table 9
Portfolio manager compensation structures and fund risk shifting

This table presents estimation results of the impact of various portfolio manager compensation structures on fund risk-shifting behavior. The dependent variable is *Risk Shift Ratio,* constructed as in Eq. (3). We use the diversified domestic equity fund sample in this analysis. All dependent and independent variables are defined as in Tables 1 and 2. Standard errors are clustered at the family level and *t*-statistics are reported in parentheses. In column (2), we also perform *F*-tests to compare the coefficients of different compensation structures and report the F-test *p*-values at the bottom of the table. The superscripts ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

	Intra-year Risk Shift Ratio				
Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
Performance Pay $_{t-1}$	-0.029**	-0.031**			
	(-2.29)	(-2.24)			
AUM Pay $_{t-1}$		0.001			
		(0.19)			
Advisor-Profits Pay $_{t-1}$		-0.004			
		(-0.75)			
Fixed Salary $_{t-1}$		-0.020			
		(-1.41)			
Evaluation Period Mean $_{t-1}$			-0.004*		
			(-1.84)		
Evaluation Period Min $_{t-1}$				0.002	
				(1.24)	
Evaluation Period Max $_{t-1}$					-0.003**
					(-2.30)
Log Family Size $_{t-1}$	0.004***	0.004***	0.002**	0.001	0.002**
	(3.35)	(3.22)	(2.07)	(1.06)	(2.05)
Subadviser $_{t-1}$	-0.000	-0.000	-0.004	-0.003	-0.003
	(-0.09)	(-0.01)	(-0.89)	(-0.60)	(-0.77)
Owner $_{t-1}$	-0.013**	-0.012**	-0.015***	-0.014**	-0.017***
	(-2.13)	(-2.16)	(-2.68)	(-2.39)	(-2.96)
Team Mgmt. $_{t-1}$	-0.011*	-0.011*	-0.006	-0.002	-0.006
	(-1.88)	(-1.88)	(-1.23)	(-0.46)	(-1.16)
Log Manager Tenure $_{t-1}$	-0.006	-0.006	-0.004*	-0.004*	-0.004*
	(-1.48)	(-1.47)	(-1.88)	(-1.78)	(-1.67)
Log Fund Size $_{t-1}$	0.003**	0.003**	0.003*	0.003*	0.003*
	(2.13)	(2.08)	(1.89)	(1.86)	(1.87)
Log Fund Age $_{t-1}$	-0.004	-0.004	-0.002	-0.002	-0.002
	(-1.36)	(-1.35)	(-0.76)	(-0.81)	(-0.66)
Expense $_{t-1}$	-0.018**	-0.018**	-0.013	-0.012	-0.014*
	(-2.01)	(-2.02)	(-1.62)	(-1.55)	(-1.81)
Log Turnover $_{t-1}$	0.004	0.004	0.005*	0.006*	0.005
	(0.90)	(0.99)	(1.71)	(1.79)	(1.42)
Net Flows $_{t-1}$	0.000	0.000	0.000	0.000	0.000
	(0.82)	(0.80)	(0.35)	(0.30)	(0.42)
Performance Adv. Fee $_{t-1}$	-0.019**	-0.019**	-0.003	-0.008	-0.007
	(-2.22)	(-2.18)	(-0.62)	(-1.29)	(-1.20)
Coles Incentive Rate $_{t-1}$	0.026***	0.024***	0.013	0.008	0.012

	(2.72)	(2.81)	(1.32)	(0.85)	(1.30)
Risk Shift Ratio$_{t-1}$	0.148	0.148	-0.012	-0.011	-0.014
	(1.57)	(1.57)	(-0.34)	(-0.30)	(-0.38)
Constant	0.948***	0.951***	1.080***	1.071***	1.087***
	(15.16)	(15.46)	(27.47)	(25.88)	(26.83)
Objective & Year FEs	Yes	Yes	Yes	Yes	Yes
# of Obs.	5,346	5,346	2,676	2,676	2,676
Adj. R^2	0.239	0.239	0.296	0.295	0.297
F-tests					
Fix= Perf.		0.510			
Fix = AUM		0.167			
Fix = Profit		0.224			
Fix=Perf.=AUM=Profit		0.087			
Perf.=AUM		0.047			
Perf.= Profit		0.017			
Perf.=AUM=Profit		0.054			

Internet Appendix

"Portfolio Manager Compensation and Mutual Fund Performance"

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Table A1
Summary statistics of compensation structures of diversified domestic equity funds

This table reports the distribution of compensation structures (Panel A), further breakdown of non-fixed salary (Panel B), summary statistics of evaluation periods (Panel C), and correlation coefficient matrix of the main variables of portfolio manager compensation structures (Panel D). The sample consists of diversified domestic equity funds, with 5,845 fund-year observations over the period 2006-2011. The variable *Fixed Salary* is an indicator variable that equals one if the portfolio manager receives a fixed amount of compensation from the advisor, zero otherwise. *Performance Pay* is a dummy variable that is set to one if the bonus is tied to the investment performance of the fund, zero otherwise; *AUM Pay* is an indicator variable that equals one if portfolio manager compensation is tied to the fund's assets under management, zero otherwise; *Advisor-Profits Pay* is a dummy variable that is set to one if the portfolio manager's compensation depends on the advisor's profits, zero otherwise; *Evaluation Period Mean* is the average number of years over which investment performance is measured for performance-based pay; most funds report multiple evaluation windows, *Evaluation Period Min* is the shortest evaluation window, *Evaluation Period Max* is the longest evaluation window, and *Evaluation Period Median* is the median evaluation window if there are three or more evaluation periods disclosed. For funds that have multiple reported evaluation windows, we calculate *Evaluation Period Mean* as the mean of *Evaluation Period Min* and *Evaluation Period Max*. *P-values* are in brackets in Panel D.

Panel A: Summary statistics of compensation structures

	# of Obs.	***% of Sample***
Total	5,845	100%
Fixed Salary	96	1.6%
Non-fixed Salary	5,749	98.4%
Performance Pay	4,415	75.5%
AUM Pay	1,252	21.4%
Advisor-Profits Pay	3,047	52.1%

Panel B: Further breakdown of non-fixed salary

Performance Pay	***AUM Pay***	***Advisor-Profits Pay***	***# of Obs.***	***% of Non-fixed Salary Sample***
1	0	0	1,830	31.8%
1	1	0	566	9.8%
1	0	1	1,422	24.7%
1	1	1	597	10.4%
0	1	0	60	1.0%
0	0	1	999	17.4%
0	1	1	29	0.5%
0	0	0	246	4.3%
Total Non-fixed Salary			5,749	100%

Panel C: Summary statistics of evaluation period

Variables (years)	*Obs.*	*Mean*	*Median*	*Std. Dev.*	*Min*	*Max*
Evaluation Period Mean	3,704	3.08	3	1.20	0.25	6.5
Evaluation Period Min	3,704	1.66	1	1.30	0.25	5
Evaluation Period Max	3,704	4.49	5	1.99	0.25	10
Evaluation Period Median	1,713	3.29	3	0.87	1	5

Panel D: Correlation matrix

	Fixed Salary	***Performance Pay***	***AUM Pay***	***Advisor-Profits Pay***	***Evaluation Period Mean***
Fixed Salary	1.00				
Performance Pay	-0.23	1.00			
	[0.00]				
AUM Pay	-0.07	0.21	1.00		
	[0.00]	[0.00]			
Advisor-Profits Pay	-0.13	-0.23	-0.02	1.00	
	[0.00]	[0.00]	[0.09]		
Evaluation Period Mean	.	0.04	-0.11	-0.37	1.00
	.	[0.03]	[0.00]	[0.00]	

Table A2
Summary statistics of compensation structures by year

This table reports the distribution of compensation structures (Panel A) and summary statistics of evaluation periods (Panel B) by year. The sample period is 2006 to 2011. All variables are defined in Table A1.

Panel A: Yearly statistics of compensation structures

Year	*Fixed Salary*	*Performance Pay*	*AUM Pay*	*Advisor Profits Pay*	*# Obs.*
2006	1.4%	80.5%	19.6%	47.4%	2,578
2007	1.6%	79.6%	20.2%	48.8%	2,670
2008	1.1%	80.7%	19.9%	48.5%	2,559
2009	1.3%	79.3%	20.0%	49.6%	2,646
2010	1.3%	77.9%	17.4%	49.8%	2,606
2011	1.6%	77.5%	16.5%	48.4%	2,546
All	1.4%	79.2%	18.9%	48.7%	15,605

Panel B: Yearly statistics of evaluation period

Year	*Evaluation Period Mean*	*Evaluation Period Min*	*Evaluation Period Max*	*Evaluation Period Median*	*# Obs.*
2006	3.00	1.67	4.34	3.22	1,797
2007	3.02	1.69	4.35	3.24	1,852
2008	3.06	1.66	4.47	3.22	1,779
2009	3.06	1.63	4.48	3.23	1,816
2010	3.12	1.72	4.53	3.25	1,693
2011	3.14	1.71	4.57	3.26	1,646
All	3.07	1.68	4.45	3.24	10,583

Table A3
Summary statistics of alternative performance measures

This table reports the summary statistics of several alternative alpha estimates that we use in the robustness tests. First, we use daily return data in each year to estimate the following in-sample alpha measures: *Net Four-Factor* (*Six-Factor*) *Alpha* and *Gross Four-Factor* (*Six-Factor*) *Alpha*. To capture any effect of infrequent trading on daily fund returns (e.g., Scholes and Williams, 1977; Dimson, 1979), we include both contemporaneous and lagged daily factor returns. We annualize the daily alpha estimate by $(1+\text{daily alpha})^{252} - 1$. Second, *Net* (*Gross*) *Benchmark-Adjusted Alpha* is computed by regressing 12 monthly excess net-of-fee (gross-of-fee) returns of a fund in a year on the excess returns of its Morningstar-assigned benchmark index (i.e., Morningstar Category Index). All alpha measures are annualized and winsorized at the 1% and 99% level.

Variables	***Mean***	***Median***	***Std. Dev.***	***1st***	***99th***	***Obs.***
Alphas estimated in-sample using daily return data						
Net Four-Factor Alpha *(in % per year)*	-0.537	-0.574	5.795	-16.931	14.752	5,845
Net Six-Factor Alpha *(in % per year)*	-0.119	-0.242	7.869	-23.983	26.597	15,605
Gross Four-Factor Alpha *(in % per year)*	0.606	0.494	5.865	-15.824	16.058	5,845
Gross Six-Factor Alpha *(in % per year)*	0.929	0.662	7.953	-22.910	28.123	15,605
Benchmark-adjusted alphas						
Net Benchmark-Adjusted Alpha *(in % per year)*	-0.486	-0.345	6.102	-21.195	17.616	15,540
Gross Benchmark-Adjusted Alpha *(in % per year)*	0.590	0.524	6.072	-19.842	18.767	15,540

Table A4
Robustness tests: Four-factor and six-factor alphas estimated using daily return data

This table repeats the analysis of Tables 3, 4, and 5 except using four- and six-factor alphas estimated in sample each year using daily return data as the dependent variable. The dependent variables are defined in Table A3. For the sake of brevity, we only report the coefficient estimates of the main variables of interest. Panel A (B) reports the results on the relation between compensation structures (evaluation period) and fund performance. Standard errors are clustered at the family level and *t*-statistics are reported in parentheses. In columns (2), (4), (6), and (8) of Panel A, we also perform *F*-tests to compare the coefficients of different compensation structures and report the F-test *p*-values at the bottom of the table. The superscripts ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Performance-based pay and fund performance

	Gross Four-Factor Alpha$_t$		***Net Four-Factor Alpha$_t$***		***Gross Six-Factor Alpha$_t$***		***Net Six-Factor Alpha$_t$***	
Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
Performance Pay$_{t-1}$	0.613**	0.544**	0.632**	0.570**	0.456**	0.460**	0.471**	0.478**
	(2.42)	(2.19)	(2.55)	(2.35)	(2.29)	(2.11)	(2.37)	(2.20)
AUM Pay$_{t-1}$		-0.290		-0.305		-0.384**		-0.399**
		(-1.02)		(-1.08)		(-2.27)		(-2.36)
Advisor-Profits Pay $_{t-1}$		-0.265		-0.245		-0.262*		-0.245*
		(-1.14)		(-1.07)		(-1.86)		(-1.76)
Fixed Salary $_{t-1}$		-2.517**		-2.515**		-1.532**		-1.551**
		(-2.45)		(-2.48)		(-2.42)		(-2.46)
Controls$_{t-1}$	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Objective & Year FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
# of Obs.	5,814	5,814	5,814	5,814	15,483	15,483	15,483	15,483
Adj. R^2	0.0736	0.0760	0.0733	0.0758	0.178	0.179	0.180	0.181
F-tests								
Perf.= AUM		0.053		0.041		0.007		0.005
Perf. = Profit		0.025		0.021		0.004		0.003
Perf. = Fix		0.005		0.004		0.002		0.001
Perf.=AUM=Profit		0.065		0.053		0.010		0.008
Perf.=AUM=Profit=Fix		0.020		0.016		0.002		0.001

Panel B: Evaluation period and fund performance

	Gross Four-Factor Alpha$_t$			***Net Four-Factor Alpha$_t$***			***Gross Six-Factor Alpha$_t$***			***Net Six-Factor Alpha$_t$***		
Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**	**(11)**	**(12)**
Evaluation Period Mean$_{t-1}$	0.190*			0.181*			0.304***			0.286***		
	(1.77)			(1.67)			(3.39)			(3.21)		
Evaluation Period Min$_{t-1}$		-0.186*			-0.189*			0.052			0.043	
		(-1.66)			(-1.67)			(0.61)			(0.52)	
Evaluation Period Max$_{t-1}$			0.185***			0.180***			0.162***			0.154***
			(3.19)			(3.09)			(3.77)			(3.65)
Controls$_{t-1}$	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Objective & Year FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
# of Obs.	2,891	2,891	2,891	2,891	2,891	2,891	8,276	8,276	8,276	8,276	8,276	8,276
Adj. R^2	0.082	0.082	0.084	0.079	0.080	0.082	0.205	0.203	0.205	0.205	0.204	0.205

Table A5
Robustness tests: Benchmark-adjusted alphas using Morningstar-assigned benchmarks

This table repeats the analysis of Tables 3, 4, and 5 except using gross and net benchmark-adjusted alphas as the dependent variable. The dependent variables are defined in Table A3. For the sake of brevity, we only report the coefficient estimates of the main variables of interest. Panel A (B) reports the results on the relation between compensation structures (evaluation period) and fund performance. Standard errors are clustered at the family level and *t*-statistics are reported in parentheses. In columns (2) and (4) of Panel A, we also perform *F*-tests to compare the coefficients of different compensation structures and report the F-test *p*-values at the bottom of the table. The superscripts ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Performance-based pay and fund performance

	Gross Bench.-Adj. Alpha$_t$		***Net Bench.-Adj. Alpha$_t$***	
Variables	**(1)**	**(2)**	**(3)**	**(4)**
Performance Pay$_{t-1}$	0.501***	0.467**	0.527***	0.482**
	(2.60)	(2.22)	(2.69)	(2.25)
AUM Pay$_{t-1}$		-0.103		-0.080
		(-0.64)		(-0.50)
Advisor-Profits Pay $_{t-1}$		-0.171		-0.149
		(-1.09)		(-0.94)
Fixed Salary $_{t-1}$		-0.964		-1.048
		(-1.36)		(-1.45)
Controls $_{t-1}$	Yes	Yes	Yes	Yes
Objective & Year FEs	Yes	Yes	Yes	Yes
# of Obs.	15,462	15,462	15,462	15,462
R^2	0.096	0.097	0.100	0.100
F-tests				
Perf.= AUM		0.068		0.075
Perf. = Profit		0.007		0.008
Perf. = Fix		0.045		0.035
Perf.=AUM=Profit		0.026		0.030
Perf.=AUM=Profit=Fix		0.022		0.021

Panel B: Evaluation period and fund performance

	Gross Bench.-Adj. Alpha$_t$			***Net Bench.-Adj. Alpha$_t$***		
Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Evaluation Period Mean$_{t-1}$	0.360***			0.333***		
	(4.35)			(3.89)		
Evaluation Period Min$_{t-1}$		0.024			-0.002	
		(0.22)			(-0.02)	
Evaluation Period Max$_{t-1}$			0.207***			0.202***
			(4.60)			(4.41)
Controls $_{t-1}$	Yes	Yes	Yes	Yes	Yes	Yes
Objective & Year FEs	Yes	Yes	Yes	Yes	Yes	Yes
# of Obs.	8,276	8,276	8,276	8,276	8,276	8,276
R^2	0.123	0.120	0.124	0.127	0.124	0.128

Table A6
Robustness tests: Evaluation period and fund performance without conditioning on clearly stated benchmarks

This table repeats the tests in Table 5 except that we include all funds that report the evaluation period, regardless of whether a clear benchmark is stated. For the sake of brevity, we only report the coefficient estimates of the main variables of interest. Standard errors are clustered at the family level and *t*-statistics are reported in parentheses. The superscripts ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Gross Four-Factor Alpha$_t$			***Net Four-Factor Alpha$_t$***			***Gross Six-Factor Alpha$_t$***			***Net Six-Factor Alpha$_t$***		
Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**	**(11)**	**(12)**
Evaluation Period Mean$_{t-1}$	0.043			0.035			0.188*			0.173*		
	(0.38)			(0.31)			(1.85)			(1.70)		
Evaluation Period Min$_{t-1}$		-0.114			-0.121			0.103			0.096	
		(-0.97)			(-1.02)			(1.22)			(1.17)	
Evaluation Period Max$_{t-1}$			0.061			0.058			0.076			0.070
			(0.99)			(0.94)			(1.62)			(1.49)
Controls$_{t-1}$	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Objective & Year FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
# of Obs.	3,683	3,683	3,683	3,683	3,683	3,683	10,524	10,524	10,524	10,524	10,524	10,524
Adj. R^2	0.116	0.116	0.116	0.114	0.114	0.114	0.112	0.112	0.112	0.109	0.109	0.109

Table A7
Determinants of portfolio manager compensation structures

This table reports the OLS regression estimates of the determinants of various portfolio manager compensation structures. Specifically, the dependent variable is *Performance Pay* in column (1), *AUM Pay* in column (2), *Advisor-Profits Pay* in column (3), *Fixed Salary* in column (4), and *Evaluation Period Mean* in column (5). All independent variables are defined as in Table 2. Standard errors are clustered at the family level and *t*-statistics are reported in parentheses. The superscripts ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

	Performance Pay$_t$	***AUM Pay$_t$***	***Advisor-Profits Pay$_t$***	***Fixed Salary$_t$***	***Evaluation Period Mean$_t$***
	(1)	**(2)**	**(3)**	**(4)**	**(5)**
Log Manager Tenure$_{t-1}$	-0.012	-0.008	0.010	-0.001	-0.002
	(-1.44)	(-0.68)	(0.47)	(-0.30)	(-0.04)
Log Family Size$_{t-1}$	0.057***	-0.013	-0.032**	-0.012***	0.262***
	(6.75)	(-1.06)	(-2.03)	(-3.64)	(3.74)
Subadviser$_{t-1}$	-0.080	0.008	0.138**	0.005	-0.123
	(-1.57)	(0.17)	(2.37)	(0.66)	(-0.81)
Owner$_{t-1}$	-0.328***	0.011	0.352***	-0.007	-0.061
	(-4.74)	(0.16)	(6.45)	(-0.75)	(-0.17)
Team Mgmt.$_{t-1}$	0.027	0.046	0.020	-0.011*	-0.393***
	(0.83)	(1.14)	(0.40)	(-1.85)	(-2.67)
Log Fund Size$_{t-1}$	-0.009	0.004	0.005	-0.002	0.062**
	(-1.15)	(0.51)	(0.45)	(-1.00)	(2.37)
Log Fund Age$_{t-1}$	-0.009	-0.001	-0.004	-0.001	0.024
	(-0.70)	(-0.05)	(-0.18)	(-0.20)	(0.45)
Expense$_{t-1}$	0.069	0.062	0.025	-0.005	-0.196
	(1.55)	(1.54)	(0.48)	(-0.69)	(-1.10)
Log Turnover$_{t-1}$	0.017	0.004	0.005	0.001	-0.036
	(1.29)	(0.33)	(0.32)	(0.30)	(-0.73)
Net Flows$_{t-1}$	-0.000	-0.001	-0.003	-0.001**	-0.002
	(-0.28)	(-1.03)	(-1.41)	(-2.19)	(-0.33)
Performance Adv. Fee$_{t-1}$	-0.023	0.029	-0.113	0.010	0.131
	(-0.45)	(0.33)	(-1.58)	(1.22)	(0.41)
Coles Incentive Rate$_{t-1}$	-0.048	0.055	0.127	-0.065	0.944**
	(-0.65)	(0.45)	(0.88)	(-1.33)	(2.45)
Constant	0.279*	0.234*	0.597***	0.149***	0.587
	(1.74)	(1.82)	(2.97)	(3.19)	(0.76)
Objective & Year FEs	Yes	Yes	Yes	Yes	Yes
# of Obs.	15,527	15,527	15,527	15,527	10,562
Adj. R^2	0.260	0.020	0.147	0.058	0.326

Table A8
Robustness tests: Compensation structures and intra-year risk shift difference

This table repeats the analysis on intra-year risk-shifting behavior of Table 9 except that we use an alternative risk-shifting measure: intra-year risk shift difference. Rather than taking the ratio, this alternative measure takes the difference of intended portfolio risk in the second half of the year and the realized portfolio risk in the first half of the year. For the sake of brevity, we only report the coefficient estimates of the main variables of interest. Standard errors are clustered at the family level and *t*-statistics are reported in parentheses. In column (2), we also perform *F*-tests to compare the coefficients of different compensation structures and report the F-test *p*-values at the bottom of the table. The superscripts ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Intra-year Risk Shift Difference				
Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
Performance Pay$_{t-1}$	-0.070**	-0.075**			
	(-2.14)	(-2.14)			
AUM Pay$_{t-1}$		0.006			
		(0.43)			
Advisor-Profits Pay $_{t-1}$		-0.010			
		(-0.69)			
Fixed Salary $_{t-1}$		-0.038			
		(-0.92)			
Evaluation Period Mean$_{t-1}$			-0.012*		
			(-1.69)		
Evaluation Period Min$_{t-1}$				0.010**	
				(2.05)	
Evaluation Period Max$_{t-1}$					-0.011**
					(-2.53)
Controls$_{t-1}$	Yes	Yes	Yes	Yes	Yes
Objective & Year FEs	Yes	Yes	Yes	Yes	Yes
# of Obs.	5,346	5,346	2,676	2,676	2,676
Adj. R^2	0.297	0.297	0.385	0.385	0.386
F-tests					
Fix= Perf.		0.423			
Fix = AUM		0.323			
Fix = Profit		0.468			
Fix=Perf.=AUM=Profit		0.196			
Perf.=AUM		0.052			
Perf.= Profit		0.036			
Perf.=AUM=Profit		0.106			