How do firms appropriate value from employees with transferable skills?
A study of the appropriation puzzle in actively managed mutual funds

Online Supplement

Appendix A – Data-cleaning procedures

A1: Identifying unique managers

To assess the firm-specificity of the three investment skills, Characteristic Style, Characteristic Timing, and Average Style, we needed to first identify unique managers and sole-managed funds. Team-managed funds cannot be used to assess the skills that different managers possess because we do not observe the individual contributions of each manager to the overall fund's performance. We identify unique managers in two steps. First, we rely on manager names included in CRSP to distinguish team-managed from solo-managed funds. If a single name appears in the fund manager's name field, we treat this fund as solo-managed. If multiple names or variations of the term "Team Managed"[1] appear, we treat this fund as team-managed. Solo-managed funds were further manually checked to ensure that only legitimate names remained.

In the second step, we use managers' names, the dates in which they took over their funds, and the firm's managerial history to assess manager uniqueness. We deploy three rules: First, we treat two managers with the same first and last name (regardless of punctuation or middle initials), but working for different management or advisory companies and managing different funds simultaneously as different managers. Second, we deem two managers with the same first and last name (regardless of punctuation or middle initials, unless the middle initials are different) managing two different funds in the same management company simultaneously as the same person. Third, we code two managers managing the same fund and possessing the same first and last name (regardless of punctuation or middle initials) at any point in the fund's history as the same person. We treat all other cases as different persons. These rules, along with other restrictions that we describe in our Methods section, leave us with 2,164 unique fund managers between 1998 and 2010, inclusive.

We retain both solo- and team-managed funds in our sample because our measures of management-company spillovers are calculated for all funds in the firm and our mentorship variable is created by observing movement of managers between solo- and team-managed funds. However, all

[1] There has recently been a rise in the number of funds that do not report managers' names but, instead, keep these funds "anonymous" by stating only that the fund is "Team Managed" or only providing the management company's name in place of the manager's name (Massa, Reuter & Zitzewitz, 2009). Anonymous funds restrict the extent to which any given manager in the organization is able to claim credit for the fund's performance and thereby presumably reduce managers' bargaining power.

regressions containing individual-level skill measures use data only for the solo-managed funds because we cannot calculate individual skill measures for the team-managed funds.

A2: Procedure for coding the gender of managers

To account for the effects of gender on the wage-setting process in organizations, we relied on the first names of managers provided by CRSP, to identify each manager's gender. Unfortunately, this method was not error-free. In cases where a first name could be male or female, we coded gender as male. The following list of first names contains all the names that we coded as "female" in our sample.

Alison	Carolie	Donna	Jana	Juliet	Lauriann	Maria	Nina	Shelby	Vera
Allison	Charlotte	Doris	Jane	Karen	Laurie	Mariateresa	Nola	Sonya	Wendy
Amy	Cherry	Duffy	Janet	Katherine	Leigh	Mariko	Nora	Sophia	Whitney
Ann	Cheryl	Eileen	Janice	Kathleen	Leslie	Marilyn	Olessia	Susan	Yolanda
Anna	Christiana	Elizabeth	Jayne	Kathryn	Linda	Marina	Patricia	Susanne	
Anne	Christine	Elisa	Jennifer	Kathy	Lindsay	Marion	Patty	Suzanne	
Annette	Cindy	Elizabeth	Jenny	Katinka	Lisa	Martha	Paula	Tereasa	
Arlene	Claire	Georgina	Jill	Katrina	Livia	Mary	Penelope	Teresa	
Barbara	Coreen	Geraldine	Jocelin	Keitha	Loretta	Maureen	Pratima	Tessie	
Bernice	Cynthia	Geri	Jody	Kelli	Louise	Melissa	Roberta	Theresa	
Bettina	Dara	Heather	Joyce	Kelly	Lynda	Michelle	Roselia	Thyra	
Betty	Deborah	Helen	Judith	Kimberly	Margaret	Minerva	Rosemary	Tracy	
Brooke	Debra	Hilary	Judy	Kristina	Margery	Minyoung	Sandra	Uri	
Carey	Denise	Ira	Julene	Kuriyan	Margie	Nancy	Sarah	Valerie	
Carol	Diane	Irene	Julie	Laura	Marguerite	Natalie	Sharon	Varilyn	

Appendix B – Skill-Measure Creation

B1: Benchmark construction

To calculate our skill measures, we followed Daniel, Grinblatt, Titman and Wermers (1997) and first decomposed fund performance net of corresponding benchmarks. The benchmarks were calculated at the stock-level, so that we aggregated net performance per stock into a net performance of the fund's portfolio. We reused pre-constructed benchmarks from Russ Wermers and outline his methodology here.

The first step was to sort all stocks traded on NYSE, NASDAQ, and AMEX in June of each year, with data on prices and shares outstanding in CRSP and the book value of equity available in COMPUSTAT along three dimensions. The first dimension was market capitalization: all stocks were sorted or market capitalization at the end of June, and were assigned into one of five size quintiles. Next, within each market-capitalization quintile, stocks were sorted along a second dimension, their book-to-market ratios, creating a total of 25 distinct stock portfolios made up of the 5x5 quintiles. Finally, within each of these 25 portfolios, stocks were further sorted into quintiles according to their momentum (the 12-month past return of each stock between June of the previous year and up to May of the current year). This yielded the complete set of 125 fractile portfolios every year. For each portfolio, which was re-sorted annually, a value-weighted return was calculated for every month, and this constituted the benchmark return for each stock that was a member of a given portfolio in a given year. The benchmark returns provided by Wermers were monthly returns, but because the holdings data were available only on a quarterly basis, we compounded the monthly returns into quarterly ones. Wermers also provided a table linking each stock with its benchmark return based on the triple sort. We used this table to link each stock contained in the fund holdings reported in the Thomson Reuters mutual-fund holdings file with its benchmark.

B2: Skill-measure calculation

We follow the methods described in Daniel, Grinblatt, Titman and Wermers (1997) to construct measures of skill and then use an empirical method to assess the firm-specificity of each. We describe the construction of these measures in greater detail below.

Characteristic Selectivity

This measure aimed to answer the following question: from within each of the 125 benchmark portfolios re-created each year, was the manager able to select those stocks that outperformed the

portfolio's average return? The measure was calculated as the difference between the value-weighted sum of individual buy-and-hold quarterly stock returns (with dividends reinvested) as selected by the manager and reported in Thomson's holdings file and the value-weighted sum of the passive portfolio returns calculated by Wermers, matched to each stock at the end of the previous quarter. The quarter *t* component of the CS measure was calculated as

$$CS_t = \sum_{j=1}^{N} w_{jt-1}\left(R_{jt} - R_t^{b_{jt-1}}\right) \quad (1)$$

where w_{jt-1} is the portfolio weight on stock *j* at the end of quarter *t-1*, the stock's quarter *t* return is measured by R_{jt} and the quarter *t* return of the characteristic-based passive portfolio matched to stock *j* at the end of quarter *t-1* is measured by R_t^{bt-1}. The weights were estimated using the most recent portfolio holdings available in the Thomson Holdings file, usually from the previous quarter end.

Characteristic Timing

Under the assumption that there are differences in returns to particular benchmark portfolios over time, the characteristic timing measure captures the manager's ability to time investments such that she moves into (out of) particular benchmark portfolios right before they end up being most (least) profitable. Specifically, the manager may choose to invest in those benchmark portfolios each quarter that happen to yield the highest return, and choose to sell stocks in benchmark portfolios, the returns to which are, on average, lower. This measure was calculated as the difference between the value-weighted sum of individual buy-and-hold quarterly benchmark returns (with dividends reinvested) matched to each stock held at the end of the previous quarter and the value-weighted sum of the benchmark returns of these stocks matched to each stock one year prior to the most recent quarter. The quarter *t* component of the CT measure was calculated as

$$CT_t = \sum_{j=1}^{N}\left(w_{jt-1}R_t^{b_{j,t-1}} - w_{jt-5}R_t^{b_{jt-5}}\right) \quad (2)$$

where w_{jt-1} and w_{jt-13} are the portfolio weights on stock *j* at the end of quarter *t-1* and at the end of quarter *t-5* (provided the fund did hold this stock for at least a year), and the quarter *t* returns of the characteristic-based passive portfolio matched to stock *j* at the end of quarters *t-1* and *t-5* are measured by $R_t^{bj,t-1}$and by $R_t^{bj,t-5}$. The weighted differences in the passive portfolio returns of all stocks held in both the previous quarter and five quarters ago formed the CT measure for that quarter.

Average Style

Average style refers to the tendency to hold certain stocks regardless of current returns. This measure was calculated as the value-weighted sum of the benchmark returns of these stocks matched to each stock one year prior to the most recent quarter. We calculated the quarter *t* component of the AS measure as

$$AS_t = \sum_{j=1}^{N} \left(w_{jt-5} R_t^{b_{j,t-5}} \right) \quad (3)$$

where w_{jt-13} is the portfolio weight on stock *j* at the end of quarter *t-5* (provided the fund did hold this stock for at least a year) and the quarter *t* returns of the characteristic-based passive portfolio matched to stock *j* at the end of quarter *t-5* measured by $R_t^{bj,t-5}$. The sum of these weighted benchmark returns across all stocks held by the fund in quarter *t* that were also held by the fund five quarters earlier form the AS measure for that quarter.

B3: Skill-measure summary statistics

Table OS 1 provides summary statistics for the three components of our skill measures, broken down by year and are adjusted for fund costs and S&P500 Index returns.

< Insert Table OS1 about here >

We also examined the distribution of our measures across all observations. To do this, we present the kernel-density plots of the three measures along with the combined Firm-Specific skill measure in Figures OS1-OS4. For ease of comparison, each plot also contains the standard normal curve. Our measures are distributed narrowly but symmetrically around the mean, leaving thinner tails compared to the normal.

< Insert Figures OS1-OS4 about here >

Appendix C – Skill Measure Robustness Tests and Validation

In this section, we seek to show that our results are not driven by the methods we chose, and that our task- and firm-specific skill measures are consistent with theoretical predictions. We discuss our robustness and validation checks in turn.

C1: Replicating Our Skill Identification Results with Two-Stage Least Squares

To ensure that our results are not driven by the methods we chose, we repeat the regressions in Table 3 (our main skill identification table), using two-stage least squares (2SLS). We again use as our instrument the annual change in state marginal income tax rates, lagged by one year, but our results are robust to using other variants of tax rate changes (e.g. total – the sum of federal and state income tax rates, or average tax rate changes outside of the focal state). However, unlike in our residual inclusion regressions, we perform the two-stage instrumental variables approach separately for internal and external managerial changes. This is because the multiple instruments available to us – in-state and out-of-state tax changes – are positively correlated, reducing the strength of our first stage estimation when we include both endogenous variables together and biasing our second-stage coefficients.

Our results for external manager changes are included in Table OS3, and our results for internal manager changes are in Table OS4. As both tables show, the signs and significance of the effects of manager changes on the components of fund performance are broadly in line with those we obtain using the residual inclusion method. We interpret this as evidence that our skill identification results – which skills are more or less transferable – are generally robust to estimation approach. However, what is also apparent is the large discrepancy in coefficient sizes between the residual inclusion and the two-stage least squares method. This is a common problem in applying 2SLS to cases where the endogenous variable is binary and rare[2], and both the endogenous variable and the instrument vary little within each panel (Basinger and Ensley 2010). Despite the first stage F-statistic being relatively high and the instrument being a very significant predictor of managerial change in the

[2] An alternative explanation for the differences in results could arise from the endogenous binary variable being a binary transformation of an underlying continuous variable. To the extent that our binary endogenous variable is a 'coarse' version of a continuous variable, the coarsening may itself lead to a violation of the exclusion restriction and subsequent inflation of coefficients in the order of magnitude that we observe (Marshall 2017). This can arise when the instrument directly affects multiple levels of the endogenous variable, but is unable to pick these effects up due to the variable being transformed into a binary variable. However, in our case, the binary variable – managerial change – is unlikely to be a function of an underlying continuous variable.

first stage, the base rate of managerial change – 1.6% – is low, leading to relatively weak variation in the variable itself, and causing the magnitude of the correlation between the instrument and managerial change to also be small relative to the reduced form coefficients regressing the instrument on fund performance directly (Angrist and Pischke 2009: 115-116). This can lead to severely inflated coefficients in the second stage, sometimes even beyond the range of the dependent variable (Basinger and Ensley 2010).

< Insert Tables OS3 and OS4 about here >

An alternative explanation is that our instruments are weak. Weak instruments amplify any inconsistencies that arise from even small violations of the exclusion restriction and, therefore, bias the 2SLS coefficients towards the OLS results. We address this problem in multiple ways. First, we compare our results to simple OLS and find that the signs, magnitudes and significance of managerial change are quite different, suggesting that the 2SLS approach is picking up more exogenous variation than the direct OLS approach. Second, we find that the reduced form coefficients on our instruments are highly significant and their magnitudes are meaningful, suggesting that the instruments are unlikely to be irrelevant. Third, we examine our first-stage partial R-squared of excluded instruments and find that our F-statistics vary from a low of 6.38 for 3-quarter external manager change with the focal state tax rate change as the instrument, to a high of 34.08 for three-quarter internal manager change with the average out-of-state tax rate change as the instrument. While 6.38 is a relatively low value, our results replicate with the average out-of-state tax rate change instrument which yields an F-statistic of 23.55 for the same case. Furthermore, first-stage F-statistics below 10, while a common rule of thumb, are in practice less relevant (Angrist and Pischke 2009: 205-213). Instead, we compare the Kleibergen-Paap Wald F-statistic to the Stock & Yogo (2005) critical values (adapted for panel data), and find that most of our second stage instrumented results reflect only up to 5% bias relative to OLS, and the remaining few results falling in the 10-15% range. While not ideal, it certainly suggests that the 2SLS results are not meaningless.

Further, while the 2SLS approach with a single instrument is approximately median-unbiased, we repeat our analyses with multiple instruments (focal state and average out-of-state marginal income tax changes, total tax rate changes in the focal state and the average of other states) using

LIML, which has been shown in Monte Carlo simulations to be much more robust to weak instruments (Flores-Lagunes 2007). We find few major differences between LIML and 2SLS in our second stage coefficients, which again provides evidence that the bias we see in the second stage coefficients does not render our tests meaningless. Therefore, together with our results from the residual inclusion method, we are confident that our skill identification approach does identify the direction of the effects of managerial change on fund performance (which is our primary goal in the skill identification section), even though the magnitudes of those changes are not themselves reliable.

Finally, the difference between the 2SLS and residual inclusion results may also be driven by problems in the estimation of the residual inclusion models. Since those estimates often exceed the observed ranges for the variables, this is again unlikely to be the sole explanation for the inflated 2SLS estimates, but it may nonetheless play a part. The residual inclusion models are sensitive to violations of the first stage functional form and the distributional assumptions of its errors. If violated, the resulting estimates may be biased and inconsistent. However, simulation results in Basinger and Ensley (2010) suggest that the residual inclusion models we use are relatively robust to small violations of the assumptions and are often superior to the linear 2SLS alternative in the presence of binary endogenous variables.

Despite the above tests, the possibility remains that our instrument might still be violating the exclusion restriction, which may be particularly damaging if the instruments are also somewhat weak. While we provide a range to tests and evidence to help rule out the weakness of our instruments, we cannot directly test the exclusion restriction. Therefore, even though we are confident in the exogeneity of our instruments with respect to fund performance, given the above discussion and the impossibility of testing it directly, our results – particularly the 2SLS results – should be taken with appropriate caution.

C2: Testing for the Presence of Managerial Discretion in Firm-Specific Skills

We sought to further validate our task- and firm-specific skill measures by deriving predictions from human-capital theory and empirically testing them. As already discussed in the paper, if our measures are discriminating, we should observe the theoretically predicted relationships

between our skill measures and hypothesized outcomes. We therefore proceed to describe the three validation checks that we performed.

First, a potential concern for us is that our measures of firm-specific skills may be capturing firm-level policies and leave little manager discretion. We address this issue above with interviews and information from industry manuals, but also examine discretion directly by substituting fund performance in our skill identification tables with changes in the composition of the benchmarks held in the fund (further details on benchmark construction can be found in Appendix B1 above). Since each stock held by a fund is matched on its momentum, book-to-market and capitalization to one of the 125 benchmarks that a triple-sort of the three characteristics produces, we can obtain an average asset-weighted benchmark held by a fund in each quarter and calculate the percent change in this average between quarters[3]. To the extent that benchmark decisions are controlled at the firm level, we should observe little, if any, effect of manager changes on this measure. However, to the extent that managers do retain discretion over benchmark construction, we should see significant changes in benchmark turnover following manager change, particularly when the manager is hired externally, since she will lack firm-specific knowledge, but will bring new ideas from experience outside the firm. Following the same methodology as in our skill derivation table, we regress the absolute value of percentage change in benchmark portfolios on internal and external managerial change, the residuals from the probit first stage, and controls. The complete summary statistics and correlation table for all variables in these regressions are in Table OS2 and the results are in Table OS5, Models 1-3. The effects of external manager change are positive and significant for all three quarters and the effect of internal change are negative and significant, suggesting that external managers do retain some discretion over these decisions, and that internal hires tend to follow the trajectory set by departed managers.

< Insert Tables OS5 about here >

[3] For example, for a manager holding 75% of her assets in benchmark 99 and 25% in benchmark 101 in quarter 1, the weighted average for the quarter will become 99.5. If the next quarter the manager's holdings change to 75% of her assets in benchmark 101 and 25% of assets in benchmark 100, then the weighted average will become 100.75, and the percent change between quarter 1 and 2 will be 1.26%. Since each benchmark corresponds to a unique combination of momentum, capitalization and book-to-market ratio quintiles, these changes reflect meaningful rebalancing of portfolios. Also, while the changes can reflect both purposeful rebalancing and capital appreciation/depreciation, in both cases, the resulting average is the result of the manager's choice to either adjust or not adjust holdings in response to changes in their value.

Second, we examine how the managers' skills affect their tenure at the firm. If our measures capture firm- and task-specific skills accurately, we should observe firm-specific skills leading to longer tenures at the firm because the outside option for managers with firm-specific skills should be inferior to the status quo. To test our predictions, we first convert our data to the manager-quarter level by averaging (and asset-weighing where appropriate) across all fund-level variables for each manager. Summary statistics for the manager-level panel are included in Panel B in Table 2 in the paper. We then create a measure of task- and firm-specific skills derived from the fund-level results on manager change and aggregate it to the manager level by averaging each manager's performance in each quarter across all funds she is managing simultaneously (if any). We create three versions of this skill measure: a binary Task-Specific Skill Dummy – taking the value of 1 if the manager falls in the top 50% of managers on the task-specific dimension and bottom 50% on the firm-specific dimension (both measures are cumulated over each manager's career), and 0 otherwise[4], and two continuous measures – the average four-quarter performance along the task-specific and firm-specific skill dimensions, and the average career-long cumulative performance along each dimension. We test our predictions with a regression of manager tenure at the firm on each of the three measures, a number of controls, and firm-, investment objective, and time dummies. Table OS6 presents the results. The results accord with expectations. In Model 1, managers with predominantly task-specific skills experience shorter tenures. In Models 2 and 3, increases in firm-specific skills lead to longer tenures at the firm, while increases in task-specific skills show a negative sign, but have no statistically significant effect.

Finally, we examine how a manager's wages vary with her skills. Drawing on Becker (1962), we expect that controlling for total surplus created, relative to firm-specific skills, increases in task-specific skills will allow managers greater surplus capture. [5] We estimate an OLS model regressing the log of managers' quarterly wages (measured as management fees times fund size) on managers' four-quarter average performance along the two types of skills multiplied by fund size[6], the quarterly surplus they each generated, firm or fund-fixed effects, and a set of controls described in Table 1 in

[4] Managers high or low on both skill types are omitted to allow a clean comparison.
[5] The surplus created operates as a proxy for each manager's marginal product.
[6] We adjust our skill measures for size in this regression due to the non-linear relationship between fund returns and fund size or the dollar value of management fees, which are calculated as a proportion of fund size (Berk and Green 2004). By multiplying returns and size, we net out the effects of size from both sides of the regression and test the returns-wages relation directly.

the paper. Our results are presented in Table OS6, Columns 4 and 5. As predicted, the task-specific component of performance is positively associated with the share of surplus appropriated by the manager. In contrast, the firm-specific component of performance is negatively associated with the share of surplus appropriated by the manager.

< Insert Table OS6 about here >

Appendix D - Robustness Tests for Main Results

To ensure that the tests of our hypotheses are not driven by the way in which we calculate our skill measures, we re-estimate each of our models testing our three hypotheses using two alternative skill measures. The first is a four-quarter moving average of the manager's performance and the second is a cumulative average over the manager's tenure at a particular firm up to the current year, rather than only the most recent four quarters. Both measures have benefits and drawbacks.

The two chief benefits of both measures are that they are continuous and calculated separately along the task- and firm-specific dimensions. Recall that our binary variable capturing task-specific skills in the main paper excludes managers who score high or low on both dimensions. The continuous measures allow us to also include these managers in the analysis, and to also look at the effects of each dimension separately.

However, these same benefits also constitute the measures' drawbacks. Due to being continuous and separate for each skill dimension, it is difficult to use these measures to make simple comparisons across managers. Moreover, with regards to the four-quarter moving-average measures in particular, while they may be better able than the cumulative measures to capture short-run fluctuations in fund performance and relate them to the inflows they trigger (Nanda et al. 2004), the measures are based on at most four observations per manager (recall that we only observe changes in investment decisions and fund performance on a quarterly basis), and are therefore very noisy. As a result, in our main analyses we prefer to focus on a binary measure of skill, which is derived from the managers' cumulative performance, and relegate the continuous and short-horizon measures to this Online Supplement.

The rest of this section replicates the tests of our main hypotheses in Table 4 in the main paper using the two alternative skill measures described above. As in the main analysis, we use three types of models for our mentorship and risk-taking regressions: the limited probability model, the probit model and the logit model. For our spillovers regressions we use OLS. All specifications also include firm dummies, investment objective dummies, year and quarter dummies.

Mentoring

As already discussed above, due to the noisiness of the four-quarter moving average measure, we believe that a career-long measure of skill type is more appropriate for studying mentoring

because it more accurately captures the stable underlying skill components that are driving the firm's decision to assign particular managers to mentoring roles. However, it may be that the career-long measures of skill type underweight the manager's most recent skill changes. On-the-job learning is of course an important source of skill change in this setting, and we expect that organizations do take this into account.

Models 1-3 in Tables OS7 and OS8 provide, respectively, the results using career-long and four-quarter moving average measures of skill type on the probability that the focal manager joins a team-managed fund. The results with career-long measures suggest that team membership is more sensitive to managers' firm- rather than task-specific skills. In particular, while the coefficients on the task-specific skill measure are positive across specifications, only the coefficient in the probit specification is weakly significant. In contrast, the coefficients on the firm-specific skill measure are negative and robustly significant across specifications.

The results using the four-quarter moving average measures, as expected, show much weaker effects, suggesting that recent increases in both skill types lead to similar effects. Compared with the career-long measures of skill type, these results suggest an interesting dynamic, where the negative effects of firm-specific skills on the likelihood of joining a team-managed fund are only observable in the long run. In the short run, any increase in performance, regardless of whether it is driven by firm- or task-specific skills, can lead to a higher likelihood of joining a team-managed fund.

Risk-taking

Models 4-6 in Tables OS7 and OS8 replicate our tests of risk-taking using the career-long and four-quarter moving average measures, respectively. The results using the career-long measures of skill type suggest that risk-taking is more sensitive to task-specific rather than firm-specific skills. Across all three specifications, the coefficients on the task-specific skill measure are positive and significant, while the coefficients on firm-specific skills remain insignificant and have a negative sign in the probit and logit specifications. Our results using the four-quarter moving-average measures show a similar pattern: risk-taking continues to be more sensitive to task- rather than firm-specific skills. However, as expected, due to the greater noisiness of this measure, the effects are less significant.

Spillovers

Finally, we re-estimate our regressions on spillovers using the career-long and four-quarter moving-average measures of skill type in Models 7-9 in Tables OS7 and OS8, respectively. Reflecting our main results, task-specific skills fail to generate more firm-level spillovers than firm-specific skills. However, interestingly, the effects are driven mainly by the positive effects of firm-specific skills on spillovers, which remain robustly significant across all specifications for both skill type measures. Nonetheless, in both tables, the effects of star funds on firm inflows are large, significant and similar in magnitude to our main results.

< Insert Tables OS7 & OS8 about here >

Appendix E – A comparison of management fees by firm ownership type

As discussed in the discussion section of our results, the wedge between fund-level returns and fund company-level returns demands a reconciliation of the accounting of surplus. Our results imply that fund managers over-appropriate from investors in mutual funds but the beneficiaries are the investors in the fund management companies. Consistent with this, Figure OS5 shows that publicly traded mutual fund companies have higher management fees compared with private fund companies, because public fund companies separate the interests of investors in the mutual funds from the investors in the fund companies. In contrast, in private companies (e.g., mutuals), investors in the funds are also the owners in the fund company and we observe less transfer of wealth from fund to fund company investors.

< Insert Figure OS5 about here >

Figures

Figure OS1 – Kernel-Density Plot of Characteristic Selectivity

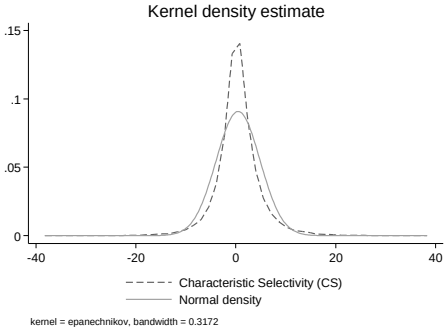


Figure OS2 – Kernel-Density Plot of Characteristic Timing

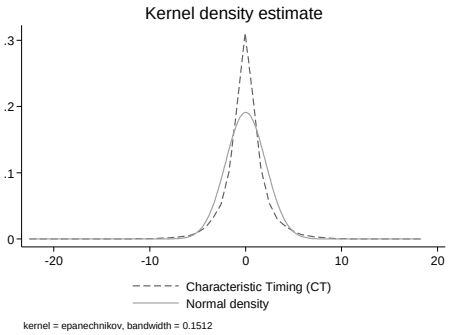


Figure OS3 – Kernel-Density Plot of Average Style

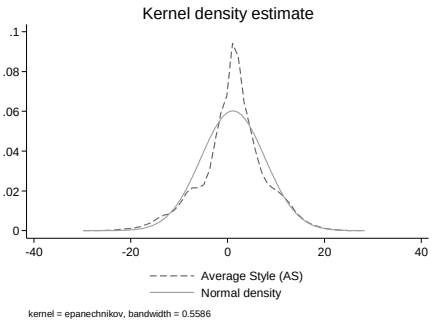


Figure OS4 – Kernel-Density Plot of Gross Return

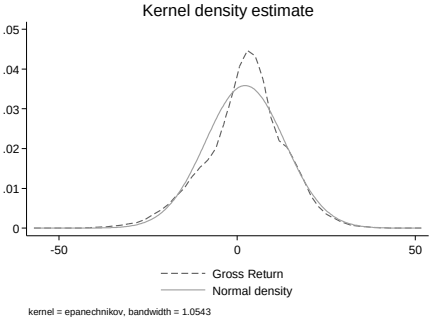
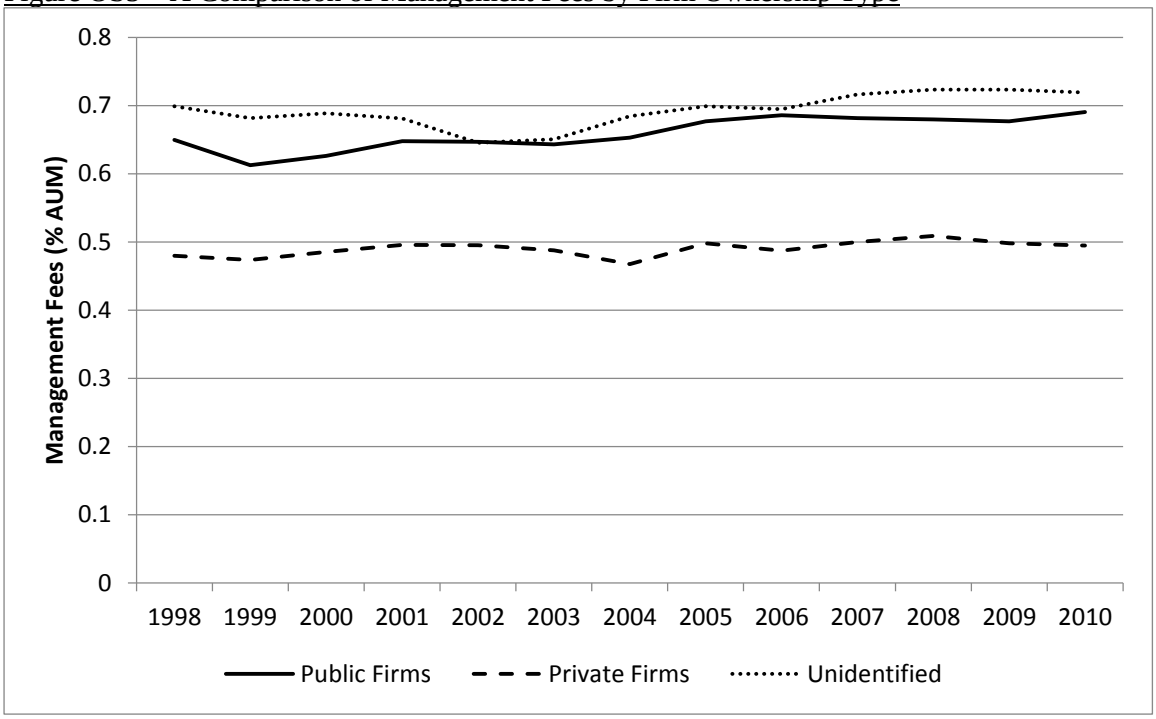


Figure OS5 – A Comparison of Management Fees by Firm Ownership Type



Tables

Table OS1 – Summary Statistics

	S&P 500	No. Firms	No Fnds	Fund TNA ($bn.)	CS	CT	AS	Ret on Equity	Total Ret.	Tot Ret net S&P	Management Fee	Tot Ret – (S&P + Mgt Fee)	Exp. Ratio	Tot Ret – (S&P + Exp)
1998	28.580	405	1794	1.161	1.260	0.690	11.770	17.028	13.383	-15.197	0.670	-15.867	1.290	-16.487
1999	21.040	517	1994	1.205	-2.590	2.710	9.070	17.653	17.431	-3.609	0.660	-4.269	1.240	-4.849
2000	-9.110	481	2136	1.321	9.510	0.550	-1.760	4.353	0.244	9.354	0.660	8.694	1.270	8.084
2001	-11.890	492	2338	1.012	1.200	-0.500	-3.780	-5.366	-9.942	1.948	0.660	1.288	1.250	0.698
2002	-22.680	487	2463	0.861	0.400	-0.770	-11.370	-17.622	-20.928	1.752	0.640	1.112	1.350	0.402
2003	28.680	467	2461	0.873	2.030	-0.710	21.590	33.939	31.155	2.475	0.640	1.835	1.390	1.085
2004	10.880	468	2447	1.111	2.040	-0.140	8.180	14.485	11.629	0.749	0.660	0.089	1.390	-0.641
2005	4.910	446	2432	1.238	2.490	-0.890	5.380	9.510	6.784	1.874	0.680	1.194	1.330	0.544
2006	15.790	416	2347	1.455	0.150	0.420	9.180	13.764	12.229	-3.561	0.690	-4.251	1.310	-4.871
2007	5.490	414	2319	1.668	2.370	0.670	3.360	8.163	7.231	1.741	0.680	1.061	1.250	0.491
2008	-37.000	393	2189	1.406	1.330	0.440	-25.300	-32.308	-35.551	1.449	0.700	0.749	1.230	0.219
2009	26.460	343	1754	1.242	1.820	-1.090	20.850	29.048	30.969	4.509	0.690	3.819	1.220	3.289
2010	15.060	294	1461	1.560	-0.140	-0.100	-3.020	-1.489	17.674	2.614	0.690	1.924	1.240	1.374
1998-2010	5.862	433	2164	1.239	1.680	0.100	3.400	7.012	6.331	0.469	0.670	-0.202	1.289	-0.820
Panel B - Single-Manager Funds														
	S&P 500	No. Firms	No Fnds	Fund TNA ($bn.)	CS	CT	AS	Ret on Equity	Total Ret.	Tot Ret net S&P	Management Fee	Tot Ret – (S&P + Mgt Fee)	Exp. Ratio	Tot Ret – (S&P + Exp)
1998	28.580	310	1022	1.060	1.010	1.010	1.100	17.237	13.601	-14.979	0.690	-15.669	1.330	-16.309
1999	21.040	400	1104	1.167	0.980	1.020	1.080	17.762	18.132	-2.908	0.680	-3.588	1.270	-4.178
2000	-9.110	342	1035	1.330	1.090	1.000	0.990	4.597	0.094	9.204	0.670	8.534	1.300	7.904
2001	-11.890	347	1010	1.052	1.010	1.000	0.970	-6.662	-9.616	2.274	0.680	1.594	1.330	0.944
2002	-22.680	341	1064	0.869	1.010	0.990	0.900	-17.280	-20.762	1.918	0.650	1.268	1.380	0.538
2003	28.680	338	1086	0.871	1.020	0.990	1.200	34.633	31.868	3.188	0.640	2.548	1.420	1.768
2004	10.880	313	1017	1.060	1.020	1.000	1.080	14.832	11.846	0.966	0.660	0.306	1.410	-0.444
2005	4.910	261	831	1.228	1.030	0.990	1.050	10.204	7.452	2.542	0.690	1.852	1.360	1.182
2006	15.790	243	801	1.381	1.000	1.000	1.090	13.218	12.117	-3.673	0.680	-4.353	1.310	-4.983
2007	5.490	266	758	1.619	1.030	1.010	1.030	9.307	8.178	2.688	0.670	2.018	1.250	1.438
2008	-37.000	232	721	1.255	1.010	1.000	0.770	-33.181	-36.228	0.772	0.680	0.092	1.230	-0.458
2009	26.460	188	629	1.179	1.030	0.990	1.180	30.490	32.437	5.977	0.650	5.327	1.220	4.757
2010	15.060	160	486	1.558	1.000	1.000	0.990	-1.776	17.708	2.648	0.640	2.008	1.220	1.428
1998-2010	5.862	288	890	1.202	1.020	1.000	1.030	7.183	6.679	0.817	0.670	0.149	1.310	-0.493
Panel C - Team-Managed Funds														
	S&P 500	No. Firms	No Fnds	Fund TNA ($bn.)	CS	CT	AS	Ret on Equity	Total Ret.	Tot Ret net S&P	Management Fee	Tot Ret – (S&P + Mgt Fee)	Exp. Ratio	Tot Ret – (S&P + Exp)
1998	28.580	239	772	1.292	1.270	0.600	9.430	16.757	13.095	-15.485	0.650	-16.135	1.240	-16.725
1999	21.040	343	890	1.251	-2.100	2.410	7.440	17.523	16.562	-4.478	0.630	-5.108	1.200	-5.678
2000	-9.110	325	1101	1.313	7.990	0.570	-1.590	4.138	0.386	9.496	0.660	8.836	1.230	8.266
2001	-11.890	347	1328	0.982	1.100	-0.530	-2.410	-4.363	-10.189	1.701	0.630	1.071	1.200	0.501
2002	-22.680	334	1399	0.855	0.130	-0.570	-9.270	-17.887	-21.053	1.627	0.630	0.997	1.330	0.297
2003	28.680	346	1375	0.876	1.790	-0.620	19.400	33.454	30.591	1.911	0.640	1.271	1.370	0.541
2004	10.880	346	1430	1.147	1.800	-0.030	7.350	14.251	11.474	0.594	0.670	-0.076	1.370	-0.776
2005	4.910	329	1601	1.243	2.100	-0.870	4.810	9.150	6.435	1.525	0.680	0.845	1.320	0.205
2006	15.790	319	1546	1.494	0.290	0.370	8.580	14.054	12.288	-3.502	0.690	-4.192	1.320	-4.822
2007	5.490	328	1561	1.692	1.940	0.600	3.150	7.583	6.771	1.281	0.690	0.591	1.250	0.031
2008	-37.000	310	1468	1.480	1.400	0.600	-22.720	-31.900	-35.230	1.770	0.710	1.060	1.230	0.540
2009	26.460	272	1125	1.276	1.320	-1.100	17.390	28.284	30.155	3.695	0.710	2.985	1.220	2.475
2010	15.060	234	975	1.561	-0.170	-0.120	-0.890	-1.344	17.658	2.598	0.720	1.878	1.250	1.348
1998-2010	5.862	313	1275	1.266	1.450	0.100	3.130	6.900	6.072	0.210	0.670	-0.460	1.270	-1.061

Table OS2 – Fund-level summary statistics for skill identification

		Mean	S.D.	Min	Max	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1)	Gross Return	2.644	12.124	-64.640	108.446	1.000										
(2)	Characteristic Selectivity	0.568	4.140	-28.951	61.006	0.456	1.000									
(3)	Characteristic Timing	-0.018	1.806	-18.099	22.773	0.123	0.067	1.000								
(4)	Average Style	1.037	5.917	-27.113	27.077	0.791	0.030	-0.105	1.000							
(5)	Firm Spec. Skill	0.992	5.852	-25.038	29.568	0.811	0.048	0.196	0.952	1.000						
(6)	Ext. Mgr Chg 1Q	0.016	0.124	0.000	1.000	-0.003	0.002	0.005	-0.011	-0.010	1.000					
(7)	Int. Mgr Chg 1Q	0.023	0.148	0.000	1.000	-0.017	-0.007	-0.005	-0.019	-0.019	-0.019	1.000				
(8)	Focal State Tax (lag)	5.747	2.237	0.000	10.920	0.000	-0.020	0.000	0.013	0.013	0.000	-0.018	1.000			
(9)	Avg. Out. State Tax (lag)	5.369	0.082	5.143	5.639	0.018	-0.004	0.023	0.004	0.010	-0.004	0.012	-0.657	1.000		
(10)	Gender	0.085	0.279	0.000	1.000	0.013	0.015	0.004	0.004	0.005	0.019	0.003	0.061	-0.036	1.000	
(11)	No. Funds	2.077	3.007	1.000	27.000	-0.011	-0.008	-0.004	0.004	0.002	-0.033	0.016	-0.041	0.001	-0.025	1.000
(12)	Mgr Tenure	28.321	21.926	1.000	208.000	-0.023	-0.008	-0.007	-0.012	-0.013	-0.117	-0.052	-0.007	0.007	-0.056	0.121
(13)	Trade Vol (quintiles)	1.971	1.357	0.000	4.000	0.033	0.073	0.018	-0.027	-0.025	0.011	0.022	-0.050	0.038	0.019	-0.019
(14)	TNA (quintiles)	2.184	1.394	0.000	4.000	0.003	0.014	-0.003	0.004	0.004	-0.015	0.017	0.015	0.000	0.002	-0.110
(15)	Fund Age	55.630	54.211	-18.000	344.000	-0.019	-0.004	-0.001	-0.012	-0.012	-0.005	0.014	-0.012	-0.007	0.018	-0.078
(16)	Firm Perf.	1.711	10.237	-93.238	98.238	0.868	0.141	0.075	0.842	0.846	-0.004	-0.014	0.012	0.021	0.007	-0.002
(17)	No. Funds	26.820	35.867	1.000	130.000	-0.027	-0.018	-0.010	-0.021	-0.023	0.015	0.093	-0.075	0.092	0.006	0.039
(18)	Expense Rat.	0.013	0.005	0.001	0.097	0.026	0.018	-0.001	0.012	0.011	0.011	-0.012	0.105	-0.066	0.008	0.095
(19)	Cash	4.458	8.124	-76.240	176.830	0.005	-0.013	-0.007	0.010	0.009	-0.012	-0.022	0.044	-0.043	-0.006	0.124
(20)	Portfolio Risk	0.014	0.005	0.000	0.072	-0.029	0.023	-0.023	-0.020	-0.027	0.007	0.022	0.005	-0.081	-0.020	0.208
(21)	Front Load	0.472	0.499	0.000	1.000	-0.002	-0.004	0.005	-0.002	0.000	0.033	0.033	0.077	-0.061	0.063	-0.061
(22)	Rear Load	0.368	0.482	0.000	1.000	-0.004	-0.006	-0.005	-0.003	-0.005	0.014	0.029	0.044	-0.021	0.033	-0.050

		Mean	S.D.	Min	Max	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
(12)	Mgr Tenure	28.321	21.926	1.000	208.000	1.000										
(13)	Trade Vol	1.971	1.357	0.000	4.000	-0.099	1.000									
(14)	TNA	2.184	1.394	0.000	4.000	0.063	0.128	1.000								
(15)	Fund Age	55.630	54.211	-18.000	344.000	0.234	0.002	0.331	1.000							
(16)	Firm Perf.	1.711	10.237	-93.238	98.238	-0.021	-0.009	0.005	-0.016	1.000						
(17)	No. Funds	26.820	35.867	1.000	130.000	-0.107	0.134	0.224	0.053	-0.009	1.000					
(18)	Expense Rat.	0.013	0.005	0.001	0.097	-0.046	-0.043	-0.366	-0.196	0.009	-0.171	1.000				
(19)	Cash	4.458	8.124	-76.240	176.830	0.060	-0.074	-0.118	-0.046	-0.002	-0.094	0.090	1.000			
(20)	Portfolio Risk	0.014	0.005	0.000	0.072	-0.080	0.060	0.035	-0.053	-0.035	0.075	0.173	-0.078	1.000		
(21)	Front Load	0.472	0.499	0.000	1.000	-0.182	0.064	0.103	0.073	-0.011	0.016	0.257	-0.056	-0.024	1.000	
(22)	Rear Load	0.368	0.482	0.000	1.000	-0.094	0.051	0.091	0.053	-0.012	0.060	0.211	-0.029	-0.048	0.475	1.000

This table is based on a sample of 16,416 observations. Correlations larger in absolute value than 0.01 are significant at the 5% level.

Table OS3 – 2SLS Results – External Manager Changes

	First Stage Results			Second Stage Results													
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
	Ext. Mgr Chg 1Q	Ext. Mgr Chg 2Q	Ext. Mgr Chg 3Q	Gross Return	Gross Return	Gross Return	Characteristic Selectivity	Characteristic Selectivity	Characteristic Selectivity	Characteristic Timing	Characteristic Timing	Characteristic Timing	Average Style	Average Style	Average Style	Firm Spec. Skill	Firm Spec. Skill	Firm Spec. Skill
Focal State State Tax Chg (Ratio)	-0.0414*	-0.0617*	-0.0859*															
	(0.0158)	(0.0234)	(0.0340)															
Ext. Mgr Chg 1Q				-100.7+			9.447			-2.525			-75.00*			-77.79*		
				(54.01)			(11.14)			(4.422)			(36.19)			(36.41)		
Ext. Mgr Chg 2Q					-67.58+			6.342			-1.695			-50.35*			-52.22*	
					(36.54)			(7.403)			(2.972)			(23.91)			(24.06)	
Ext. Mgr Chg 3Q						-48.54+			4.555			-1.217			-36.16*			-37.51*
						(26.61)			(5.321)			(2.154)			(17.28)			(17.47)
Gender	0.0206+	0.0352+	0.0406+	3.078+	3.382+	2.973*	-0.356	-0.385	-0.347	0.145	0.153	0.143	2.280+	2.507*	2.202*	2.397*	2.633*	2.317*
	(0.0115)	(0.0184)	(0.0226)	(1.631)	(1.757)	(1.492)	(0.314)	(0.335)	(0.292)	(0.130)	(0.141)	(0.128)	(1.171)	(1.232)	(1.027)	(1.200)	(1.263)	(1.059)
No. Funds	-0.00194*	-0.00304*	-0.00445*	-0.435*	-0.445*	-0.456*	0.0191	0.0200	0.0210	-0.00510	-0.00535	-0.00561	-0.280*	-0.287*	-0.295*	-0.285*	-0.293*	-0.301*
	(0.000658)	(0.00116)	(0.00165)	(0.143)	(0.154)	(0.161)	(0.0368)	(0.0378)	(0.0387)	(0.0183)	(0.0186)	(0.0190)	(0.0976)	(0.105)	(0.109)	(0.0953)	(0.104)	(0.108)
Mgr Tenure	-0.0024***	-0.0042***	-0.0058***	-0.237+	-0.285+	-0.284+	0.0232	0.0277	0.0276	-0.00374	-0.00493	-0.00490	-0.184*	-0.220*	-0.219*	-0.188*	-0.225*	-0.224*
	(0.000249)	(0.000410)	(0.000549)	(0.126)	(0.153)	(0.155)	(0.0264)	(0.0314)	(0.0312)	(0.0105)	(0.0126)	(0.0127)	(0.0848)	(0.100)	(0.101)	(0.0855)	(0.101)	(0.102)
Fund Age	0.0011***	0.0017***	0.0023***	-0.140*	-0.130*	-0.137*	-0.0114	-0.0123	-0.0116	-0.000848	-0.000601	-0.000793	-0.0594	-0.0521	-0.0578	-0.0564	-0.0488	-0.0547
	(0.000232)	(0.000389)	(0.000528)	(0.0579)	(0.0635)	(0.0603)	(0.0122)	(0.0131)	(0.0123)	(0.00503)	(0.00545)	(0.00518)	(0.0395)	(0.0424)	(0.0400)	(0.0401)	(0.0430)	(0.0409)
Firm Performance	-0.0006***	-0.000496*	-0.0009***	0.102*	0.132***	0.124***	-0.0125	-0.0154*	-0.0146*	-0.000525	0.000228	3.74e-05	0.0436+	0.0660***	0.0604**	0.0396	0.0629***	0.0570**
	(0.000108)	(0.000153)	(0.000165)	(0.0362)	(0.0225)	(0.0258)	(0.00776)	(0.00484)	(0.00548)	(0.00304)	(0.00198)	(0.00223)	(0.0240)	(0.0146)	(0.0165)	(0.0242)	(0.0148)	(0.0168)
No. Funds	-0.00066**	-0.000883*	-0.00113*	-0.260***	-0.253***	-0.248***	0.00667	0.00601	0.00557	-0.00511	-0.00493	-0.00482	-0.163***	-0.158***	-0.155***	-0.165***	-0.159***	-0.155***
	(0.000194)	(0.000341)	(0.000459)	(0.0451)	(0.0431)	(0.0407)	(0.00958)	(0.00894)	(0.00847)	(0.00428)	(0.00406)	(0.00392)	(0.0301)	(0.0287)	(0.0269)	(0.0304)	(0.0291)	(0.0273)
Expense Rat.	-0.0724	0.673	2.805+	69.41	122.2	212.9+	61.12*	56.17*	47.66+	-16.94*	-15.61*	-13.34	34.12	73.44	141.0+	18.05	58.83	128.9
	(0.572)	(1.113)	(1.671)	(75.12)	(92.16)	(118.3)	(21.26)	(22.18)	(25.89)	(7.640)	(7.741)	(9.286)	(48.03)	(61.71)	(77.66)	(50.37)	(64.36)	(80.30)
Cash	-0.000122	-0.000395+	-0.000309	-0.0422+	-0.0566*	-0.0449+	0.000881	0.00223	0.00113	-0.00359	-0.00395	-0.00365	-0.0289*	-0.0397*	-0.0310*	-0.0315*	-0.0426*	-0.0336*
	(0.000132)	(0.000232)	(0.000276)	(0.0224)	(0.0273)	(0.0230)	(0.00450)	(0.00510)	(0.00458)	(0.00253)	(0.00271)	(0.00256)	(0.0136)	(0.0171)	(0.0140)	(0.0138)	(0.0175)	(0.0143)
Portfolio Risk	-0.801	-0.586	0.0852	403.4***	444.4***	488.1***	87.36**	83.51**	79.40***	-48.11***	-47.09***	-45.99***	166.1*	196.6*	229.2**	106.8	138.4*	172.3*
	(0.651)	(1.152)	(1.603)	(97.65)	(95.15)	(89.86)	(23.99)	(21.88)	(20.20)	(10.82)	(10.07)	(9.595)	(64.36)	(63.87)	(60.18)	(65.89)	(65.66)	(62.16)
Front Load	-0.000778	-0.00625	-0.00866	-0.472	-0.816	-0.814	-0.0527	-0.0204	-0.0206	0.0733	0.0647	0.0647	-0.135	-0.391	-0.390	-0.0263	-0.292	-0.291
	(0.00643)	(0.0101)	(0.0140)	(0.794)	(0.859)	(0.863)	(0.217)	(0.228)	(0.227)	(0.0714)	(0.0748)	(0.0760)	(0.530)	(0.570)	(0.565)	(0.546)	(0.592)	(0.593)
Rear Load	-0.00244	-0.00692	-0.0145	-0.792	-1.014	-1.250	0.298*	0.319*	0.341*	0.0550	0.0494	0.0435	-0.854+	-1.020+	-1.196*	-0.804+	-0.976+	-1.158*
	(0.00552)	(0.00957)	(0.0126)	(0.698)	(0.805)	(0.836)	(0.147)	(0.157)	(0.166)	(0.0597)	(0.0641)	(0.0681)	(0.482)	(0.558)	(0.568)	(0.488)	(0.571)	(0.579)
Constant	0.0450*	0.0920*	0.131*															
	(0.0203)	(0.0398)	(0.0553)															
Observations	19,513	19,513	19,513	19,376	19,376	19,376	19,376	19,376	19,376	19,376	19,376	19,376	19,376	19,376	19,376	19,376	19,376	19,376
Trade Vol FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
TNA FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Inv. Obj. FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fund FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses are clustered at the fund level. The first-stage F-statistics testing the excluded instruments are 6.87 for 1-quarter manager change, 6.95 for 2-quarter manager change and 6.38 for 3-quarter manager change.

*** p<0.0001, ** p<0.001, * p<0.05, + p<0.1

Table OS4 – 2SLS Results – Internal Manager Changes

	First Stage Results			Second Stage Results													
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
	Int. Mgr Chg 1Q	Int. Mgr Chg 2Q	Int. Mgr Chg 3Q	Gross Return	Gross Return	Gross Return	Characteristic Selectivity	Characteristic Selectivity	Characteristic Selectivity	Characteristic Timing	Characteristic Timing	Characteristic Timing	Average Style	Average Style	Average Style	Firm Spec. Skill	Firm Spec. Skill	Firm Spec. Skill
Focal State State Tax Chg (Ratio)	-0.0596*	-0.0832*	-0.141**															
	(0.0187)	(0.0296)	(0.0391)															
Int. Mgr Chg 1Q				-69.93*			6.562			-1.754			-52.10*			-54.04*		
				(33.95)			(7.328)			(3.060)			(21.55)			(21.56)		
Int. Mgr Chg 2Q					-50.09*			4.700			-1.256			-37.32*			-38.71*	
					(25.48)			(5.313)			(2.196)			(16.53)			(16.58)	
Int. Mgr Chg 3Q						-29.49*			2.767			-0.740			-21.97*			-22.79*
						(13.16)			(3.088)			(1.290)			(8.204)			(8.167)
Gender	-0.0231+	-0.0344	-0.0478	-0.612	-0.723	-0.407	-0.0103	0.000214	-0.0294	0.0526	0.0498	0.0578	-0.469	-0.552	-0.317	-0.454	-0.540	-0.296
	(0.0129)	(0.0229)	(0.0317)	(1.340)	(1.534)	(1.235)	(0.265)	(0.288)	(0.260)	(0.108)	(0.110)	(0.101)	(0.915)	(1.087)	(0.873)	(0.919)	(1.093)	(0.870)
No. Funds	0.00203*	0.00236	-0.000301	-0.0974	-0.121	-0.248*	-0.0126	-0.0104	0.00155	0.00337	0.00277	-0.000411	-0.0284	-0.0462	-0.141+	-0.0244	-0.0428	-0.141+
	(0.00102)	(0.00215)	(0.00292)	(0.128)	(0.139)	(0.108)	(0.0269)	(0.0275)	(0.0265)	(0.0156)	(0.0155)	(0.0152)	(0.0869)	(0.100)	(0.0789)	(0.0854)	(0.100)	(0.0769)
Mgr Tenure	-0.001***	-0.0019**	-0.0024**	-0.0801+	-0.0958+	-0.0706+	0.00847	0.00995	0.00758	0.000210	-0.000185	0.000448	-0.0668*	-0.0785*	-0.0597*	-0.0668*	-0.0790*	-0.0595*
	(0.000283)	(0.000513)	(0.000713)	(0.0445)	(0.0563)	(0.0388)	(0.00919)	(0.0110)	(0.00834)	(0.00385)	(0.00453)	(0.00348)	(0.0295)	(0.0381)	(0.0261)	(0.0299)	(0.0388)	(0.0264)
Fund Age	-5.06e-05	-5.68e-05	-0.000443	-0.251***	-0.250***	-0.260***	-0.000924	-0.000989	-3.12e-05	-0.00363+	-0.00362+	-0.00387+	-0.142***	-0.142***	-0.149***	-0.142***	-0.142***	-0.150***
	(0.000259)	(0.000470)	(0.000665)	(0.0217)	(0.0262)	(0.0241)	(0.00452)	(0.00467)	(0.00486)	(0.00210)	(0.00215)	(0.00223)	(0.0147)	(0.0182)	(0.0163)	(0.0151)	(0.0188)	(0.0167)
Firm Performance	-0.001***	-0.00032+	-0.001***	0.120***	0.149***	0.139***	-0.0142*	-0.017***	-0.0160**	-7.38e-05	0.000652	0.000408	0.0570**	0.0786***	0.0714***	0.0536**	0.0759***	0.0684***
	(0.000134)	(0.000180)	(0.000210)	(0.0254)	(0.0144)	(0.0154)	(0.00573)	(0.00355)	(0.00413)	(0.00234)	(0.00154)	(0.00175)	(0.0158)	(0.00918)	(0.00925)	(0.0158)	(0.00928)	(0.00926)
No. Funds	0.000207	0.000914+	0.000471	-0.178***	-0.147***	-0.179***	-0.000954	-0.00389	-0.000898	-0.00307	-0.00229	-0.00309	-0.103***	-0.0796*	-0.103***	-0.102***	-0.0776*	-0.102***
	(0.000319)	(0.000513)	(0.000692)	(0.0272)	(0.0370)	(0.0257)	(0.00608)	(0.00759)	(0.00597)	(0.00304)	(0.00354)	(0.00302)	(0.0187)	(0.0255)	(0.0177)	(0.0190)	(0.0258)	(0.0179)
Expense Rat.	1.375+	3.047*	6.420*	172.9+	229.3+	266.0*	51.41*	46.11+	42.67	-14.34+	-12.93	-12.01	111.2*	153.3*	180.6*	98.01+	141.6+	170.0*
	(0.768)	(1.510)	(2.275)	(94.85)	(123.2)	(122.7)	(21.39)	(24.90)	(27.04)	(8.188)	(9.603)	(10.63)	(50.88)	(73.10)	(69.86)	(52.24)	(74.92)	(71.17)
Cash	-4.76e-05	0.000180	-2.92e-05	-0.0332	-0.0209	-0.0307	3.93e-05	-0.00112	-0.000192	-0.00336	-0.00305	-0.00330	-0.0223+	-0.0131	-0.0204+	-0.0245*	-0.0150	-0.0226*
	(0.000178)	(0.000341)	(0.000386)	(0.0203)	(0.0217)	(0.0188)	(0.00442)	(0.00485)	(0.00442)	(0.00249)	(0.00255)	(0.00249)	(0.0123)	(0.0144)	(0.0113)	(0.0123)	(0.0144)	(0.0113)
Portfolio Risk	-3.226**	-3.982*	-3.681	258.4+	284.6+	375.5**	101.0*	98.51*	89.98**	-51.75**	-51.09**	-48.81***	58.10	77.57	145.3*	-5.237	14.96	85.19
	(0.880)	(1.611)	(2.334)	(147.9)	(150.8)	(105.1)	(33.89)	(32.34)	(25.00)	(14.99)	(14.28)	(11.53)	(91.90)	(97.31)	(66.82)	(93.14)	(99.62)	(68.80)
Front Load	0.00780	0.0304+	0.0508*	0.151	1.128	1.103	-0.111	-0.203	-0.201	0.0889	0.113	0.113	0.330	1.058	1.039+	0.455	1.210	1.191+
	(0.00900)	(0.0166)	(0.0207)	(0.760)	(1.145)	(0.924)	(0.223)	(0.266)	(0.260)	(0.0760)	(0.0995)	(0.0973)	(0.524)	(0.789)	(0.615)	(0.540)	(0.805)	(0.621)
Rear Load	0.00522	0.00649	0.00684	-0.181	-0.221	-0.345	0.241	0.245	0.256+	0.0703	0.0693	0.0662	-0.399	-0.429	-0.521	-0.332	-0.363	-0.459
	(0.00669)	(0.0109)	(0.0148)	(0.595)	(0.637)	(0.542)	(0.155)	(0.157)	(0.151)	(0.0624)	(0.0619)	(0.0596)	(0.396)	(0.437)	(0.364)	(0.407)	(0.449)	(0.368)
Constant	0.0686*	0.0682	0.125+															
	(0.0294)	(0.0502)	(0.0709)															
Observations	19,513	19,513	19,513	19,376	19,376	19,376	19,376	19,376	19,376	19,376	19,376	19,376	19,376	19,376	19,376	19,376	19,376	19,376
Trade Vol FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
TNA FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Inv. Obj. FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fund FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses are clustered at the fund level. The first-stage F-statistics testing the excluded instruments are 10.21 for 1-quarter manager change, 7.91 for 2-quarter manager change and 13.06 for 3-quarter manager change.

*** p<0.0001, ** p<0.001, * p<0.05, + p<0.1

Table OS5 – Effects of Manager change on Average Benchmark Composition

	(1) Weighted Average Bench	(2) Weighted Average Bench	(3) Weighted Average Bench
Ext. Mgr Chg 1Q	5.522**		
	(1.513)		
Int. Mgr Chg 1Q	-1.720*		
	(0.730)		
Residual from External Mgr Change (1Q)	-4.987***		
	(1.269)		
Residual from Internal Mgr Change (1Q)	1.773*		
	(0.685)		
Ext. Mgr Chg 2Q		2.148*	
		(0.680)	
Int. Mgr Chg 2Q		-1.463+	
		(0.808)	
Residual from External Mgr Change (2Q)		-1.791***	
		(0.429)	
Residual from Internal Mgr Change (2Q)		1.873*	
		(0.741)	
Ext. Mgr Chg 3Q			1.647*
			(0.518)
Int. Mgr Chg 3Q			-0.912+
			(0.530)
Residual from External Mgr Change (3Q)			-1.396**
			(0.386)
Residual from Internal Mgr Change (3Q)			1.214*
			(0.466)
Gender	-1.842+	-1.674*	-1.463
	(0.973)	(0.835)	(0.905)
No. Funds	0.832***	0.671***	0.692**
	(0.213)	(0.166)	(0.186)
Manager Tenure	0.220***	0.160***	0.163**
	(0.0536)	(0.0378)	(0.0437)
Fund Age	-0.00813	-0.00391	-0.00200
	(0.0159)	(0.0169)	(0.0165)
Firm Performance	0.0707*	0.00343	0.00736
	(0.0259)	(0.0113)	(0.0107)
No. Funds	0.0508*	0.0421*	0.0464*
	(0.0216)	(0.0201)	(0.0200)
Expense Ratio	99.12	75.24	80.50
	(121.2)	(122.6)	(119.0)
Cash	0.0299	0.0467	0.0404
	(0.0307)	(0.0318)	(0.0326)
Portfolio Risk	-166.7*	-175.1*	-172.2*
	(65.07)	(65.04)	(61.23)
Front Load	0.263	0.966*	0.876*
	(0.374)	(0.406)	(0.392)
Rear Load	1.274*	1.124*	1.101*
	(0.538)	(0.478)	(0.525)
Constant	4.947	0.452	0.841
	(3.088)	(2.742)	(2.665)
Observations	19,478	19,478	19,478
Trade Volume FE	Yes	Yes	Yes
Fund TNA FE	Yes	Yes	Yes
Fund FE	Yes	Yes	Yes
Chi2 Statistic: Internal = External Mgr Change	15.94***	9.690**	9.900**

Standard errors in parentheses are bootstrapped and clustered at the fund level.
*** p<0.0001, ** p<0.001, * p<0.05, + p<0.1

Table OS6 – Skill Identification Robustness Tests

	(1) Manager Tenure OLS	(2) Manager Tenure OLS	(3) Manager Tenure OLS	(4) Ln(wage) OLS	(5) Ln(wage) OLS
Task-Specific Skill Dummy	-4.73486**				
	(1.53318)				
Task-Specific Skill Career Measure		-0.26891			
		(0.359)			
Firm-Specific Skill Career Measure		0.82512*			
		(0.35835)			
Task-Specific Skill 4Q Average			-0.16217		
			(0.1026)		
Firm-Specific Skill 4Q Average			0.26349*		
			(0.10318)		
Asset-Weighted Task-Specific Skill ($ bn)				0.014***	0.003**
				(0.003)	(0.001)
Asset-Weighted Firm-Specific Skill ($ bn)				0.004**	-0.000
				(0.001)	(0.000)
Constant	22.74805***	8.78408	28.62049***	0.473	-2.343**
	(6.70965)	(12.41249)	(6.39754)	(0.533)	(0.711)
Observations	8,214	14,337	12,818	11,431	11,431

Notes: *** Indicates significance at the 0.1% level, ** significance at the 1% level, * significance at the 5% level and + significance at the 10% level. Errors are clustered at the firm level and all regressions contain firm fixed effects. Column 5 also includes manager fixed effects. Task-specific Skill Dummy takes the value of 1 if the manager falls in the top 50% of the distribution on task-specific skills and bottom 50% of the distribution on firm-specific skills, and zero otherwise. Task- and Firm-specific Skill Career Measures capture the average cumulative performance of the manager on task- and firm-specific skills respectively. Task- and Firm-specific Skill Four-Quarter Average measures capture the performance of the manager on task- and firm-specific skills respectively over the past four quarters only. Asset-Weighted Task-and Firm-Specific Skill capture the asset-weighted four-quarter average manager performance in billions of dollars. New Internal Manager is a dummy variable taking the value of 1 if the manager is new to the fund, but has managed funds in the same firm previously. All columns include controls for firm assets under management, firm performance, firm diversification of fund styles, number of subadvised funds per manager, average fund performance volatility at the manager level, manager gender, lipper, year and quarter dummies.

Table OS7 – Main Results Robustness Check – Career-Long Continuous Skill Measures

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Team Membership LPM	Team Membership Probit	Team Membership Logit	New Fund LPM	New Fund Probit	New Fund Logit	Firm Inflows (excl. focal mgr funds) OLS	Firm Inflows (excl. focal mgr funds) OLS	Firm Inflows (excl. focal mgr funds) OLS
Task-Specific Skill Car. Meas.	0.001	0.068+	0.117	0.001+	0.187**	0.431**	-76.282		-86.249
	(0.001)	(0.038)	(0.102)	(0.001)	(0.057)	(0.163)	(65.456)		(65.973)
Firm-Specific Skill Car. Meas.	-0.002*	-0.067*	-0.124+	0.000	-0.018	-0.087	110.807+		105.889+
	(0.001)	(0.028)	(0.071)	(0.001)	(0.072)	(0.205)	(62.005)		(62.610)
Star Fund								1,718.884*	1,754.367*
								(761.160)	(868.699)
Firm Performance	0.012	1.001*	1.966	0.001	0.085	0.417	1,762.065+	1,817.023*	1,746.089+
	(0.009)	(0.480)	(1.229)	(0.007)	(0.729)	(1.785)	(933.163)	(834.841)	(933.492)
Firm TNA	0.000	0.000	0.000	-0.000+	-0.000*	-0.000	0.022***	0.023***	0.022***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.003)	(0.003)	(0.003)
Firm Marketing Expense	-0.031	-0.647	0.101	-0.006	-0.582	-4.839	-14,396.4***	-13,793.5***	-14,498.0***
	(0.049)	(2.147)	(6.003)	(0.032)	(4.919)	(15.437)	(2,786.188)	(2,525.042)	(2,770.367)
Diversification	-0.000	0.002	-0.046	-0.000	-0.030	-0.077	-224.405***	-221.636***	-220.479***
	(0.000)	(0.025)	(0.076)	(0.000)	(0.068)	(0.181)	(35.388)	(33.944)	(34.641)
No. Sub-advised Funds / Manager	0.047***	0.452**	1.221**	0.004	0.115+	0.370	-53.379	-68.619	-66.496
	(0.010)	(0.143)	(0.451)	(0.004)	(0.067)	(0.300)	(61.036)	(59.536)	(60.434)
Portfolio Risk	0.241	11.038	37.801	0.178	34.441	60.919	-16,891.054	-32,660.384+	-19,872.599
	(0.309)	(14.120)	(39.061)	(0.233)	(32.638)	(102.658)	(19,771.212)	(17,036.962)	(19,941.638)
Manager Tenure	0.000	-0.004	-0.012	0.000	0.001	-0.001	0.918	0.204	0.557
	(0.000)	(0.003)	(0.009)	(0.000)	(0.005)	(0.018)	(2.638)	(2.460)	(2.627)
Gender	-0.001	-0.168	-0.192	-0.000	-0.174	-0.307	-140.076	-143.601	-141.470
	(0.004)	(0.213)	(0.463)	(0.002)	(0.255)	(0.744)	(189.035)	(188.257)	(188.767)
No. Funds	-0.044***	-0.321*	-0.971*	0.002	0.038	0.042	-14.989	6.985	-13.492
	(0.010)	(0.140)	(0.414)	(0.003)	(0.033)	(0.076)	(128.582)	(120.855)	(127.684)
Constant	-0.035	-2.463***	-4.613*	0.005	-3.745**	-7.084*	-1,505.481	-1,665.801	-1,450.964
	(0.032)	(0.665)	(1.808)	(0.009)	(1.177)	(3.137)	(1,156.203)	(1,067.628)	(1,154.674)
Observations	12,183	6,080	6,080	12,183	2,792	2,792	11,101	12,050	11,082
R-squared	0.136			0.055			0.056	0.056	0.056
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Inv. Obj. FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses
*** p<0.001, ** p<0.01, * p<0.05, + p<0.1

Table OS8 – Main Results Robustness Check – Four-Quarter Average Continuous Skill Measures

	(1) Team Membership LPM	(2) Team Membership Probit	(3) Team Membership Logit	(4) New Fund LPM	(5) New Fund Probit	(6) New Fund Logit	(7) Firm Inflows (excl. focal mgr) OLS	(8) Firm Inflows (excl. focal mgr) OLS	(9) Firm Inflows (excl. focal mgr) OLS
Task-Specific Skill 4Q Average	0.000	0.049**	0.111*	-0.000	0.031+	0.080+	-36.047		-49.015
	(0.000)	(0.019)	(0.050)	(0.000)	(0.018)	(0.045)	(48.161)		(48.859)
Firm-Specific Skill 4Q Average	0.001+	0.043*	0.103+	0.000	0.015	0.037	575.451***		574.507***
	(0.000)	(0.021)	(0.054)	(0.000)	(0.027)	(0.069)	(56.257)		(56.051)
Star Fund								1,802.502*	2,134.581*
								(778.794)	(968.946)
Firm Performance	-0.023	-0.983	-2.643	-0.012	-2.104	-4.308	-1,274.873	-10,875.045***	-1,410.526
	(0.036)	(1.624)	(3.992)	(0.032)	(1.896)	(4.624)	(1,930.277)	(1,732.247)	(1,926.246)
Firm TNA	0.000	0.000	0.000	-0.000	-0.000*	-0.000+	0.019***	0.023***	0.019***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.003)	(0.003)	(0.003)
Firm Marketing Expense	-0.061	-1.636	-4.118	0.010	-0.700	-3.394	-11,859.908***	-15,026.354***	-11,712.930***
	(0.053)	(2.110)	(5.589)	(0.035)	(2.228)	(5.739)	(3,427.470)	(2,676.293)	(3,430.409)
Diversification	0.000	0.031	0.056	-0.000	-0.011	-0.027	-233.049***	-221.022***	-235.497***
	(0.001)	(0.023)	(0.064)	(0.000)	(0.031)	(0.079)	(37.316)	(34.994)	(37.288)
No. Sub-advised Funds / Manager	0.023***	0.333***	0.765***	0.005*	0.128	0.342	-65.990	-71.469	-90.071+
	(0.003)	(0.065)	(0.166)	(0.002)	(0.097)	(0.323)	(50.779)	(49.292)	(54.022)
Portfolio Risk	0.287	17.531	45.607	0.018	-9.391	-21.402	7,488.583	-32,978.328+	4,727.441
	(0.313)	(14.435)	(38.083)	(0.221)	(11.314)	(31.853)	(21,531.359)	(18,090.185)	(21,636.727)
Manager Tenure	-0.000+	-0.006*	-0.016	0.000	0.006*	0.013+	-0.815	0.189	-0.732
	(0.000)	(0.003)	(0.010)	(0.000)	(0.003)	(0.007)	(2.830)	(2.498)	(2.846)
Gender	0.002	0.036	0.310	0.002	0.184	0.515	-129.448	-151.613	-133.451
	(0.004)	(0.187)	(0.450)	(0.002)	(0.139)	(0.346)	(218.363)	(193.960)	(217.952)
Constant	0.003	-2.129	-3.937	0.025	0.572	1.539	2,143.943	11,831.964***	2,366.515
	(0.039)	(1.705)	(4.287)	(0.034)	(2.043)	(4.967)	(2,472.914)	(2,068.610)	(2,466.399)
Observations	12,055	6,374	6,374	12,055	6,263	6,263	9,380	11,618	9,366
R-squared	0.098			0.056			0.073	0.058	0.074
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Inv. Obj. FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses

***** p<0.001, ** p<0.01, * p<0.05, + p<0.1**

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