

# Portfolio Manager Ownership and Mutual Fund Risk Taking<sup>\*</sup>

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## ABSTRACT

This study examines the effects of portfolio manager ownership on the risk-taking behavior of mutual funds. Using both return-based and holding-based risk measures, we find that funds managed by portfolio managers with higher beneficial ownership exhibit lower risk. In particular, using holding-based risk-shifting measure and a difference-in-differences approach, we find that funds with higher managerial ownership adjust their portfolio holdings to a lower risk level. Further investigation shows that the reduction in total risk for funds with greater managerial ownership is driven by the drop in systematic risk. Interestingly, we find that funds with higher managerial ownership exhibit higher idiosyncratic risk, which is consistent with the idea that these managers employ non-conventional and specialized investment strategies. Moreover, funds with higher managerial ownership show superior subsequent risk-adjusted performance and attract more capital inflows. Overall, our results suggest that managerial ownership aligns portfolio managers' interests with those of fund shareholders, which leads to a reduction in fund risk taking and superior risk-adjusted performance.

JEL Classification: G29, G32

Keywords: Mutual Funds, Managerial Ownership, Fund Risk, Risk Shifting

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## **Portfolio Manager Ownership and Mutual Fund Risk Taking**

The interaction between portfolio managers' incentives and their risk-taking behavior has received much attention in various economics and finance studies. In particular, the convex flow-performance relation can lead to agency issues as it can induce portfolio managers to alter the risk of their funds to attract additional capital flows (e.g., Brown, Harlow, and Starks (1996), Chevalier and Ellison (1997)). One of the important mechanisms to mitigate agency conflicts is managerial ownership (e.g., Jensen and Meckling (1976)). Starting in March 2005, the Securities and Exchange Commission (SEC) adopted a new federal rule that requires mutual funds to disclose the beneficial ownership of portfolio managers in the fund. Using a unique dataset on portfolio manager ownership, we examine the effects of managerial ownership on the risk-taking behavior in the mutual fund industry.

Managerial ownership can affect fund risk through two alternative channels. First, by investing their personal wealth in the funds they manage, portfolio managers share the downside risk with fund shareholders. In this way, managerial ownership reduces the convexity of the payoff structure arising from the flow-performance relation, leading to lower risk taking. Alternatively, managerial ownership can reflect portfolio managers' personal risk preference and/or overconfidence. Less risk-averse or overconfident managers are more likely to invest in the funds that they manage since managerial ownership mostly reflects the personal portfolio decision of portfolio managers (e.g., Khorana, Servaes, and Wedge (2007)). If this is true, one would expect funds with higher managerial ownership to have higher risk taking than their counterparts.

To empirically test these two competing hypotheses, we examine the relation between ownership of portfolio managers and their risk-taking behavior, using a sample of 2,582 U.S. domestic equity mutual funds over the period from 2009 to 2010. We construct two managerial ownership measures, one in logged dollar value and the other as a percentage of fund assets under

management.<sup>1</sup> In our sample, 58.7% of all funds have positive managerial ownership. Portfolio managers, on average, own about \$400,000 in the funds that they manage, which is 0.81% of the fund's assets under management. To measure fund risk taking, we employ a return-based risk measure defined as the volatility of monthly fund returns and a holding-based risk-shifting measure defined as the difference between a fund's current holdings volatility and its past realized volatility (Huang, Sialm, and Zhang (2011)). A fund has a positive risk-shifting measure if the most recently disclosed holdings are riskier than the past fund holdings (e.g., in the previous four quarters).

Using both return-based and holding-based risk measures, we find that funds managed by portfolio managers with higher beneficial ownership exhibit lower risk. First, we find that funds with higher managerial ownership have lower subsequent return volatility. In terms of economic magnitude, a one-standard deviation increase in dollar value managerial ownership is associated with a 0.26 standard deviation drop in fund return volatility. Next, we employ the holding-based risk-shifting measure and use a difference-in-differences approach in our empirical tests. Our results show that funds with higher managerial ownership adjust their portfolio holdings to a lower risk level. A one-standard deviation increase in dollar value managerial ownership is associated with a 0.25 standard deviation drop in the risk-shifting measure. In addition, we find that funds with higher managerial ownership tend to have lower leverage ratios. Our results are robust to instrumental variable estimations to control for endogeneity, alternative measures of fund risk taking, alternative ways of measuring portfolio manager ownership, and the inclusion of an extensive set of factors that have been shown to impact fund risk taking. Overall, our evidence supports the idea that managerial ownership aligns managers' interests with those of shareholders and reduces fund risk taking.

Having examined total fund risk taking, we next investigate whether managerial ownership

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<sup>1</sup> The SEC only requires mutual funds to disclose the portfolio manager ownership in dollar ranges, rather than the exact amount. Following Khorana, Servaes, and Wedge (2007), we convert the dollar ranges into dollar amounts by assuming managerial ownership to be at the midpoint of the reported interval. Our results are robust to alternative assumptions (e.g., at the lowest point of the reported interval).

reduces both systematic and idiosyncratic fund risk. In particular, if managerial ownership induces portfolio managers to increase effort and adopt investment strategies that specialize in the types of stocks in which managers perceive to have expertise, we would expect funds with managerial ownership to exhibit higher idiosyncratic risk exposure. To test this idea, we decompose both the fund volatility and holding-based risk-shifting measures into systematic and idiosyncratic components. We find that the reduction in total risk for funds with greater managerial ownership is completely driven by the drop in systematic risk. Interestingly, we find that funds with higher managerial ownership exhibit higher idiosyncratic risk, which is consistent with the idea that these managers employ non-conventional and specialized investment strategies.

Lastly, we investigate whether fund shareholders indeed benefit from the portfolio manager co-investing in the fund and how they respond in terms of fund flows. We find that funds with higher managerial ownership tend to have better subsequent risk-adjusted performance as measured by the Carhart (1997) four-factor alpha. In addition, mutual fund investors rationally interpret managerial ownership as a positive signal and respond with large capital inflows.

Taken together, our evidence suggests that ownership tends to dampen the risk-taking behavior of portfolio managers and these managers are likely to be skilled as they tend to employ specialized investment strategies to generate better risk-adjusted performance, thereby attracting larger subsequent capital inflows. Since higher managerial ownership reduces managers' personal portfolio diversification, portfolio manager ownership is a costly signal (e.g., Leland and Pyle (1977)).<sup>2</sup> Our findings are consistent with the idea that, in equilibrium, portfolio manager ownership can be viewed as a signal of better interest alignment between portfolio managers and shareholders.

Our study contributes to the literature in several ways. First, our paper adds to the large

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<sup>2</sup> The underdiversification issue due to portfolio manager ownership is probably less severe than in the setting of corporate firms since mutual funds usually are diversified portfolios of assets and portfolio managers can voluntarily reduce their ownership in the fund. Nevertheless, we think that it is still substantial since both the human capital and personal wealth of portfolio managers are exposed to fund specific risk.

literature on risk-taking behavior of mutual funds. To our best knowledge, our study is the first to analyze the effects of portfolio manager ownership on mutual fund risk taking. While many studies focus on the interaction between the convex flow-performance relation and fund risk taking (e.g., Brown, Harlow, and Starks (1996), Chevalier and Ellison (1997), Koski and Pontiff (1999)) or the interaction between the advisory fee contract and risk taking (e.g., Elton, Gruber, and Blake (2003), Dass, Massa, and Patgiri (2008), Massa and Patgiri (2009)), our evidence indicates that managerial ownership can reduce the convexity of the payoff structure of portfolio managers and reduce unnecessary risk taking.<sup>3</sup>

Second, our paper complements recent studies by Khorana, Servaes, and Wedge (2007) and Evans (2008), which find that funds with managerial ownership tend to have better performance. In contrast to these studies, our paper focuses on managerial ownership and risk taking behavior, using a more comprehensive sample of domestic equity mutual funds. Our study shows that portfolio manager ownership reduces mutual fund risk taking. In addition, we provide new evidence that funds with managerial ownership employ specialized investment strategies with high idiosyncratic risk exposure and attract more capital inflows. Our paper also extends the growing literature on mutual fund governance (e.g. Tufano and Sevick (1997), Almazan, Brown, Carlson, and Chapman (2004), Chen, Goldstein, and Jiang (2008)).<sup>4</sup> Our study provides new evidence that portfolio manager ownership serves as an incentive alignment mechanism.

Lastly, our paper adds to a more broad literature on managerial incentive and risk taking in the corporation-settings. Since the seminal work of Jensen and Meckling (1976), many studies focus on the relation between managerial ownership and firm investment policies and/or valuation

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<sup>3</sup> Other studies on flow-performance relation and/or fund risk taking include Busse (2001), Basak, Pavlova, and Shapiro (2007), Kempf and Ruenzi (2008), Kempf, Ruenzi, and Thiele (2009), Spiegel and Zhang (2010), Hu, Kale, Pagani, and Subramanian (2011), Huang, Sialm, and Zhang (2011), and Schwarz (2011).

<sup>4</sup> There is growing literature on the board of directors in the U.S. mutual fund industry (e.g. Tufano and Sevick (1997), Del Guercio, Dann, and Partch (2003), and Khorana, Tufano, and Wedge (2005)), directors' ownership in mutual funds (e.g. Chen, Goldstein, and Jiang (2008), Cremers, Driessen, Maenhout, and Weinbaum (2009), Meschke (2009)), and portfolio managers investment constraints (e.g., Almazan, Brown, Carlson, Chapman (2004)).

implications (e.g., Agrawal and Mandelker (1987), Morck, Shleifer, and Vishny (1988), Guay (1999), Coles, Daniel, and Naveen (2006)). Using a different setting, our study provides new evidence that managerial ownership is associated with lower risk taking and better risk-adjusted performance in the mutual fund industry.

The remainder of the paper is organized as follows. Section I describes the data, variable construction, and summary statistics. Section II discusses on the empirical methodology employed in this paper. Section III analyzes the effects of managerial ownership on fund risk taking. Section IV examines the relation between managerial ownership and fund performance and fund flows. Section V concludes the paper.

## **I. Data, Variables, and Descriptive Statistics**

### *A. Data Descriptions*

We obtain data from several sources. Our primary data source is the Morningstar Direct Mutual Fund database. It covers the U.S. open-end mutual funds and provides information about fund names, manager names, fund returns, assets under management (AUM), inception dates, expense ratios, turnover ratios, investment objectives, and other fund characteristics. For the purpose of our study, we include all diversified U.S. equity funds over the period from January 2010 to December 2011. Our sample excludes balanced funds, international funds, and sector funds. Multiple share classes are listed as separate funds in the Morningstar Direct Mutual Fund database. To avoid multiple counting, we aggregate the share-class level data to portfolio level.

Information about the beneficial ownership of portfolio managers is hand-collected from mutual funds' Statement of Additional Information (SAI) in the SEC Edgar Database. In 2004, the SEC adopted a new federal rule that requires mutual funds to disclose their beneficiary ownership of portfolio managers in the fund annually in the SAI. Mutual funds, however, do not have to disclose

the exact dollar amount of portfolio manager ownership. Rather, they are allowed to disclose it using the following ranges: \$0 (None); \$1-\$10,000; \$10,001-50,000; \$50,001-\$100,000; \$100,001-\$500,000; \$500,001-\$1,000,000; and above \$1,000,000. Whenever available, we collect the ownership information for all managers of our sample funds for the year 2009 and 2010. As portfolio manager ownership is disclosed as of the fund fiscal year end, we assume the managerial ownership is as of the end of calendar year for those funds with fiscal year end not in December.<sup>5</sup>

Beneficial ownership of portfolio managers in the mutual funds that they manage mostly reflects the personal portfolio decision of portfolio managers, rather than the requirements of the fund investment advisors on portfolio managers. There is little evidence to suggest that such requirements are a common practice (e.g. Khorana, Servaes, and Wedge (2007)). Thus, as in previous literature (e.g. Khorana, Servaes, and Wedge (2007), Fu and Wedge (2011)), we believe that portfolio managers tend to voluntarily decide to invest personal wealth in the fund.

We obtain holdings data of our sample funds from Thomson Reuters Mutual Fund Holdings (formerly CDA/Spectrum S12) database. It contains the quarterly portfolio holdings for all the U.S. equity mutual funds. We merge the Morningstar Direct Mutual Fund (MDMF) database and the Thomson Reuters Mutual Fund Holdings (TRMFH) database using the MFLINKS table and the CRSP Survivor-Bias-Free Mutual Fund (CRSP) database.<sup>6</sup>

## *B. Variable Constructions*

### *B.1 Measures of Managerial Ownership*

We construct two main measures of managerial ownership, one in dollar value, *Ownership\$*,

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<sup>5</sup> The majority of funds, over 80%, have fiscal year end in the fourth quarter of a year (i.e. October, November, and December). Our results are qualitatively similar if we only consider funds with fiscal year end in December.

<sup>6</sup> We merge the MDMF database and TRMFH database using a three-step procedure. First, we merge the TRFMH database with the CRSP database to obtain fund tickers and fund CUSIPs, using MFLINKS tables. The MFLINKS tables provide a reliable means to join TRFMH database and CRSP database. They are developed by Wermers (2000) and are accessible on Wharton Research Data Services (WRDS). Second, we match the MDMF database and TRMFH database by fund tickers and fund CUSIPs. Finally, we merge the rest of the sample manually using fund names.

and the other as a percentage of fund AUM, *Ownership%*. As discussed earlier, the SEC only requires mutual funds to disclose the beneficial ownership of portfolio managers in dollar ranges, rather than the exact amount. Following Khorana, Servaes, and Wedge (2007), we convert the dollar ranges into dollar amounts by assuming managerial ownership to be at the midpoint of the reported interval.<sup>7</sup> For instance, if the managerial ownership is in the range of \$100,001-\$500,000, we assume the manager owns \$300,000 in the fund ( $= (\$100,001 + \$500,000) / 2$ ). For cases with ownership over \$1,000,000, we take the value of 1,000,000 in our analyses. In the cases of the funds managed by a team of managers (69.3% of fund-year observations), we aggregate the dollar amount of managerial ownership across all the team members. As an alternative measure, we compute the percentage ownership by dividing the dollar amount of managerial ownership by the fund AUM.

In our empirical tests, we use managerial ownership in other funds that managers manage as an instrument to correct for potential endogeneity problem. It is defined as the dollar amount that a manager invests in all the other funds she manages. We believe that managers' stake in other funds can affect the risk-taking incentive only through its positive correlation with their ownership in a particular fund. Similarly, we compute both the managerial ownership in other funds in dollar value (*OwnershipOther\$*) and as a percentage of fund AUM (*OwnershipOther%*), using the midpoint of dollar ranges.

A valid instrument should affect the second-stage variable only through its effects on the first-stage endogenous variable based on economic arguments (e.g., Robert and Whited (2011)). We believe that the above instrument meets this condition for the following reasons. For a given fund, if the managerial ownership in other funds that they manage is higher, the probability of investing in this particular fund is higher due to reasons related to managers' portfolio needs, risk preference, and/or self-perceived abilities, which in turn affect fund risk taking. However, it is hard for us to

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<sup>7</sup> Khorana, Servaes, and Wedge (2007) also use an alternative way to measure the dollar amount of managers' ownership by assuming it to be at the lowest point of the reported interval. Our empirical results are robust if we employ this alternative measure in the analyses.



make an intuitive economic argument that managerial ownership in other funds that they manage will have a direct systematic effect on the risk taking of a given fund. Thus, we believe that managerial ownership in other funds affects fund risk taking only through the channel of ownership in this particular fund.

## *B.2 Measures of Risk Taking*

In our empirical investigation, we construct two types of variables to measure mutual fund risk taking, one set based on monthly return data from Morningstar Direct database and the other based on quarterly holdings data from Thomson Reuters Mutual Fund Holdings database.

We first construct an annual measure of the funds' total risk, *Total Risk*, by computing the standard deviation of 12 monthly fund returns. Our measure of fund unsystematic risk, *Idiosyncratic Risk*, is the standard deviation of the residuals estimated using the Carhart (1997) four-factor model as in Model (1). The difference between fund total risk and the unsystematic risk is the systematic risk, *Systematic Risk*.

$$R_{i,t} - R_{f,t} = \alpha_i + \beta_{i,m} (R_{m,t} - R_{f,t}) + \beta_{i,s}SMB_t + \beta_{i,h}HML_t + \beta_{i,mom}MOM_t + \varepsilon_{i,t} \quad (1)$$

where  $R_{i,t} - R_{f,t}$  is the return of the fund  $i$  in month  $t$  minus the risk free rate; and  $R_{m,t} - R_{f,t}$  is the excess return of the CRSP value-weighted market index over the risk free rate;  $SMB$  is the return difference between small and large capitalization stocks;  $HML$  is the return difference between high and low book-to-market stocks, and  $MOM$  is the return difference between the stocks with high and low past returns.<sup>8</sup>

Fund managers can alter their portfolio risk by changing risk properties of their holding assets or the diversification level of their overall portfolio. To capture the risk-shifting behavior of the fund managers, we next construct a risk-shifting measure based on quarterly holdings data,

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<sup>8</sup> We thank Professor Kenneth French for making the returns on the market, risk-free rate, and the three factors (size, book-to-market, and momentum) available on his website.

following Huang, Sialm, and Zhang (2011). Specifically, our holdings-based risk-shifting measure, *Risk Shift*, is defined as the difference between a fund’s current holdings volatility and its past realized volatility as in Equation (2), estimated over the prior 52 weeks.<sup>9</sup> The current holdings volatility  $\sigma_{i,q}^H$  is the standard deviation of fund returns  $Ret_{i,q,t}^H$  based the most recent fund holdings and the past realized volatility  $\sigma_{i,q}^R$  is the standard deviation of the actual fund returns  $Ret_{i,q,t}^R$ .

$$Risk\ Shift_{i,q} = \sigma_{i,q}^H - \sigma_{i,q}^R = \sqrt{VAR(Ret_{i,q,t}^H)} - \sqrt{VAR(Ret_{i,q,t}^R)} \quad (2)$$

$$where\ Ret_{i,q,t} = \sum_{j=1}^N \omega_{i,q}^j R_t^j$$

where  $i$  indexes fund,  $q$  indexes quarter; and  $t$  index week.  $\omega_{i,q}^j$  is the portfolio weight of fund  $i$  at quarter  $q$  in stock  $j$  and  $R_t^j$  is the return of stock  $j$  at week  $t$ . By using stock returns over the same time periods to estimate both the current holdings volatility and the realized volatility for a fund, this measure is designed to capture the changes in risk levels induced by changes in the portfolio composition and is unaffected by changes in market conditions. A positive risk-shifting measure means that the most recently disclosed holdings are riskier than the actual fund holdings.

To future examine the changes in systematic and idiosyncratic risk separately, we decompose our risk-shifting measure into two components: systematic risk-shifting, *Systematic Risk Shift*, and idiosyncratic risk-shifting, *Idiosyncratic Risk Shift*. Specifically, we first divide the current holdings volatility  $\sigma_{i,q}^H$  and the past realized volatility  $\sigma_{i,q}^R$  into systematic and idiosyncratic components separately, based the Carhart (1997) four-factor model. Then, we take the difference between the systematic (idiosyncratic) volatility of a fund’s current holdings and the systematic (idiosyncratic) volatility of its past realized returns to construct *Systematic Risk Shift* (*Idiosyncratic Risk Shift*). These two measures capture changes in fund systematic and idiosyncratic risk due to portfolio changes.

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<sup>9</sup> Our results are robust if we construct the risk-shifting measure by taking the ratio of the two volatilities or estimating the two volatility measures using 12 or 24 monthly returns. See more details in Section III.B.

### B.3 Other Variables

*Fund Performance Measures:* we construct two measures of fund performance. First, we compute a fund's annual net return by compounding monthly net returns over a 12-month period. Second, to evaluate the funds' risk-adjusted performance, we use the alpha measure, *Alpha*, estimated using the Carhart (1997) four-factor model as in Model (1).

*Net Flow Measure:* our net flow measure, *Net Flow*, is retrieved from Morningstar Direct database. It is defined as the difference between the inflows and outflows in the N-SAR reports that mutual funds filed with the SEC. We calculate the annual net flows of a fund by aggregate the monthly net flows over a 12-month period.

*Leverage Ratio:* Some mutual funds tend to use leverage (i.e. derivatives and short sales) in their portfolio management (e.g, Koski and Pontiff (1999)).<sup>10</sup> In our empirical analyses, we also examine the relation between fund leverage usage and managerial ownership. We construct a fund leverage measure, *Leverage Ratio*, using the financial data from the N-SAR forms that mutual funds file to the SEC semi-annually. It is defined as option and short sale related liabilities of a fund (Item 74-R in N-SAR form, including reverse repurchase agreements, short sales, written options, and all other liabilities) over total assets as in the following equation:

$$Leverage\_total_{i,t} = Fund\ Liabilities_{i,t} / Total\ Assets_{i,t} \quad (3)$$

We consider option and short sale related leverage since it can affect fund risk easily and also represents the most important part of leverage.<sup>11</sup> We collected leverage related data from the financial statement data in N-SAR forms for the year of 2010 and match it to our other data using

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<sup>10</sup> On average, open-end mutual funds use leverage less aggressively compared to closed-end funds in the U.S. due to various reasons (i.e., investor redemptions). According on Cherkes, Sagi, and Stanton (2009) and Tang (2011), the U.S. closed-end funds on average have above 20% total leverage on their balance sheets, defined (total assets -total net assets)/total assets.

<sup>11</sup> Option and short sale related leverage captures the most important part of mutual fund leverage usage since, on average, it accounts for over half of the total fund leverage defined as (total assets -total net assets)/total assets. Our results are qualitatively similar if we total fund leverage in our analyses, which include Payables for portfolio instruments purchased (N-SAR Item 74-O), Amounts owed to affiliated persons (N-SAR Item 74-P), and Senior long-term debt (N-SAR Item 74-Q).

ticker and fund names.<sup>12</sup> As shown in Table I, there are large variations in mutual fund leverage usage, though the average of *Leverage Ratio* is modest, 2.67%. For instance, 12.7% of the funds in our sample have *Leverage Ratio* over 10% in the year 2010.

*Control Variables*: we include several other fund characteristics in our analysis: fund size, age, expense ratio, turnover ratio, family size, team management and average manager tenure. To capture size, we sum the total dollar value (in millions) of assets under management across all share classes for each fund. We calculate fund age using the inception date of the oldest share class in the fund. Expense ratio and turnover ratio are calculated as the average expense and turnover ratios, respectively, across different share classes. We aggregate each family's total AUM to get *Family Size*. *Team Dummy* is an indicator variable which equals to one if a fund is managed by a team of managers and zero otherwise. *Manager Tenure* measures the time the portfolio managers have managed the fund. In case of the team-managed fund, we compute the average tenure of all the managers.

### C. Descriptive Statistics

Our final sample consists of 2,582 unique funds from 469 fund families, covering 4,576 fund-year observations. We find that 2,687 fund-year observations have positive managerial ownership, representing 58.7% of all observations. As shown in Figure 1, within each fund investment objective, the percentage of observations with positive managerial ownership appears to be in the similar range. The investment objective with the largest percentage of funds with positive ownership is Mid-Cap Blend (66.2%) and the one with the smallest percentage funds is Large-Cap Blend (49.3%).

[Insert Figure 1 here]

We present summary statistics of all variables used in this paper in Table I. The mean

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<sup>12</sup> We are working on extending our N-SAR data to the year of 2011.

(median) managerial ownership in our sample is \$400,999 (\$40,002). Since it is a skewed measure, we use the logarithm of the dollar value managerial ownership in our empirical tests. An average fund in our sample has managerial ownership equal to 0.81% of the fund's AUM. Managerial ownership in our sample is slightly higher than previous studies (e.g., Khorana, Servaes, and Wedge (2007)).<sup>13</sup>

[Insert Table I here]

The average annual net return of funds in our sample is 18.6% and the average four-factor alpha is close to zero, negative 6 basis points. The average total risk is 4.77%, of which 4.0% is due to systematic risk with the remaining 0.7% attributed to unsystematic risk. An average fund has about \$1,074.8 million assets under management. The average annual net flows are 11.79% of fund AUM. The average fund age is about 13 years and the average manager tenure is about 5 years. An average fund family manages \$81,066.1 million of assets. The majority of our sample funds (69.3%) are managed by a team of managers.

## **II. Empirical Methodology**

In this section, we discuss the empirical methodology used in our study. Our research goal is to examine how portfolio manager ownership affects the risk-taking behavior of mutual funds.

### *A. Return-based Risk Taking Measures*

We first consider the return-based risk measure estimated using monthly fund returns. We use the following OLS specification to test the effects of managerial ownership on fund risk taking:

$$Risk_{i,t} = \alpha + \beta_1 Ownership_{i,t-1} + \gamma_1 Controls_{i,t-1} + \varepsilon_{i,t} \quad (4)$$

where  $i$  indexes fund;  $t$  indexes year.  $Ownership_{i,t-1}$  is the aggregated portfolio manager beneficial

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<sup>13</sup> The increase in managerial ownership could be due to the difference in sample periods. Our sample covers the year 2009 and 2010, while Khorana, Servaes, and Wedge (2007) use the ownership information in 2004.

ownership of fund  $i$  in year  $t-1$ . We construct two measures for this variable: the logged dollar value of manager ownership ( $Ownership\$$ ) and manager ownership as a percent of fund AUM ( $Ownership\%$ ). The dependent variable,  $Risk_{i,t}$ , is the volatility estimated using 12 monthly fund returns. We control for lagged total risk in the regressions. Other control variables include fund size, family size, fund age, expense ratio, turnover ratio, team management dummy, manager tenure, and fund flows. All these control variables are lagged by one year. Lastly, unless otherwise specified, we adjust standard errors accounting for heteroskedasticity and clustering at the fund level, as well as control for fund category and time fixed effects.

In the second specification, we employ a 2SLS regression methodology to alleviate the concern that certain omitted funds characteristics will affect both managerial ownership and fund risk. For managerial ownership in fund  $i$ , we employ the managerial ownership in other funds that managers oversee,  $OwnershipOther$ , as the instrument variable. In this specification, we first compute the predicted values of  $Ownership$  by estimating a first-stage regression in which the independent variables include the chosen instrument and all the exogenous variables from the second-stage risk regression. The predicted values of  $Ownership$  are then employed as an independent variable in lieu of their actual values in the second-stage risk regression. Thus, we estimated the following IV 2SLS regression specification:

$$Risk_{i,t} = \alpha + \beta_1 \widehat{Ownership}_{i,t-1} + \gamma_1 Controls_{i,t-1} + \varepsilon_{i,t} \quad (5)$$

where  $i$  indexes fund;  $t$  indexes year;  $\widehat{Ownership}_{i,t-1}$  is the predicted managerial beneficial ownership of fund  $i$  in year  $t-1$ . The control variables are the same as in Model (4), lagged by one year. The coefficient  $\beta_1$  in both Models (4) and (5) are our main variable of interest as it measures the effects of managerial ownership on fund risk taking.

### *B. Holdings-based Risk Taking Measures*

We next examine managers' risk shifting behavior based on fund portfolio holdings. Specifically, we employ the following specification to test how managerial ownership affects managers' risk shifting behavior:

$$RiskShift_{i,t,q} = \alpha + \beta_1 Ownership_{i,t-1} + \gamma_1 Controls_{i,t-1} + \varepsilon_{i,t,q} \quad (6)$$

where  $i$  indexes fund;  $t$  indexes year;  $q$  indexes quarter.  $Ownership_{i,t-1}$  is the aggregated managerial ownership of fund  $i$  in previous year, in dollar value ( $Ownership\$$ ) or as a percentage of AUM ( $Ownership\%$ ). The dependent variable,  $RiskShift_{i,t}$ , is a holdings-based risk-shift measure based on 52 weekly returns ( $Risk Shift$ ). Control variables include fund size, family size, fund age, expense ratio, turnover ratio, team management dummy, manager tenure, and fund flows, all lagged by one year.

The specification of Model (6) actually uses a difference-in-differences approach, which can address endogeneity concerns. In the first step, the risk-shifting measure captures the difference between the current holding volatility and actual realized volatility separately for funds with and without managerial ownership. Then, we examine the difference in the risk shifting behavior of the two groups, which is an estimate of the effects of managerial ownership on manager risk taking.

To ensure that our results are robust to tests that account for endogeneity, we also employ a 2SLS regression methodology with the same instrument variable as in Section III.A, as in the following specification:

$$RiskShift_{i,t,q} = \alpha + \beta_1 \widehat{Ownership}_{i,t-1} + \gamma_1 Controls_{i,t-1} + \varepsilon_{i,t,q} \quad (7)$$

where  $i$  indexes fund;  $t$  indexes year, and  $q$  indexes quarter.  $\widehat{Ownership}_{i,t-1}$  is the predicted managerial beneficial ownership of fund  $i$  in year  $t-1$ . The control variables are the same as in Model (6), lagged by one year. The coefficient  $\beta_1$  in both Models (6) and (7) measures the effects of managerial ownership on fund risk shifting in the portfolio holdings.

We empirically test two alternative hypotheses using a sample of the U.S. domestic equity

mutual funds. On one hand, portfolio managers of mutual funds have a convex, option-like payoff structure due to the flow-performance relation (e.g., Chevalier and Ellison (1997), Sirri and Tufano (1998)). Managerial ownership can align managers' interests with those of shareholders because it reduces the convexity of their payoff structure, and thus reduces fund risk taking. Based on this *Alignment Hypothesis*, we would expect  $\beta_1$  to be negative and significant.

Alternatively, managerial ownership can reflect portfolio managers' personal risk preference and/or overconfidence. Less risk-averse or more overconfident managers are more likely to invest in the funds that they manage, which suggests a positive relation between managerial ownership and risk taking. If this *Overconfidence Hypothesis* is true, we would expect  $\beta_1$  to be positive and significant.

### **III. Fund Risk Taking and Managerial Ownership**

In this section, we use returns-based and holdings-based risk taking measures to empirically test how portfolio manager ownership affects the fund risk taking behavior. In addition, we also examine the relation between fund leverage ratio and managerial ownership.

#### *A. Total Risk Taking and Managerial Ownership*

In this section, we examine how portfolio manager ownership affects the total risk taken by mutual funds. Specifically, we employ two measures of total risk taking by mutual funds: (1) total risk based on monthly fund returns, *Total Risk*; (2) the risk shifting measure, *Risk Shift*, based on fund portfolio holdings as in Huang, Sialm, and Zhang (2011).

We first examine the relation between managerial ownership and total risk based on monthly fund returns, *Total Risk*. We investigate this relation by estimating Models (4) and (5) with *Total Risk* as the dependent variable. Based on the *Alignment Hypothesis*, managers with beneficial ownership



are better aligned with the shareholders and reduce risk taking. The *Alignment Hypothesis* predicts that managerial ownership is negatively related to *Total Risk*. The opposite is expected if the *Overconfidence Hypothesis* is valid.

Table II reports the estimation results with the OLS estimates of Model (4) in columns (1) and (2) and the 2SLS estimates of Model (5) in columns (3) and (4). Consistent with the *Alignment Hypothesis*, we find that funds with managerial ownership have lower future total fund risk compared to those without. For the OLS estimation, the coefficient on *Ownership*\$ is -0.0057, significant at the 1% level, and the coefficient on *Ownership*% is -0.0109, significant at the 5% level. The estimates of the 2SLS regressions are qualitatively similar, except that the coefficient on *Ownership*% in column (4) becomes insignificant at conventional levels. These effects are economically significant. For instance, based on the results in column (3), a one-standard deviation increases in *Ownership*\$ is associated with a 0.26 standard deviation drop in *Total Risk*.

[Insert Table II here]

Next, we examine mutual fund holdings to examine how managerial ownership affects managerial risk taking. We construct a risk-shifting measure, *Risk Shift*, based on fund holdings, following Huang, Sialm, and Zhang (2011). A fund has a positive risk shifting measure if its current holdings are riskier than the past fund holdings. Our univariate results show that funds without managerial ownership, on average, shift up their annualized volatility by 1.71 percentage points, which is 0.79 percentage point higher than funds with managerial ownership (t-stat. =16.25, untabulated).

We estimate the multivariate regressions in Model (6) and (7), using *Risk Shift* as the dependent variable. Based on the *Alignment Hypothesis*, managerial ownership aligns portfolio managers' interests with those of the shareholders and thus reduces risk taking, implying that  $\beta_1$  should be negative and significant. Again, the opposite is expected based on the *Overconfidence*

### *Hypothesis.*

Table III reports the estimation results. Our results show that funds with managerial ownership reduce the risk taking in their portfolio holdings compared to those without. For instance, the coefficient of the 2SLS estimation on *Ownership*\$ in column (3) is -0.0128 (t-stat. =-3.11), significant at the 1% level, and the one on *Ownership*% in column (4) is -0.0066 (t-stat. =-2.57), significant at the 5% level. The OLS estimations are qualitatively similar. In terms of the economic impact, the results in columns (3) and (4) suggest that one-standard deviation increases in *Ownership*\$ and *Ownership*% are associated with 0.25 and 0.06 standard deviation drops in *Risk Shift* respectively.

[Insert Table III here]

Our results are robust to different ways of constructing the risk-shifting measure (untabulated). First, our main risk-shifting measure is related to the level of fund volatility. To adjust for the level of fund volatility, we consider an alternative ratio-based risk-shifting measure and find similar results. This measure is defined as the ratio of the current holdings volatility to the past realized volatility. Second, we construct two alternative risk-shifting measures using 12 or 24 monthly returns, rather than 52 weekly returns, to estimate fund volatility. Our results hold for both risk-shifting measures.

To summarize, our results support the *Alignment Hypothesis* that beneficial ownership mitigates the risk shifting agency issues. Huang, Sialm, and Zhang (2011) find that funds that increase risk perform worse than funds with more stable risk levels. They attribute risk shifting to agency conflicts between managers and shareholders or inferior managerial ability. Our study provides evidence that managerial ownership reduces unnecessary risk shifting behavior.

### *B. Fund Leverage and Managerial Ownership*

To better understand how managerial ownership affects fund risk taking behavior, we investigate other risk-related policies of mutual funds. In particular, we examine the leverage usage of mutual funds.

We construct a fund leverage measure, *Leverage Ratio*, using the financial data of the fund from the N-SAR forms that mutual funds file to the SEC semi-annually. It is defined as option and short sale related liabilities (Item 74-R in N-SAR form) over total assets of the fund. We first compare the leverage ratio of funds with managerial ownership to the ratios of funds without ownership. Our univariate comparison shows that the former group uses significantly lower leverage than the latter (untabulated). For funds with managerial ownership, the average *Leverage Ratio* is 2.48%, 0.58 percentage point lower than the ones without (t-stat. =-2.74).

Next, we estimate Models (4) and (5) with fund leverage ratio as the dependent variable. Table IV presents the OLS and IV estimation results. Our multivariate regression results confirm our univariate results. Managerial ownership is associated with lower future leverage usage. For instance, the coefficient on *Ownership*\$ is -0.0826 while the coefficient on *Ownership*% is -0.0755, both significant at the 1% level. Moreover, the effect on leverage usage is economically significant. A one standard deviation increase in *Ownership*\$ (*Ownership*%) is associated with a drop in *Leverage Ratio* by 0.09 (0.04) standard deviation. Our results using the 2SLS regression methodology are qualitatively similar. Overall, our investigation shows that managerial ownership is associated with less leverage usage by mutual funds, which adds to the evidence that managerial ownership is associated with less risk taking.

[Insert Table IV here]

### C. *Systematic vs. Idiosyncratic Risk Taking*

Our investigations in the previous sections focus on total fund risk and establish the negative

relation between managerial ownership and total fund risk taking. In this section, we examine whether managerial ownership affects systematic and idiosyncratic fund risk differently. In particular, if portfolio managers with beneficial ownership adopt less conventional investment strategies to generate better performance, we would expect funds with managerial ownership to exhibit higher idiosyncratic risk exposure.

### *C.1 Evidence based on Fund Returns*

To test the effects on systematic and idiosyncratic fund risk separately, we first decompose *Total Risk* measures into systematic and idiosyncratic components, *Systematic Risk* and *Idiosyncratic Risk*. Then, we estimate Models (4)-(5) with *Systematic Risk* and *Idiosyncratic Risk* as the dependent variables to examine the effects of ownership on systematic and idiosyncratic risk separately.

A univariate comparison suggests that funds with managerial ownership tend to have lower future systematic risk but higher future idiosyncratic risk, with both differences significant at the 1% level (untabulated). On one hand, funds with managerial ownership, on average, have an annualized systematic risk exposure of 13.54 percentage points ( $= 3.91 * \sqrt{12}$ ), which is 0.70 percentage points lower than the ones without (t-stat. = -7.89). On the other hand, funds with managerial ownership have an annualized idiosyncratic risk exposure of 2.88 percentage points ( $= 0.83 * \sqrt{12}$ ), which is 0.58 percentage point higher than the ones without (t-stat. = 13.57).

We then estimate Models (4) and (5) with *Systematic Risk* and *Idiosyncratic Risk* each as the dependent variable. Table V presents the estimation results. It shows several empirical findings. First, consistent with the univariate comparison, the results show that managers with beneficial ownership tend to take lower systematic risk. For instance, with *Systematic Risk* as the dependent variable, the coefficient of the 2SLS estimation on *Ownership* is -0.0552 and the one on *Ownership%* is -0.0364, both significant at the 1% level. The OLS estimation results are qualitatively similar. In

terms of the economic significance, a one standard deviation increase in *Ownership\$* and *Ownership%* is associated with a drop in *Systematic Risk* by 0.41 and 0.11 standard deviation, respectively.

[Insert Table V here]

Second, we find a positive relation between managerial ownership and future idiosyncratic risk exposure. With *Idiosyncratic Risk* as the dependent variable, the coefficient of the 2SLS estimation on *Ownership\$* is 0.0210, significant at the 5% level, and the one on *Ownership%* is 0.0268, significant at the 1% level. In terms of the economic impact, a one standard deviation increase in *Ownership\$* and *Ownership%* are associated with an increase in *Idiosyncratic Risk* by 0.31 and 0.16 standard deviation, respectively. Thus, our results suggest that portfolio managers with beneficial ownership tend to adopt less conventional investment strategies, which exhibit higher future idiosyncratic risk exposure.

### *C.2 Evidence based on Fund Holdings*

In this section, we examine fund holdings to test whether managerial ownership affects systematic and idiosyncratic risk taking differently. Similar to the section above, we first decompose *Risk Shift* measure into systematic and idiosyncratic components, *Systematic Risk Shift* and *Idiosyncratic Risk Shift*. The results in Table I show that an average U.S. equity fund in our sample shifts up their annualized systematic risk exposure by 2.01 percentage points ( $= 0.279 * \sqrt{52}$ ) and shifts down their annualized idiosyncratic risk exposure by 0.84 percentage points ( $= -0.116 * \sqrt{52}$ ).

We then estimate Models (6) and (7) using each *Systematic Risk Shift* and *Idiosyncratic Risk Shift* as the dependent variable. Table VI reports the estimation results. Consistent with our results in the section above, we find that managerial ownership leads to a decrease in systematic risk exposure and an increase in idiosyncratic risk exposure in fund holdings. For instance, with 2SLS regression methodology, the coefficients on managerial ownership are negative and significant with

*Systematic Risk Shift* as the dependent variable: -0.0170 on *Ownership*\$ with t-stat. of -3.04 and -0.0107 on *Ownership*% with t-stat. of -3.37.

[Insert Table VI here]

In contrast, we find a positive relation between managerial ownership and the idiosyncratic risk shift measure. In columns (7) and (8) with 2SLS estimation, the coefficient on *Ownership*\$ is 0.0047 (t-stat.= 1.40) and the coefficient on *Ownership*% is 0.0042 (t-stat.=2.32). In terms of the economic impact, an increase in *Ownership*\$ of one standard deviation is associated with a drop in *Systematic Risk Shift* by 0.23 standard deviation and an increase in *Idiosyncratic Risk Shift* by 0.11 standard deviation. The economic impact is similar, with slightly lower magnitude, if we consider *Ownership*%.

#### *D. Discussion*

Our results thus far provide evidence that funds with higher managerial ownership have lower total risk exposure, and in particular systematic risk exposure, compared to the funds without. Our evidence on the negative relation between managerial ownership and total and systematic risk exposure supports our *Alignment Hypothesis*, but not *Overconfidence Hypothesis*. Mutual fund managers face a convex payoff structure due to the flow-performance relation (e.g., Chevalier and Ellison (1997), Sirri and Tufano (1998)). The option-like payoff structure can induce portfolio managers to take excess risk over and above the risk level that shareholders are willing to take. Managerial ownership works as mechanism to align managers' interests with those of shareholders by reducing the convexity of the payoff structure which helps reduce unnecessary risk taking.

Moreover, our evidence on the positive relation between fund idiosyncratic risk and managerial ownership indicates that managers with beneficial ownership in the funds they manage tend to employ less conventional strategies in order to generate better abnormal performance. A

mutual fund with high idiosyncratic risks, conditional on portfolio concentration, implies that it consists of stocks with high idiosyncratic variations, which contain more firm-specific information (Durnev, Morck, Yeung, and Zarowin (2003)). Most importantly, in Section IV.A, our evidence shows funds with managerial ownership have higher risk-adjusted performance, which confirms the idea that they use unique or distinctive strategies to produce abnormal performance. Taken together, our results thus far suggest that mutual funds with managerial ownership tend to take less unnecessary risk and deviate from conventional investment strategies to generate risk-adjusted performance.

#### **IV. Risk-Adjusted Performance, Fund Flows, and Managerial Ownership**

The presence of positive abnormal returns is necessary to confirm that shareholders indeed benefit from the ownership in the funds by portfolio managers. In this section, we examine whether managerial ownership is associated with better future abnormal performance. In addition, we are interested in how managerial ownership affects future fund flows.

##### *A. Future Fund Abnormal Performance*

In this section, we examine how managerial ownership affects future fund abnormal performance.<sup>14</sup> Our evidence in Section III suggests that managerial ownership induces managers to adopt distinctive investment strategies with higher idiosyncratic risk exposure. We investigate whether shareholders benefit from these non-conventional investment strategies. Specifically, we estimate Models (4) and (5) using risk-adjusted performance, *Alpha*, as the dependent variable. Similar to the specifications for the risk-taking variables, we include a set of lagged control variables

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<sup>14</sup> While our prediction is clear regarding to future abnormal fund returns, the prediction on raw performance is ambiguous as we find that funds with managerial ownership tend to take less systematic risk. In untabulated results, we do not find significant relation between managerial ownership and future raw returns.

that can affect the fund risk-adjusted performance. We cluster the standard errors at fund level and adjust for heteroskedasticity. We control for both the fund investment objective fixed effects and time fixed effects.

Table VII reports the estimation results. Similar to previous studies (e.g., Carhart (1997), Chen, Hong, Huang, and Kubik (2004)), our four-factor alpha measure is negatively related to expense ratio, turnover ratio, and fund size and positively related with fund family size. More importantly, our results show that funds with managerial ownership have better future risk-adjusted performance than the funds without. For instance, in the 2SLS specification, the coefficient on *Ownership* is 0.0180 (t-stat. =1.88), significant at the 10% level and the coefficient on *Ownership%* is 0.0283 (t-stat. =3.46), significant at the 1% level. Moreover, these effects are economically significant. A one standard deviation increase in *Ownership* (*Ownership%*) is associated with an increase in *Alpha* by 0.29 (0.20) standard deviation. Our results using OLS are qualitatively similar, with the coefficient magnitude being slightly lower.

[Insert Table VII here]

Our evidence is consistent with recent studies by Khorana, Servaes, and Wedge (2007) and Evans (2008), which find that funds with managerial ownership tend to have better future abnormal performance than those without. Different from these two studies, both of which use a partial sample of the U.S. mutual funds due to data constraints, our sample covers all U.S. diversified domestic equity funds during the period from 2010 to 2011, ensuring it is free of sample selection bias.<sup>15</sup>

Our results in Section III show that funds with managerial ownership tend to reduce systematic risk exposure and employ unique investment strategies with high idiosyncratic risk exposure. Our evidence on the positive relation between managerial ownership and future abnormal

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<sup>15</sup> Khorana, Servaes, and Wedge (2007) use a sample of 1,406 mutual funds, including balanced, domestic bond, domestic equity, and international funds, with managerial ownership at the end of 2004, which is about one quarter of all U.S. mutual funds in 2005. While Evans (2008) uses a sample of 273 domestic equity funds with managerial ownership as of 2004, which is less than a fifth of all the U.S. domestic equity funds.



performance confirms that shareholders indeed benefit from the managerial ownership in the mutual funds. Taken together, our evidence suggests that funds with managerial ownership tend to reduce systematic risk exposure, adopt unique investment strategies, and generate better abnormal performance than funds without managerial ownership.

There are several reasons to expect managers with ownership to generate higher abnormal returns. Better future abnormal performance could be due to better effort induced by managerial ownership or better information that managers have *ex ante*, or both. Our empirical tests are not able to determine which reason drives the results. In each of those two scenarios, managerial ownership can be viewed as a signal of better effort and/or better skill. As managerial ownership is a costly signal due to underdiversification, only skillful and/or better informed managers can afford to invest in the funds that they oversee. A nature question followed is to see how mutual fund investors respond to this signal, which is our focus in the following section.

### *B. Future Fund Flows*

In this section, we examine how managerial ownership affects future fund flows. As managerial ownership leads to less unnecessary risk taking and better abnormal performance, we would expect mutual fund investors to respond to it with more future fund flows. We first do a univariate comparison on annual net flow of funds with and without managerial ownership. Funds with managerial ownership, on average, have an annual net fund flow in the magnitude of 14.6% of the fund AUM at previous year end, which is 7.1% higher than the ones without (t-stat.=3.07, untabulated). We then estimate Models (4) and (5) with annual total net flow, *Net Flow*, as the dependent variable. Similar to previous estimations, we include a set of control variables and adjust standard errors accounting for heteroskedasticity and clustering at the fund level.

Table VIII presents the estimation results on fund flows. As we expected, our results show

that mutual fund investors respond positively to managerial ownership. For instance, in columns (3) and (4) with 2SLS estimation, the coefficient on *Ownership\$* and *Ownership%* is 0.0253 (t-stat. =1.48) and 0.0831 (t-stat. =2.73) respectively. In terms of economic magnitude, a one standard deviation increase in *Ownership\$* is associated with an increase in *Net Flow* by 0.22 standard deviation; a one standard deviation increase in *Ownership%* is associated with an increase in *Net Flow* by 0.30 standard deviation. Overall, our evidence suggests that mutual fund investors rationally interpret managerial ownership as a positive signal and respond with positive fund flows.

[Insert Table VIII here]

## V. Concluding Remarks

In this paper, we examine how managerial ownership affects fund risk-taking behavior in the mutual fund industry. We empirically test two alternative hypotheses using the managerial ownership data of the U.S. domestic equity mutual funds. On one hand, portfolio managers of mutual funds tend to face a convex option-like payoff structure due to the flow-performance relation (e.g., Chevalier and Ellison (1997), Sirri and Tufano (1998)). Managerial ownership can align managers' interests with those of shareholders, especially along the downside, and reduce fund risk taking. On the other hand, if managerial ownership reflects portfolio managers' low personal risk preference and/or overconfidence, one would expect funds with managerial ownership to have higher risk taking. Our evidence supports the alignment hypothesis that managerial ownership aligns managers' interests with those of shareholders and reduces risk taking. Moreover, we further provide new evidence that the non-conventional investment strategies by fund-owning managers to generate better abnormal performance and larger fund flows.

## References

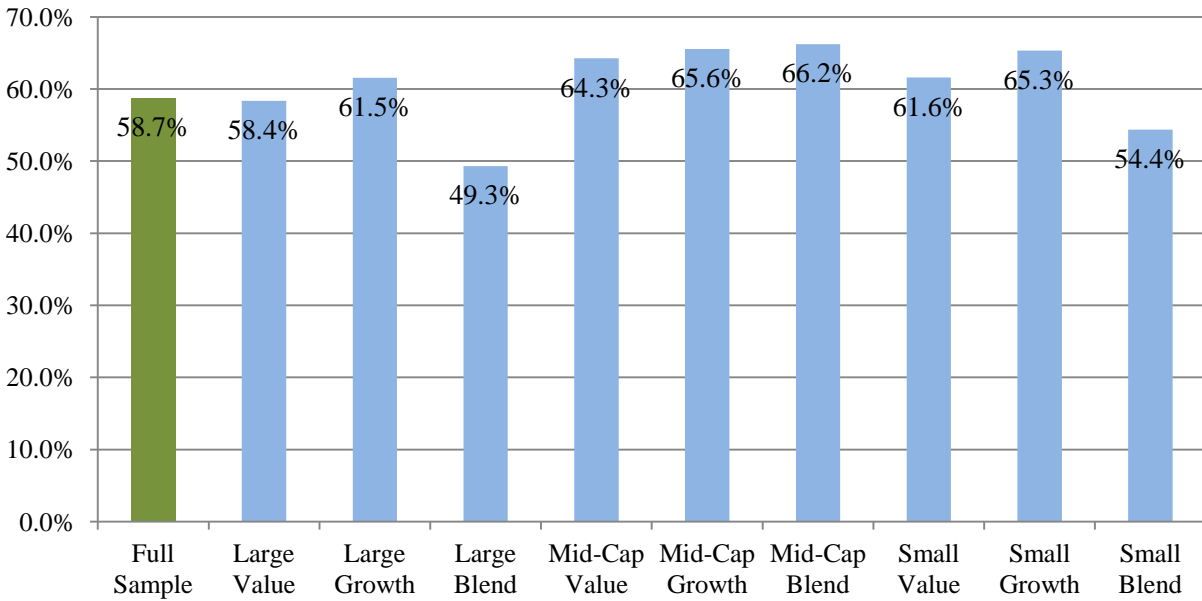
- Almazan, Andres, Keith C. Brown, Murray Carlson, and David A. Chapman, 2004, Why Constrain Your Mutual Fund Manager? *Journal of Financial Economics*, 73, 289-321.
- Agrawal, A., and G. N. Mandelker, 1987, Managerial Incentives and Corporate Investment and Financing Decisions, *Journal of Finance* 42, 823-837.
- Basak, S., A. Pavlova, and A. Shapiro. 2007. Optimal Asset Allocation and Risk Shifting in Money Management. *Review of Financial Studies* 20:1583–1621.
- Brown, K. C., W. V. Harlow, and L. T. Starks. 1996. Of Tournaments and Temptations: An Analysis of Managerial Incentives in the Mutual Fund Industry. *Journal of Finance* 51, 85–110.
- Busse, J. A. 2001. Another Look at Mutual Fund Tournaments. *Journal of Financial and Quantitative Analysis* 36:53–73.
- Carhart, M. M. 1997. On Persistence in Mutual Fund Performance. *Journal of Finance* 52, 57–82.
- Cherkes, Martin, Jacob Sagi, and Richard Stanton, 2009, A liquidity-based theory of closed-end funds, *Review of Financial Studies* 22, 257-297
- Chen, Qi, Itay Goldstein, and Wei Jiang, 2008. Director Ownership in the U.S. Mutual Fund Industry. *Journal of Finance* 63, 2629-2677.
- Chen, Joseph, Harrison Hong, Ming Huang, and Jeffrey Kubik. 2004. Does Fund Size Erode Performance? Liquidity, Organizational Diseconomies, and Active Money Management. *American Economic Review* 94,1276–1302.
- Chevalier, Judith, and Glenn Ellison, 1997, Risk Taking by Mutual Funds as a Response to Incentives. *Journal of Political Economy* 105,1167–1200.
- Coles, J. L., Daniel, N.D., Naveen, L., 2006. Managerial incentives and risk-taking. *Journal of Financial Economics* 79, 431 – 468.
- Cremers, Martijn, Joost Driessen, Pascal Maenhout, and David Weinbaum, 2009, Does skin in the game matter? Director incentives and governance in the mutual fund industry, *Journal of Financial and Quantitative Analysis* 44, 1345-1373
- Dass, Nishant, Massimo Massa, and Rajdeep Patgiri, 2008, Mutual Funds and Bubbles: The surprising role of contractual incentives, *Review of Financial Studies* 21, 51-99.
- Del Guercio, D., L. Dann, and M. Partch, 2003, Governance and boards of directors in closed-end investment companies, *Journal of Financial Economics* 69, 119–152.

- Durnev, Art, Randall Morck, Bernard Yeung, and Paul Zarowin, 2003, Does greater firm-specific return variation mean more or less informed stock pricing, *Journal of Accounting Research* 41, 797–836.
- Elton, E. J., M. J. Gruber, and C. R. Blake. 2003. Incentive Fees and Mutual Funds. *Journal of Finance* 58, 779–804.
- Fu, Richard, and Lei Wedge, 2011, Managerial ownership and the disposition effect, *Journal of Banking & Finance*, 35, 2407-2417.
- Evans, A.L., 2008, Portfolio manager ownership and mutual fund performance. *Financial Management* 37, 513–534.
- Guay, W.R., 1999. The sensitivity of CEO wealth to equity risk: An analysis of the magnitude and determinants. *Journal of Financial Economics* 53, 43 – 71.
- Hu, Ping, Jayant R. Kale, Marco Pagani, and Ajay Subramanian. 2011. Fund Flows, Performance, Managerial Career Concerns, and Risk-taking. *Management Science* 57, 628-646.
- Huang, J., C. Sialm, and H. Zhang. 2011. Risk Shifting and Mutual Fund Performance. *Review of Financial Studies* 24, 2575–2616.
- Huang, J., K. D. Wei, and H. Yan. 2007. Participation Costs and the Sensitivity of Fund Flows to Past Performance. *Journal of Finance* 62,1273–1311.
- Jensen, M., and W. Meckling, 1976, Theory of the firm: managerial behavior, agency costs and ownership structure. *Journal of Financial Economics* 3, 305-360.
- Kempf, A., and S. Ruenzi. 2008. Tournaments in Mutual Fund Families. *Review of Financial Studies* 21:1013–1036.
- Kempf, A., S. Ruenzi, and T. Thiele. 2009. Employment Risk, Compensation Incentives, and Managerial Risk Taking: Evidence from the Mutual Fund Industry. *Journal of Financial Economics* 92, 92–108.
- Khorana, A., H. Servaes, and L. Wedge, 2007, Portfolio manager ownership and fund performance: an empirical analysis. *Journal of Financial Economics* 40, 403–427.
- Khorana, Ajay, Peter Tufano, and Lei Wedge, 2007, Board structure, mergers and shareholder wealth: A study of the mutual fund industry, *Journal of Financial Economics* 85, 571–598.
- Koski, Jennifer and Jeffrey Pontiff, 1999, How are derivatives used? Evidence from the mutual fund industry, *Journal of Finance* 54, 791-816.
- Leland, Hayne E. and David H. Pyle, 1977, Informational Asymmetries, Financial Structure, and Financial Intermediation, *Journal of Finance* 32, 371-387.

- Massa, M., and R. Patgiri, 2009, Incentives and Mutual Fund Performance: Higher Performance or Just Higher Risk Taking? *Review of Financial Studies* 22:1777–1815
- Meschke, Felix, 2008, An empirical examination of mutual fund boards, Working paper, University of Kansas, Working Paper.
- Morck, R., Shleifer, A., Vishny, R., 1988. Management ownership and market valuation: an empirical analysis. *Journal of Financial Economics* 20, 293–315.
- Roberts, M.R. and T.M. Whited, 2011, Endogeneity in empirical corporate finance, University of Pennsylvania and University of Rochester, Working paper
- Schwarz, Christopher G. 2011, Mutual Fund Tournaments: The Sorting Bias and New Evidence, *Review of Financial Studies*, forthcoming
- Sirri, Erik, and Peter Tufano, 1998, Costly search and mutual fund flows, *Journal of Finance* 53, 1589–1622.
- Spiegel, M., and H. Zhang, 2010, Mutual Fund Risk and Market Share Adjusted Fund Flows, Yale University, Working Paper
- Tang, Yuehua, 2011, Leverage and Liquidity: Evidence from the Closed-End Fund Industry, Georgia State University, Working Paper
- Tufano, Peter, and Matthew Sevick, 1997, Board structure and fee-setting in the U.S. mutual fund industry, *Journal of Financial Economics* 46, 321–355.
- Wermers, Russ, 2000, Mutual Fund Performance: An Empirical Decomposition into Stock-Picking Talent, Style, Transactions Costs, and Expenses, *Journal of Finance* 55, 1655-1695.

**Figure 1 Portfolio Manager Ownership and Fund Investment Objectives**

This figure reports the percentage of funds with managerial ownership in the full sample and across fund investment objectives. Our managerial ownership data covers the sample period from 2009 to 2010.



**Table I Summary Statistics**

This table reports the summary statistics for the sample funds. Panel A reports the summary statistics of portfolio managers' beneficial ownership over the period from 2009 to 2010, both in dollar terms and in percentage terms. When converting the dollar ranges into dollar amounts, Ownership(\$)\_Mean, Ownership(\$)\_Min and Ownership(\$)\_Max assume managerial ownership to be at the midpoint, minimum point and maximum point of the reported interval, respectively. The percentage ownership is computed by dividing the dollar amount of managerial ownership by the total net assets of the fund. Panel B, C, and D report the summary statistics for the other fund characteristics over the period from January 2010 to December 2011. Reported fund characteristics include fund's net return, risk-adjusted return (Carhart (1997) four-factor alpha), total risk, systematic risk, unsystematic risk, total risk shifting, systematic risk shifting, unsystematic risk shifting, leverage ratio, net flows, size, age, expense ratio, turnover ratio, family size, team-managed indicator and managerial tenure. The detailed descriptions on how we construct the above variables are in Section I.B.

	<i>Obs.</i>	<i>Mean</i>	<i>Median</i>	<i>Min</i>	<i>Max</i>	<i>Std. Dev.</i>
<i>Panel A. Managerial Ownership</i>						
Ownership(\$)_Mean	4,576	400,999	40,002	0	9,600,009	703,243
Ownership(\$)_Min	4,576	291,188	10,003	0	8,200,012	613,734
Ownership(\$)_Max	4,576	510,811	70,000	0	11,000,000	822,543
OwnershipOther(\$)_Mean	4,576	1,216,097	300,001	0	29,000,000	2,723,983
Ownership(%)_Mean	4,576	0.810	0.017	0	16.418	2.604
Ownership(%)_Min	4,576	0.484	0.006	0	10.187	1.614
Ownership(%)_Max	4,576	1.102	0.026	0	78.297	3.485
OwnershipOther(%)_Mean	4,576	2.760	0.062	0	21.739	3.485
<i>Panel B. Main Fund Level Variables</i>						
Net Return (%)	4,576	18.553	18.173	-2.556	40.847	7.088
Four-factor Alpha (%)	4,576	-0.062	-0.072	-1.431	1.716	0.390
Total Risk (%)	4,575	4.767	4.722	0.501	7.998	0.931
Systematic Risk (%)	4,575	3.993	3.958	0.339	6.087	0.857
Idiosyncratic Risk (%)	4,575	0.763	0.686	0.065	3.462	0.420
Net Flows	4,264	0.118	-0.041	-0.727	5.651	0.744
Leverage (%)	3,139	2.673	0.258	0.000	26.054	5.564
<i>Panel C. Risk-Shifting Measures</i>						
Total Risk Shifting (%)	12,362	0.164	0.109	-0.635	1.361	0.318
Systematic Risk Shifting (%)	12,362	0.279	0.156	-0.553	2.270	0.468
Idiosyncratic Risk Shifting (%)	12,362	-0.116	-0.034	-1.212	0.406	0.272
<i>Panel D. Control Variables</i>						
Size (Millions)	4,576	1074.8	164.9	0.01	148,285.5	5413.9
Age (Months)	4,576	159.6	130.0	2.0	853.0	147.7
Expense (%)	4,459	1.24	1.27	0.00	2.55	0.47
Turnover (%)	4,448	92.57	63.22	2.00	874.00	108.03
Family Size (Millions)	4,576	81,066	16,198	0.2	1,346,691	208,691
Team	4,576	0.693	1	0	1	0.461
Managerial Tenure (Months)	4,576	64.5	50.0	0	366.0	52.4

**Table II Fund Risk and Managerial Ownership**

This table reports the OLS and IV 2SLS estimations for managerial ownership on the mutual fund risk. The dependent variable is total risk which is the standard deviation of monthly returns of the fund over the 12-month period. The main independent variables of interests are managerial ownership (\$) and managerial ownership (%). Other independent variables include the logarithm of the lagged fund's size, the logarithm of the lagged fund's age, fund's lagged expense ratio, funds' lagged turnover ratio, lagged net flows, the logarithm of the lagged family size, the lagged team-managed indicator, the logarithm of the lagged managerial tenure and the lagged total risk. All variables are defined as in Section I.B. We control for the investment objective (style) fixed effects and the time fixed effects. The standard errors are clustered at the fund level. Statistical significance of 1%, 5%, and 10% is indicated by \*\*\*, \*\*, and \* respectively.

<i>Dependent Variable</i>	<i>OLS</i>		<i>IV</i>	
	<i>Total Risk<sub>t</sub></i>		<i>Total Risk<sub>t</sub></i>	
	(1)	(2)	(3)	(4)
<i>Ownership(\$)<sub>t-1</sub></i>	-0.0057*** (-3.21)		-0.0380* (-1.91)	
<i>Ownership(%)<sub>t-1</sub></i>		-0.0109** (-1.99)		-0.0120 (-0.88)
<i>Log Size<sub>t-1</sub></i>	-0.0137* (-1.78)	-0.0230*** (-2.94)	0.0353** (2.06)	0.0019 (0.17)
<i>Log Age<sub>t-1</sub></i>	0.0281** (2.10)	0.0268** (2.00)	-0.0255 (-1.42)	-0.0246 (-1.40)
<i>Expense<sub>t-1</sub></i>	0.0339 (1.21)	0.0196 (0.73)	0.1394** (2.44)	0.0545 (1.56)
<i>Turnover<sub>t-1</sub></i>	0.0006*** (3.29)	0.0006*** (3.36)	0.0004** (1.97)	0.0005** (2.48)
<i>Net Flows<sub>t-1</sub></i>	-0.0113 (-1.12)	-0.0164 (-1.62)	0.0021 (0.13)	-0.0193 (-1.49)
<i>Log Family Size<sub>t-1</sub></i>	0.0237*** (4.43)	0.0258*** (4.97)	0.0022 (0.17)	0.0234*** (3.59)
<i>Team<sub>t-1</sub></i>	0.0476** (2.16)	0.0439** (2.00)	0.0441 (1.30)	0.0147 (0.53)
<i>Managerial Tenure<sub>t-1</sub></i>	0.0150 (1.23)	0.0086 (0.71)	0.0388 (1.11)	-0.0162 (-1.01)
<i>Total Risk<sub>t-1</sub></i>	0.2026*** (45.10)	0.2033*** (45.12)	0.2027*** (45.02)	0.2044*** (44.61)
Constant	2.7672*** (28.28)	2.8012*** (28.20)	5.1014*** (38.63)	5.1356*** (35.53)
Style Fixed Effects	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes
Observations	4,167	4,167	4,167	4,167
R-squared	0.559	0.558	0.208	0.244



**Table III Fund Risk Shifting and Managerial Ownership**

This table reports the OLS and IV 2SLS estimations for managerial ownership on the managers' risk shifting behavior. The dependent variable, *Risk Shift*, is the difference between a fund's current holdings volatility and its past realized volatility as in Equation (2). The main independent variables of interests are managerial ownership (\$) and managerial ownership (%). Other independent variables include the logarithm of the lagged fund's size, the logarithm of the lagged fund's age, fund's lagged expense ratio, funds' lagged turnover ratio, lagged net flows, the logarithm of the lagged family size, the lagged team-managed indicator, and the logarithm of the lagged managerial tenure. All variables are defined as in Section I.B. We control for the investment objective (style) fixed effects and the time fixed effects. The standard errors are clustered at the fund level. Statistical significance of 1%, 5%, and 10% is indicated by \*\*\*, \*\*, and \* respectively.

<i>Dependent Variable</i>	<i>OLS</i>		<i>IV</i>	
	<i>Risk Shift<sub>t</sub></i>		<i>Risk Shift<sub>t</sub></i>	
	(1)	(2)	(3)	(4)
<i>Ownership(\$)<sub>t-1</sub></i>	-0.0068*** (-8.27)		-0.0128*** (-3.11)	
<i>Ownership(%)<sub>t-1</sub></i>		-0.0056*** (-2.75)		-0.0066** (-2.57)
<i>Log Size<sub>t-1</sub></i>	0.0066* (1.92)	-0.0010 (-0.28)	0.0135*** (3.62)	0.0011 (0.45)
<i>Log Age<sub>t-1</sub></i>	-0.0016 (-0.24)	-0.0036 (-0.53)	-0.0101** (-2.35)	-0.0127*** (-2.96)
<i>Expense<sub>t-1</sub></i>	-0.1065*** (-7.57)	-0.1206*** (-8.27)	-0.0948*** (-8.39)	-0.1201*** (-15.17)
<i>Turnover<sub>t-1</sub></i>	0.0002** (2.02)	0.0002** (2.35)	0.0001* (1.85)	0.0001*** (3.23)
<i>Net Flows<sub>t-1</sub></i>	-0.0157** (-2.00)	-0.0242*** (-3.10)	-0.0101 (-1.60)	-0.0249*** (-4.96)
<i>Log Family Size<sub>t-1</sub></i>	0.0073*** (3.66)	0.0105*** (5.28)	0.0024 (0.85)	0.0088*** (6.26)
<i>Team<sub>t-1</sub></i>	0.0047 (0.47)	0.0023 (0.23)	0.0028 (0.45)	-0.0015 (-0.24)
<i>Managerial Tenure<sub>t-1</sub></i>	-0.0036 (-0.65)	-0.0129** (-2.35)	0.0011 (0.16)	-0.0170*** (-4.70)
Constant	0.4038*** (8.90)	0.4308*** (9.10)	0.2883*** (11.07)	0.3156*** (10.75)
Style Fixed Effects	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes
Observations	11,637	11,637	11,637	11,637
R-squared	0.224	0.212	0.088	0.087

**Table IV Fund Leverage and Managerial Ownership**

This table reports the OLS and IV 2SLS estimations for managerial ownership on fund leverage usage. The dependent variable, *leverage ratio*, is the option and short sale related leverage over the total net assets of the fund. The main independent variables of interests are managerial ownership (\$) and managerial ownership (%). Other independent variables include the logarithm of the lagged fund's size, the logarithm of the lagged fund's age, fund's lagged expense ratio, funds' lagged turnover ratio, lagged net flows, the logarithm of the lagged family size, the lagged team-managed indicator, the logarithm of the lagged managerial tenure and the lagged total risk. All variables are defined as in Section I.B. We control for the investment objective (style) fixed effects and the time fixed effects. The standard errors are clustered at the fund level. Statistical significance of 1%, 5%, and 10% is indicated by \*\*\*, \*\*, and \* respectively.

<i>Dependent Variable</i>	<i>OLS</i>		<i>IV</i>	
	<i>Leverage Ratio<sub>t</sub></i>		<i>Leverage Ratio<sub>t</sub></i>	
	(1)	(2)	(3)	(4)
<i>Ownership(\$)<sub>t-1</sub></i>	-0.0826*** (-3.31)		-0.1613 (-0.85)	
<i>Ownership(%)<sub>t-1</sub></i>		-0.0755*** (-3.62)		-0.3080*** (-4.48)
<i>Log Size<sub>t-1</sub></i>	0.0206 (0.23)	-0.0907 (-1.02)	0.0819 (0.54)	-0.2352*** (-2.87)
<i>Log Age<sub>t-1</sub></i>	0.5091** (2.56)	0.4904** (2.45)	0.5061*** (3.37)	0.4230*** (2.80)
<i>Expense<sub>t-1</sub></i>	1.5855*** (3.97)	1.3739*** (3.46)	1.7558*** (3.49)	1.2730*** (4.16)
<i>Turnover<sub>t-1</sub></i>	0.0031* (1.86)	0.0034** (2.05)	0.0085*** (5.70)	0.0036*** (2.70)
<i>Net Flows<sub>t-1</sub></i>	-0.0244 (-1.09)	-0.0378* (-1.68)	-0.0167 (-0.69)	-0.0541*** (-3.03)
<i>Log Family Size<sub>t-1</sub></i>	0.2363*** (4.22)	0.2729*** (5.03)	0.1883 (1.55)	0.2304*** (5.34)
<i>Team<sub>t-1</sub></i>	0.8769*** (3.18)	0.7900*** (2.95)	0.9842*** (2.91)	0.8690*** (4.23)
<i>Managerial Tenure<sub>t-1</sub></i>	-0.2397 (-1.15)	-0.3478* (-1.72)	-0.1268 (-0.41)	-0.3157** (-2.08)
<i>Total Risk<sub>t-1</sub></i>	0.1246 (1.39)	0.1226 (1.37)	0.1471* (1.70)	0.1890*** (2.71)
Constant	-4.9758*** (-3.79)	-4.5672*** (-3.44)	-4.9811*** (-5.03)	-3.3253*** (-3.17)
Style Fixed Effects	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes
Observations	3,062	3,062	3,062	3,062
R-squared	0.061	0.057	0.055	0.038

**Table V Systematic vs. Idiosyncratic Risk and Managerial Ownership**

This table reports the OLS and IV 2SLS estimations for managerial ownership on fund systematic risk and idiosyncratic risk. We decompose *Total Risk* measures into *Systematic risk* and *Idiosyncratic risk* and use these two measures as the dependent variables. The main independent variables of interests are managerial ownership (\$) and managerial ownership (%). Other independent variables include the logarithm of the lagged fund's size, the logarithm of the lagged fund's age, fund's lagged expense ratio, funds' lagged turnover ratio, lagged net flows, the logarithm of the lagged family size, the lagged team-managed indicator, the logarithm of the lagged managerial tenure and the lagged total risk. All variables are defined as in Section I.B. We control for the investment objective (style) fixed effects and the time fixed effects. The standard errors are clustered at the fund level. Statistical significance of 1%, 5%, and 10% is indicated by \*\*\*, \*\*, and \* respectively.

<i>Dependent Variable</i>	<i>OLS</i>				<i>IV</i>			
	<i>Sys. Risk</i> (1)	<i>Sys. Risk</i> (2)	<i>Idio. Risk</i> (3)	<i>Idio. Risk</i> (4)	<i>Sys. Risk</i> (5)	<i>Sys. Risk</i> (6)	<i>Idio. Risk</i> (7)	<i>Idio. Risk</i> (8)
<i>Ownership(\$)<sub>t-1</sub></i>	-0.0123*** (-6.94)		0.0078*** (7.95)		-0.0552*** (-2.84)		0.0210** (2.33)	
<i>Ownership(%)<sub>t-1</sub></i>		-0.0236*** (-3.69)		0.0159*** (5.12)		-0.0364*** (-2.61)		0.0268*** (4.45)
<i>Log Size<sub>t-1</sub></i>	-0.0176** (-2.24)	-0.0377*** (-4.91)	0.0063 (1.38)	0.0195*** (4.23)	0.0354** (2.08)	-0.0218** (-2.04)	-0.0002 (-0.02)	0.0275*** (5.23)
<i>Log Age<sub>t-1</sub></i>	0.0582*** (4.22)	0.0555*** (3.99)	-0.0293*** (-3.74)	-0.0275*** (-3.50)	0.0113 (0.64)	0.0095 (0.55)	-0.0347*** (-4.18)	-0.0317*** (-3.94)
<i>Expense<sub>t-1</sub></i>	-0.1496*** (-5.59)	-0.1808*** (-7.05)	0.1683*** (10.92)	0.1883*** (12.52)	-0.0265 (-0.48)	-0.1530*** (-4.79)	0.1440*** (5.46)	0.1944*** (12.79)
<i>Turnover<sub>t-1</sub></i>	0.0001 (0.27)	0.0001 (0.46)	0.0004*** (4.09)	0.0004*** (3.92)	-0.0001 (-0.50)	0.0001 (0.26)	0.0005*** (4.19)	0.0004*** (3.83)
<i>Net Flows<sub>t-1</sub></i>	-0.0105 (-1.17)	-0.0217** (-2.40)	0.0001 (0.02)	0.0074 (1.28)	0.0084 (0.55)	-0.0268** (-2.36)	-0.0067 (-0.88)	0.0095 (1.58)
<i>Log Family Size<sub>t-1</sub></i>	0.0466*** (8.67)	0.0512*** (9.68)	-0.0240*** (-7.90)	-0.0268*** (-9.04)	0.0192 (1.47)	0.0477*** (7.47)	-0.0164*** (-2.63)	-0.0258*** (-8.31)
<i>Team<sub>t-1</sub></i>	0.0921*** (4.24)	0.0840*** (3.87)	-0.0511*** (-4.06)	-0.0460*** (-3.65)	0.1012*** (3.16)	0.0597** (2.28)	-0.0652*** (-4.28)	-0.0502*** (-3.93)
<i>Managerial Tenure<sub>t</sub></i>	-0.0015 (-0.12)	-0.0154 (-1.27)	0.0120* (1.81)	0.0206*** (3.14)	0.0419 (1.24)	-0.0344** (-2.25)	-0.0110 (-0.74)	0.0156** (2.34)
<i>Total Risk<sub>t-1</sub></i>	0.1726*** (39.46)	0.1741*** (39.43)	0.0254*** (9.97)	0.0244*** (9.50)	0.1724*** (39.68)	0.1757*** (38.93)	0.0257*** (9.85)	0.0239*** (9.21)
Constant	2.2427*** (21.83)	2.3162*** (22.05)	0.5886*** (10.91)	0.5380*** (9.67)	4.3386*** (34.13)	4.4734*** (32.18)	0.7591*** (14.58)	0.6499*** (11.06)
Style Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4,167	4,167	4,167	4,167	4,167	4,167	4,167	4,167
R-squared	0.470	0.467	0.297	0.293	0.123	0.193	0.242	0.269

**Table VI Systematic vs. Idiosyncratic Risk Shifting and Managerial Ownership**

This table reports the OLS and IV 2SLS estimations for managerial ownership on fund systematic risk shifting and idiosyncratic risk shifting. We decompose *Total Risk Shifting* measures into *Systematic Risk Shifting* and *Idiosyncratic Risk Shifting* and use these two measures as the dependent variables. The main independent variables of interests are managerial ownership (\$) and managerial ownership (%). Other independent variables include the logarithm of the lagged fund's size, the logarithm of the lagged fund's age, fund's lagged expense ratio, funds' lagged turnover ratio, lagged net flows, the logarithm of the lagged family size, the lagged team-managed indicator, and the logarithm of the lagged managerial tenure. All variables are defined as in Section I.B. We control for the investment objective (style) fixed effects and the time fixed effects. The standard errors are clustered at the fund level. Statistical significance of 1%, 5%, and 10% is indicated by \*\*\*, \*\*, and \* respectively.

<i>Dependent Variable</i>	<i>OLS</i>				<i>IV</i>			
	<i>Sys. Risk</i> (1)	<i>Sys. Risk</i> (2)	<i>Idio. Risk</i> (3)	<i>Idio. Risk</i> (4)	<i>Sys. Risk</i> (5)	<i>Sys. Risk</i> (6)	<i>Idio. Risk</i> (7)	<i>Idio. Risk</i> (8)
<i>Ownership(\$)<sub>t-1</sub></i>	-0.0138*** (-9.41)		0.0069*** (7.98)		-0.0170*** (-3.04)		0.0047 (1.40)	
<i>Ownership(%)<sub>t-1</sub></i>		-0.0077** (-2.25)		0.0024 (1.35)		-0.0107*** (-3.37)		0.0042** (2.32)
<i>Log Size<sub>t-1</sub></i>	0.0144** (2.49)	0.0008 (0.13)	-0.0082** (-2.42)	-0.0021 (-0.59)	0.0193*** (4.01)	0.0020 (0.62)	-0.0066** (-2.29)	-0.0013 (-0.67)
<i>Log Age<sub>t-1</sub></i>	-0.0040 (-0.34)	-0.0071 (-0.59)	0.0028 (0.40)	0.0039 (0.56)	-0.0127** (-2.23)	-0.0168*** (-2.90)	0.0029 (0.88)	0.0044 (1.30)
<i>Expense<sub>t-1</sub></i>	-0.2467*** (-9.47)	-0.2742*** (-10.01)	0.1401*** (9.33)	0.1535*** (9.77)	-0.2403*** (-15.06)	-0.2743*** (-23.04)	0.1442*** (15.34)	0.1539*** (22.29)
<i>Turnover<sub>t-1</sub></i>	0.0002 (1.49)	0.0002* (1.89)	-0.0001 (-0.50)	-0.0001 (-0.86)	0.0001** (2.10)	0.0002*** (3.37)	-0.0000 (-1.17)	-0.0001* (-1.69)
<i>Net Flows<sub>t-1</sub></i>	-0.0100 (-0.82)	-0.0261** (-2.10)	-0.0086 (-1.37)	-0.0010 (-0.15)	-0.0073 (-0.86)	-0.0275*** (-4.01)	-0.0064 (-1.27)	-0.0004 (-0.10)
<i>Log Family Size<sub>t-1</sub></i>	0.0100*** (3.03)	0.0169*** (5.17)	-0.0025 (-1.26)	-0.0062*** (-3.09)	0.0067* (1.87)	0.0150*** (8.55)	-0.0038* (-1.78)	-0.0060*** (-5.83)
<i>Team<sub>t-1</sub></i>	0.0140 (0.81)	0.0093 (0.52)	-0.0077 (-0.75)	-0.0054 (-0.51)	0.0113 (1.31)	0.0055 (0.65)	-0.0071 (-1.39)	-0.0055 (-1.09)
<i>Managerial Tenure<sub>t</sub></i>	0.0003 (0.03)	-0.0192** (-2.08)	-0.0032 (-0.59)	0.0067 (1.22)	0.0007 (0.07)	-0.0229*** (-4.68)	0.0000 (0.00)	0.0064** (2.22)
Constant	0.7150*** (9.04)	0.7488*** (8.98)	-0.3123*** (-6.95)	-0.3207*** (-6.79)	0.5626*** (15.76)	0.6106*** (15.03)	-0.2787*** (-13.34)	-0.2988*** (-12.80)
Style Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	11,637	11,637	11,637	11,637	11,637	11,637	11,637	11,637
R-squared	0.266	0.239	0.218	0.197	0.214	0.188	0.203	0.184

**Table VII Fund Performance and Managerial Ownership**

This table reports the OLS and IV 2SLS estimations for managerial ownership on the mutual fund performance. The dependent variable is risk-adjusted return measured as Carhart (1997) four-factor alpha. The main independent variables of interests are managerial ownership (\$) and managerial ownership (%). Other independent variables include the logarithm of the lagged fund's size, the logarithm of the lagged fund's age, fund's lagged expense ratio, funds' lagged turnover ratio, lagged net flows, the logarithm of the lagged family size, the lagged team-managed indicator, and the logarithm of the lagged managerial tenure. All variables are defined as in Section I.B. We control for the investment objective (style) fixed effects and the time fixed effects. The standard errors are clustered at the fund level. Statistical significance of 1%, 5%, and 10% is indicated by \*\*\*, \*\*, and \* respectively.

<i>Dependent Variable</i>	<i>OLS</i>		<i>IV</i>	
	<i>Four-factor Alpha<sub>t</sub></i>		<i>Four-factor Alpha<sub>t</sub></i>	
	(1)	(2)	(3)	(4)
<i>Ownership(\$)<sub>t-1</sub></i>	0.0023** (2.19)		0.0180* (1.88)	
<i>Ownership(%)<sub>t-1</sub></i>		0.0093** (2.39)		0.0283*** (3.46)
<i>Log Size<sub>t-1</sub></i>	-0.0132*** (-2.81)	-0.0073 (-1.50)	-0.0248*** (-2.87)	0.0014 (0.25)
<i>Log Age<sub>t-1</sub></i>	0.0031 (0.36)	0.0045 (0.53)	0.0043 (0.49)	0.0078 (0.90)
<i>Expense<sub>t-1</sub></i>	-0.0595*** (-3.82)	-0.0530*** (-3.52)	-0.0940*** (-3.44)	-0.0497*** (-3.25)
<i>Turnover<sub>t-1</sub></i>	-0.0003*** (-3.83)	-0.0003*** (-3.89)	-0.0003*** (-3.12)	-0.0003*** (-3.82)
<i>Net Flows<sub>t-1</sub></i>	-0.0042 (-0.67)	-0.0011 (-0.18)	-0.0121 (-1.50)	0.0030 (0.46)
<i>Log Family Size<sub>t-1</sub></i>	0.0108*** (3.34)	0.0105*** (3.31)	0.0202*** (3.13)	0.0127*** (3.72)
<i>Team<sub>t-1</sub></i>	-0.0017 (-0.13)	-0.0005 (-0.04)	-0.0142 (-0.94)	-0.0017 (-0.13)
<i>Managerial Tenure<sub>t-1</sub></i>	-0.0033 (-0.46)	-0.0016 (-0.23)	-0.0271* (-1.71)	-0.0052 (-0.72)
Constant	0.1659*** (3.00)	0.1256** (2.24)	0.1903*** (3.32)	0.0730 (1.09)
Style Fixed Effects	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes
Observations	4,168	4,168	4,168	4,168
R-squared	0.085	0.086	0.032	0.075

**Table VIII Fund Flows and Managerial Ownership**

This table reports the OLS and IV 2SLS estimations for managerial ownership on the mutual fund flows. The dependent variable is the net flows. The main independent variables of interests are managerial ownership (\$) and managerial ownership (%). Other independent variables include the logarithm of the lagged fund's size, the logarithm of the lagged fund's age, fund's lagged expense ratio, funds' lagged turnover ratio, lagged net flows, the logarithm of the lagged family size, the lagged team-managed indicator, the logarithm of the lagged managerial tenure, the lagged net reutr, the lagged four-factor alpha, the lagged total risk and the lagged idiosyncratic risk. All variables are defined as in Section I.B. We control for the investment objective (style) fixed effects and the time fixed effects. The standard errors are clustered at the fund level. Statistical significance of 1%, 5%, and 10% is indicated by \*\*\*, \*\*, and \* respectively.

<i>Dependent Variable</i>	<i>OLS</i>		<i>IV</i>	
	<i>Net Flows<sub>t</sub></i>		<i>Net Flows<sub>t</sub></i>	
	(1)	(2)	(3)	(4)
<i>Ownership(\$)<sub>t-1</sub></i>	0.0123*** (6.61)		0.0253 (1.48)	
<i>Ownership(%)<sub>t-1</sub></i>		0.0215** (2.23)		0.0831*** (2.73)
<i>Log Size<sub>t-1</sub></i>	-0.0527*** (-5.35)	-0.0338*** (-3.54)	-0.0621*** (-3.59)	-0.0050 (-0.39)
<i>Log Age<sub>t-1</sub></i>	-0.0464** (-2.44)	-0.0433** (-2.28)	-0.0463*** (-2.60)	-0.0344* (-1.86)
<i>Expense<sub>t-1</sub></i>	-0.0344 (-1.25)	-0.0051 (-0.20)	-0.0586 (-1.33)	0.0140 (0.49)
<i>Turnover<sub>t-1</sub></i>	0.0001 (0.65)	0.0001 (0.43)	0.0001 (0.85)	0.0001 (0.67)
<i>Net Flows<sub>t-1</sub></i>	0.1472*** (4.57)	0.1579*** (4.94)	0.1411*** (4.44)	0.1724*** (5.48)
<i>Log Family Size<sub>t-1</sub></i>	0.0080 (1.41)	0.0035 (0.62)	0.0150 (1.36)	0.0094 (1.27)
<i>Team<sub>t-1</sub></i>	-0.0452** (-2.24)	-0.0369* (-1.83)	-0.0567** (-2.12)	-0.0442** (-2.11)
<i>Managerial Tenure<sub>t-1</sub></i>	-0.0250* (-1.91)	-0.0111 (-0.89)	-0.0435 (-1.62)	-0.0210 (-1.64)
<i>Net Return<sub>t-1</sub></i>	0.0043*** (3.32)	0.0039*** (3.01)	0.0044*** (3.35)	0.0032** (2.30)
<i>Four-factor Alpha<sub>t-1</sub></i>	0.1690*** (7.36)	0.1682*** (7.24)	0.1682*** (7.64)	0.1633*** (7.12)
<i>Total Risk<sub>t-1</sub></i>	0.0351*** (3.39)	0.0308*** (2.96)	0.0383*** (3.31)	0.0274** (2.55)
<i>Idiosyncratic Risk<sub>t-1</sub></i>	0.0201 (0.61)	0.0265 (0.79)	-0.0001 (-0.00)	-0.0094 (-0.24)
Constant	0.2381* (1.87)	0.1878 (1.50)	0.2448* (1.72)	-0.0085 (-0.05)
Style Fixed Effects	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes
Observations	4,105	4,105	4,105	4,105
R-squared	0.169	0.163	0.157	0.125