



# Portfolio manager ownership and fund performance<sup>☆</sup>

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## Abstract

This paper documents the range of portfolio manager ownership in the funds they manage and examines whether higher ownership is associated with improved future performance. Almost half of all managers have ownership stakes in their funds, though the absolute investment is modest. Future risk-adjusted performance is positively related to managerial ownership, with performance improving by about 3 basis points for each basis point of managerial ownership. These findings persist after controlling for various measures of fund board effectiveness. Fund manager ownership is higher in funds with better past performance, lower front-end loads, smaller size, longer managerial tenure, and funds affiliated with smaller families. It is also higher in funds with higher board member compensation and in equity funds relative to bond funds. Future performance is positively related to the component of ownership that can be predicted by other variables, as well as the unpredictable component. Our findings support the notion that managerial ownership has desirable incentive

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alignment attributes for mutual fund investors and indicate that the disclosure of this information is useful in making portfolio allocation decisions.

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## 1. Introduction

As of March 2005, managers of US mutual funds are required to disclose how much of their personal wealth is invested in the funds they manage, using the following ranges: \$0, \$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. The new disclosure requirements are part of a series of new regulations introduced by the Securities and Exchange Commission (SEC) in 2004 in response to a number of scandals in the fund industry.<sup>1</sup> These regulations are aimed at improving transparency and oversight, thereby leading to improved protection of fund investors. Regarding the disclosure of fund manager ownership, the SEC argues that “a portfolio manager’s ownership in a fund provides a direct indication of his or her alignment with the interests of shareholders in that fund.”<sup>2</sup>

We use this newly available managerial ownership information to investigate whether fund managers who own a larger stake in the funds they manage perform better and to explore the determinants of fund manager ownership. We also shed light on the importance of fund manager ownership within the broader context of fund governance by examining the effect of other governance mechanisms, and in particular the role of the fund board, on performance. We proxy for board effectiveness using a variety of measures such as the size of the board, the degree of board independence, and board member compensation.

Regulators in other countries and members of the US fund industry have argued that the increased disclosure of fund manager ownership is not necessarily helpful. David Cliffe at the Financial Services Authority (an independent non-government agency in the UK that provides services to firms it regulates) stated in an interview ([Financial Times, 2005, p. 28](#)): “From a cost–benefit analysis, we just don’t see meaningful value for investors in requiring funds to disclose such information.” Even the Investment Company Institute (ICI), a trade association of US mutual funds, which eventually became supportive of the policy, had some initial concerns that such disclosures might inadvertently emphasize issues immaterial to investors and raise privacy issues. Objections also came from large fund families such as Vanguard and Fidelity. Both publicly expressed their doubts regarding the impact of disclosing fund managers’ personal stakes in their own funds. For example, Fidelity spokeswoman Anne Crowley argued that “knowing a manager’s stake in a fund may tell potential investors whether the fund makes sense for the manager’s personal

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<sup>1</sup>In response to various late trading scandals and market timing problems, mutual fund advisory firms have been hit with penalties exceeding \$4 billion to date.

<sup>2</sup>SEC Rule S7-12-04, Disclosure Regarding Portfolio Managers of Registered Management Investment Companies.

portfolio, but does not tell investors whether the fund fits into their own portfolio.” (Wall Street Journal, 2005, p. C1)

The goal of this article is to determine whether these fund manager ownership disclosures are useful for investors, in particular, in their ability to predict future performance. We start by describing the ownership stakes of all fund managers who provide this information as of year-end 2004. While 57% of portfolio managers do not own any stake in the funds they manage, using the most conservative estimates (based on ownership at the bottom of the range), the average manager has a stake of \$97,000 with the 90th percentile of the distribution being \$160,000. The average ownership represents 0.04% of assets under management; the 90th percentile is 0.09%. Ownership levels are highest in domestic equity funds, with an average ownership of about \$155,000, and a 90th percentile of \$510,000. These amounts represent 0.05% and 0.15% of assets under management, respectively. Even though these stakes are modest, we find that they are sufficiently large to affect excess fund performance in 2005. In particular, for every basis point increase in managerial ownership in the fund, we find that performance increases by between 2.4 and 5 basis points, depending on the model specification and the control variables included. Given that the academic literature has not been very successful in identifying factors that can be employed to predict mutual fund returns, we believe that this is a significant finding.

We do not find evidence of a robust relationship between non-ownership-related governance mechanisms (in particular, board characteristics such as board size, board independence, and board member compensation) and future performance. This is perhaps not surprising. The board of a fund is not directly involved in day-to-day management of the portfolio. While previous studies have found that board structure affects fees (see, for example, Tufano and Sevick, 1997; Del Guercio, Dann, and Partch, 2003) and approval of fund mergers (see Khorana, Tufano, and Wedge, 2007), the board is less likely to directly impact performance. The manager of the fund bears the responsibility for the fund's returns, and the manager's incentives are therefore more likely to affect performance. In addition, the fund manager is more likely to be better informed about the future performance of the fund, which could lead the manager to acquire a larger fraction of the fund.

We perform an additional test to study the importance of managerial ownership as it relates to fund performance. Specifically, we examine the subsample of managers who run multiple funds to ascertain whether they undertake greater personal investments in those funds that exhibit superior performance in the future. We find that this is the case, lending further credence to the notion that the relationship we uncover is not the result of unobservable managerial characteristics that happen to be correlated with managerial ownership in the fund.

It is possible that some of the cross-sectional variation in ownership can be explained by other observable fund, family, and manager characteristics, and future performance could be affected by these characteristics, not by ownership per se. We therefore explore the determinants of fund manager ownership by decomposing ownership into two components: the fraction that can be explained by other characteristics and the residual. We find that managers own a larger share of smaller funds, funds that have performed well in the past, funds that charge a lower front-end load, and funds that belong to smaller families. Not surprisingly, they also own a larger stake in funds they have been managing for a longer duration. In addition, managers of equity funds own a larger share of their

funds than managers of bond funds. We find no significant relationship between managerial ownership and measures of board effectiveness, except for average board member compensation, which is positively correlated with ownership.

Both the fraction of ownership that can be explained by the above variables and the residual are significant in predicting future fund performance. This implies that the importance of managerial ownership for future performance is not subsumed by other observable characteristics, but that this is new information, useful for fund investors.

Overall, our findings indicate that fund managers have superior information about their expected future performance or that increased ownership in the fund improves the incentives of managers to generate superior returns or both. Regardless of the source of the relationship between ownership and performance, during our sample period, fund investors could have employed managerial ownership information to predict future returns.

Our study contributes to three areas of research. First, there is a scant literature studying whether fund and fund manager characteristics can be employed to predict future performance (see, for example, Chevalier and Ellison, 1999). While evidence in support of predictability is mixed, at best, our findings indicate that managerial ownership has predictive power in explaining future returns. Second, there is an emerging literature studying the effectiveness of various aspects of governance in the fund industry. Our paper adds to this literature by suggesting that managerial ownership helps align a fund manager's interests with the interests of mutual fund shareholders. Third, there is a large literature studying the relation between firm performance and insider ownership for corporations. The consensus in this literature is that such a relation exists, but fierce debate is ongoing as to whether this implies that firms can alter value by changing their ownership structure (see, for example, Morck, Shleifer, and Vishny, 1988; McConnell and Servaes, 1990; Demsetz and Villalonga, 2001; McConnell, Servaes, and Lins, 2007). Our paper suggests that a fund manager's ownership is related to future performance, even after taking into account the fact that we can explain some of the cross-sectional variation in ownership using fund, family, and manager characteristics.

The remainder of this paper is organized as follows. Section 2 discusses the institutional background and various aspects of fund governance. Section 3 describes the data and hypotheses. Section 4 discusses the results on the relationship between fund manager ownership and subsequent performance, and Section 5 studies the determinants of fund manager ownership. Section 6 decomposes ownership into its predicted and residual components and analyzes whether both are related to future performance. Section 7 concludes the paper.

## **2. Institutional background, incentives of portfolio managers, and fund governance**

Mutual funds are investment companies that pool capital from shareholders and invest it in a diversified portfolio of assets. According to the Investment Company Institute 2006 Factbook, US mutual funds managed a record \$8.9 trillion in total assets by year-end 2005. The US mutual fund market is the largest in the world, accounting for half of the \$17.8 trillion in fund assets worldwide. More than five hundred fund sponsors in the US manage these assets across a total of 8454 funds. In 2005, 20% of total household financial assets were invested in mutual funds, and nearly half of all US households owned mutual funds.

Mutual funds have a distinctive organizational structure. A typical mutual fund consists of shareholders, a board of directors, the fund adviser, and the portfolio manager. Shareholders, who are also consumers of funds, are the owners of the funds with voting rights. They select funds that meet their underlying investment objective and purchase shares through different channels such as brokerage accounts, retirement plans, or insurance policies. Mutual fund shareholders entrust the board of directors to represent their interests, who in turn negotiate contracts with the fund adviser for the fund's daily management. Portfolio managers are employees of the fund advisers, and their compensation is at the adviser's discretion.

### 2.1. Fund manager incentives

Four primary mechanisms are available to create the appropriate incentives for fund managers. The first mechanism is the compensation contract: The salary and bonus of the fund manager can be based on fund performance. Not much is known about the nature of the compensation contract because these data do not have to be publicly disclosed. Whatever little is known is based on survey evidence. According to the [CFA Institute and Russell Reynolds Associates \(2005\)](#), the median compensation in 2005 of US CFA members who are portfolio managers ranges from \$176,000 for managers of domestic equity funds to \$310,000 for managers of global fixed income funds. Of this amount, the median bonus is \$30,000 for domestic equity fund managers and \$125,000 for global fixed income fund managers. Among the factors that determine bonuses, individual investment performance is the most important criterion, but the organization's business performance (e.g., profitability) is also important, along with the investment performance of the entire organization. Given the myriad of factors that enter into the bonus decision, the strength of the link between pay and investment performance is unclear. [Farnsworth and Taylor \(2006\)](#) reach similar conclusions in their compensation survey of portfolio managers.

The second mechanism is dismissal: Fund managers who perform poorly can be removed from their job. Evidence by [Khorana \(1996\)](#), [Chevalier and Ellison \(1999\)](#), and [Ding and Wermers \(2005\)](#) suggests that poorly performing managers are more likely to be dismissed and that the strength of this relationship depends on various fund and manager characteristics.

The third mechanism is removal of the fund management company by the board of directors of the fund. Given that the portfolio manager is employed by the fund management company, this also leads to the dismissal of the fund manager. However, recent evidence ([Kuhnen, 2005](#); [Khorana, Tufano, and Wedge, 2007](#)) suggests that this has happened in only a few isolated cases.<sup>3</sup>

In this article, we study an alternative mechanism, which is normally not the result of the contract between fund managers and fund families, but relies on the personal portfolio decision of the fund managers, namely, the share ownership of the managers in the funds they oversee. While we cannot exclude the possibility that managers are required by the fund management company to invest some of their personal wealth in the funds they

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<sup>3</sup>Another mechanism that can be employed by the fund board to control the behavior of the fund managers is to constrain their investment policy. [Almazan, Brown, Carlson, and Chapman \(2004\)](#) study the constraints in the mutual fund managers' investment policies. They find that restrictions are more common when fund boards contain a higher proportion of inside directors, but variations in restrictions do not affect risk-adjusted returns.

manage, we find little evidence to suggest that such requirements are a common occurrence.<sup>4</sup> We therefore believe that the portfolio manager often voluntarily decides to invest personal capital in the fund. This argument suggests that increased ownership in the fund improves the incentives of the fund manager to outperform. Another possibility is that managers simply have superior information with respect to the expected performance of the funds they manage and purchase shares in the funds they expect to outperform in the future. While we are unable to distinguish between the incentives and information interpretations in this paper, from the perspective of potential investors in the fund, both explanations are helpful because they allow them to predict future performance.

## 2.2. Other aspects of fund governance

While the fund manager bears the responsibility for the day-to-day portfolio decisions of the fund, the fund's board is responsible for managerial oversight. Prior research has highlighted certain characteristics that make boards more effective.

Specifically, the importance of board size and independence (as measured by the proportion of unaffiliated directors) has been studied in a variety of settings. In the corporate finance literature, Yermack (1996) shows an inverse relationship between board size and measures of firm value, while two articles in the mutual fund literature (Tufano and Sevick, 1997; Del Guercio, Dann, and Partch, 2003) find that funds with smaller boards and boards that consist of more independent directors have lower expense ratios. A number of other articles also provide evidence on the importance of having more independent directors on a fund's board. Khorana, Tufano, and Wedge (2007) find that more independent boards are less tolerant of poor performance when initiating fund merger decisions. Zitzewitz (2003) reports that more independent boards are more likely to take action to prevent market timing via the adoption of fair value pricing practices. Finally, Ding and Wermers (2005) find a positive relationship between board independence and future performance in US equity funds.

The academic literature has also devoted attention to the role of director compensation and ownership. For instance, Tufano and Sevick (1997) find evidence that highly paid independent directors approve higher fund fees, leading to deterioration in fund performance. Cremers, Driessen, Maenhout, and Weinbaum (2006) show that ownership levels of both independent and affiliated fund directors positively influence a fund's performance. Finally, in their study of mutual fund mergers, Khorana, Tufano, and Wedge (2007) find evidence that highly paid target boards are less likely to approve across family mergers, because these mergers tend to be associated with significant wealth losses for the board members of the target fund.

In our analyses, we study the effect of fund manager ownership on future performance in conjunction with many of the board effectiveness measures discussed above.

## 2.3. Other elements of fund and fund family organization

In this section we discuss three other aspects of fund and fund family organization. First, some managers are responsible for managing multiple funds within a family. This feature

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<sup>4</sup>There is some anecdotal evidence that a few investment advisers have just recently started requiring their managers to hold ownership stakes in the funds they manage (Wall Street Journal, 2006).

allows us to address the following question: Do managers who manage multiple funds own a larger stake in those funds that perform better subsequently? Answering this question also addresses a possible concern with the interpretation of our findings. Managerial ownership could be correlated with unobservable managerial characteristics that are affecting performance. If this is the case, then the effect of ownership on performance, if any, could be spurious. Via the inclusion of manager fixed effects, we can rule out this interpretation.

Second, a large number of funds are managed by multiple managers. We control for this aspect of fund organization in our models to make sure that managerial ownership is not simply proxying for differences in performance between funds managed by individuals and those managed by teams (see [Chen, Hong, Huang, and Kubik, 2004](#)). The same percentage ownership could also provide a stronger incentive effect if the ownership stake is held by one manager than when it is held by multiple managers. We therefore also estimate separate models for funds with single managers versus funds managed by multiple managers.

Third, we control for the size of the fund family. Prior evidence suggests that funds belonging to larger families perform better (see [Chen, Hong, Huang, and Kubik, 2004](#)), and we want to ensure that managerial ownership is not proxying for the effect of family size.

### 3. Data and descriptive statistics

In this section we describe our data sources. We also discuss the construction of our performance measures and the other explanatory variables.

#### 3.1. Ownership and governance data

The requirement to disclose fund manager ownership was introduced by the SEC in 2004 and applies to all funds that file annual reports after February 28, 2005. Going forward, the ownership data have to be disclosed at least annually in the fund's statement of additional information. We gather these data for managers of all funds (except money market funds because they are not covered by Morningstar and Lipper, our primary data sources) that filed annual reports between March and December 2005. We obtain a sample of 2,006 funds with ownership data distributed over the December 2004–December 2005 period. Because in our performance predictability tests we want to explain fund performance in 2005 as a function of lagged ownership, we limit our sample to funds for which ownership data are reported as of the end of December 2004. The resulting sample consists of 1406 funds, representing approximately 70% of the original sample. Many funds have multiple fund classes that vary in terms of fees charged and distribution channels employed. For each fund, we compute the weighted average of the class level data. Thus, all our analyses are performed at the fund level.

Unfortunately, the disclosure of fund manager ownership does not have to be exact. Managers are only required to report whether their dollar ownership falls in one of the following ranges: \$0, \$1–\$10,000, \$10,001–\$50,000, \$50,001–\$100,000, \$100,001–\$500,000, \$500,001–\$1,000,000, or above \$1,000,000. Nevertheless, this categorization leaves us with sufficient cross-sectional variation in ownership to study whether ownership affects performance. In addition, a substantial number of funds have multiple managers, and the

required disclosures are at the manager level. We simply add up the ownership stakes of each manager to determine aggregate ownership of all portfolio managers in a fund.

For our analyses, we need to translate ownership ranges into dollar amounts. An alternative would be to use dummies for each ownership range, without making specific assumptions of what ownership in a particular range implies. However, this is not possible when there are multiple managers as the ownership categories would have different lows and highs for different funds. For example, if a fund has three managers each with ownership in the \$100,001–\$500,000 range, we would have to construct a new category of ownership constituting the \$300,003–\$1.5 million range.

To translate the ownership ranges into exact dollar amounts, we use two different sets of assumptions. The more conservative assumption is that each manager's ownership is at the bottom of the range. Thus, if a manager discloses ownership in the \$500,001–\$1,000,000 category, we assume that ownership is \$500,001. Perhaps a more realistic assumption is to set ownership at the category average. A manager disclosing between \$500,001 and \$1 million would be assumed to own \$750,000 worth of shares in the fund. For the above \$1 million category, we continue to set ownership at the bottom of the range. We transform the dollar ownership into percentage ownership by dividing the dollar amount by the size of the fund as of December 2004. In the literature studying the relationship between firm value and insider ownership, percentage ownership is most often employed (see Jensen and Meckling, 1976).

Table 1 contains summary statistics on fund manager ownership. Panel A employs the minimum of the range to compute the actual level of ownership, and Panel B employs the midpoint of the lower and upper bound of the range. We present results for all funds as well as for different investment categories. In Panel A, we also include information on the percentage of funds with positive fund manager ownership. Several results stand out. First, the median fund manager does not own any shares in the fund. In fact, only 43% of all funds have any manager ownership. Second, the average stake of a fund manager is modest. Depending on the assumptions employed, fund managers hold between \$97,000 (Panel A) and \$150,000 (Panel B) worth of shares in their fund. This translates into a small stake of between 0.04% and 0.08% of the size of the fund. However, 10% of all managers own more than \$160,000 (Panel A) or \$405,000 (Panel B) of their fund's assets, translating into 0.09% to 0.22% of the size of the fund. Third, the average holding is highest for equity funds, and domestic equity funds in particular. The average domestic equity fund manager holds shares valued between \$155,000 and \$226,000.

To study the importance of board effectiveness, we obtain data from Lipper on our sample funds for the following board characteristics: board size, proportion of independent directors, and board member compensation.<sup>5</sup> In Panel A of Table 2 we report summary statistics on these measures. These statistics are reported only for sample funds with available 2005 return data. Funds in our sample have eight board members, on average, 77% of the board members are independent directors, and average board member compensation is \$1,766 per year.

### 3.2. Performance measures

We construct two measures of excess performance in 2005 using returns data from Morningstar and the Center for Research in Securities Prices (CRSP) Mutual Fund

<sup>5</sup>We are grateful to Donald Cassidy from Lipper for providing us with these data.



Table 1  
Ownership of portfolio managers

This table reports the dollar amount and % ownership of portfolio managers in their own funds, as of year-end 2004. All funds are classified into the following six categories: balanced, bond, equity, international bond, international equity, and sector. The mean, 50th, 75th, 90th, and 100th percentile of manager ownership figures are reported. Funds report only the range of each manager's holdings (\$0, \$1–\$10,000, \$10,001–\$50,000, \$50,001–\$100,000, \$100,001–\$500,000, \$500,001–\$1,000,000, or above \$1,000,000). In Panel A, we convert these ranges into dollars by using the lowest value of the range and sum up across all managers in a fund. In Panel B, we convert them into dollars by using the average (midpoint) of each category and sum up across all managers in a fund. For the above \$1 million category, we set the ownership level at the bottom of the range. Managerial ownership percentage is computed as the dollar ownership of all the portfolio managers of a fund, divided by fund assets. % own refers to the percentage of funds with positive ownership.

Panel A. Summary statistics of manager holdings (based on lowest value of range)

Fund type	N	% own	Managerial ownership (in dollars)					Managerial ownership (in percent)				
			Mean	50th	75th	90th	100th	Mean	50th	75th	90th	100th
All funds	1,406	43	96,663	0	50,001	160,003	3,700,006	0.04	0.00	0.01	0.09	0.98
Balanced	62	47	82,904	0	20,003	110,002	2,000,002	0.03	0.00	0.01	0.15	0.33
Domestic bond	405	26	15,444	0	1	50,001	600,002	0.01	0.00	0.00	0.02	0.98
Domestic equity	606	51	154,861	1	100,001	510,003	3,700,006	0.05	0.00	0.02	0.15	0.97
International bond	26	42	10,001	0	10,001	50,001	100,001	0.01	0.00	0.01	0.03	0.14
International equity	158	47	84,115	0	100,001	200,002	3,000,003	0.05	0.00	0.02	0.09	0.90
Sector	149	56	115,034	1	50,001	500,001	2,000,002	0.05	0.00	0.02	0.18	0.69

Panel B. Summary statistics of manager holdings (based on midpoint of range)

Fund type	N	Managerial ownership (in dollars)					Managerial ownership (in percent)				
		Mean	50th	75th	90th	100th	Mean	50th	75th	90th	100th
All funds	1,406	149,570	0	75,000	405,000	4,350,003	0.08	0.00	0.03	0.22	2.91
Balanced	62	134,274	0	65,000	330,000	2,000,002	0.08	0.00	0.02	0.33	0.93
Domestic bond	405	36,219	0	5,000	75,000	1,050,000	0.03	0.00	0.00	0.04	2.24
Domestic equity	606	226,227	5,000	300,000	885,000	4,350,003	0.11	0.00	0.06	0.35	2.91
International bond	26	25,000	0	30,000	75,000	300,000	0.03	0.00	0.03	0.08	0.42
International equity	158	161,203	0	210,000	600,000	3,000,003	0.11	0.00	0.06	0.24	2.21
Sector	149	161,913	5,000	75,000	750,000	2,000,002	0.09	0.00	0.04	0.34	1.47

Table 2

Summary statistics of fund characteristics in 2005

The following variables are in percent: % independent directors, objective-adjusted return, four-factor alpha, expenses, front-end load, back-end load, and portfolio turnover. Fund size and family assets are reported in millions of dollars. Board size is the number of directors on the fund board. % independent directors is the percentage of the board members who are unaffiliated with the fund management company. Board member compensation is computed as total board compensation divided by board size. Objective-adjusted return is computed as the return on the fund less the return of the median fund with the same investment objective. Four-factor alphas are computed using separate sets of factors for equity and bonds funds. The factors are described in Section 3.2. Money market funds are excluded from the analysis. Panel A compares the sample funds with funds in the rest of the universe. Panel B compares the sample funds with fund manager ownership with the sample funds without managerial ownership. Measures of board effectiveness and the single manager dummy are gathered only for the funds in our sample, hence not available for the rest of the universe (listed as n/a). \*, \*\*, and \*\*\* indicate that the difference between the two groups being compared is significant at the 10%, 5%, and 1% levels respectively. A *t*-test is conducted for differences in means and a rank sum test for differences in medians.

*Panel A. Comparing sample funds with the rest of the universe*

Variable	Sample funds			Rest of universe		
	<i>N</i>	Mean	Median	<i>N</i>	Mean	Median
<i>Measures of board effectiveness</i>						
Board size	1,325	8.17	8	n/a	n/a	n/a
% independent directors	1,325	77	75	n/a	n/a	n/a
Board member compensation	1,325	1,766	748	n/a	n/a	n/a
<i>Performance measures</i>						
Return	1,327	7.29	4.85	4,952	7.11	4.92
Objective-adjusted return	1,327	0.79	0.03	4,952	0.57	−0.01
Four-factor alpha	1,255	1.16	0.01	4,614	0.98	−0.09
<i>Control variables</i>						
Single manager dummy	1,325	0.49	0	n/a	n/a	n/a
Family assets	1,325	95,029	17,794	4,947	85,220	18,110
Expenses	1,321	1.27	1.18	4,913	1.28	1.17
Fund size	1,321	1,413	271	4,832	1,622	278
Front-end load	1,327	1.53**	0*	4,952	1.37**	0*
Back-end load	1,327	0.13	0	4,952	0.14	0
Portfolio turnover	1,315	92	51**	4,857	96	55**

*Panel B. Comparing funds with and funds without managerial ownership*

Variable	With ownership			No ownership		
	<i>N</i>	Mean	Median	<i>N</i>	Mean	Median
<i>Measures of board effectiveness</i>						
Board size	581	8.33*	8	744	8.04*	8
% independent directors	581	77	77	744	77	75
Board member compensation	581	2,546***	1,117***	744	1,156***	503***
<i>Performance measures</i>						
Return	581	8.70***	6.39***	746	6.20***	3.99***
Objective-adjusted return	581	1.44***	0.21**	746	0.29***	−0.02**
Four-factor alpha	552	1.88***	0.45***	703	0.59***	−0.21***

Table 2 (continued)

Variable	With ownership			No ownership		
	<i>N</i>	Mean	Median	<i>N</i>	Mean	Median
<i>Control variables</i>						
Single manager dummy	581	0.45**	0**	744	0.51**	1**
Family assets	581	84,108*	16,290*	744	103,557*	26,524*
Expenses	579	1.29	1.22***	742	1.26	1.13***
Fund size	576	1,873***	360***	745	1,057***	204***
Front-end load	581	1.44	0.00	746	1.60	0.00
Back-end load	581	0.13	0.00	746	0.14	0.00
Portfolio turnover	579	76	51	736	105	51

Database. First, we compute a fund's objective-adjusted performance by subtracting the performance of the median fund in the matched investment objective from the return of the fund. The following detailed objectives are used in computing objective-adjusted returns (OARs): aggressive, balanced, corporate bond, equity income, government bond, government mortgage, growth, growth and income, international bond, international equity, municipal bond, small cap, specialty environment, specialty finance, specialty health, specialty metals, specialty natural resources, specialty real estate, specialty technology, and specialty utility. The advantage of employing simple objective-adjusted returns is that we do not need a long time series of returns to compute abnormal performance. The disadvantage of such a measure is that there could still be a large dispersion in risk levels within an objective. We could therefore be capturing differences in risk instead of differences in performance. Hence, as a second measure, we compute abnormal returns using four-factor models.

To estimate the four-factor models, we employ different sets of factors for equity funds and bond funds. For equity funds, we use the three [Fama and French \(1992\)](#) factors: excess return on the CRSP value-weighted index, the difference in returns between a small and large stock portfolio, and the difference in returns between a high and low equity book-to-market portfolio. We augment these factors by a momentum factor ([Carhart, 1997](#)). For bond funds, we use the excess return on the Lehman Brothers government and corporate bond index, the excess return on the mortgage-backed securities index, the excess return on the long-term government bond index, and the excess return on the intermediate-term government bond index. These factors are the same as those employed by [Blake, Elton, and Gruber \(1993\)](#). Balanced funds are excluded from this analysis, because it is difficult to specify an appropriate factor model for these funds.

Returns data are available only at the monthly level. It is therefore not possible to estimate a four-factor model using only data for 2005. In fact, most studies that estimate four-factor models employ at least three years of data. If we were to use three years of data, we would have to rely on data from 2003 and 2004, as well as 2005. The alpha from such a regression would therefore capture abnormal performance both before and after the disclosure of ownership, while our goal is to investigate whether we can predict future performance. To overcome this problem, we estimate the following model

for each fund:

$$Return_j = \alpha_0 + \alpha_1(2005\ Dummy) + \sum_{i=1}^4 \beta_i(Factor_{ij}) + \varepsilon, \quad (1)$$

where  $j$  refers to the month, and  $i$  refers to the factor.

We use three years of monthly data over the period 2003–2005 to estimate these four-factor models (requiring at least 30 months of data out of 36 months). However, we include a dummy for observations from 2005. We then calculate monthly abnormal returns for 2005 as the sum of the intercept and the coefficient on the 2005 dummy ( $\alpha_0 + \alpha_1$ ). We multiply the monthly abnormal return by 12 to obtain a measure of the annual abnormal return. Thus, while the factor loadings are estimated using some data before the disclosure of ownership, the estimate of excess performance is for 2005 only.

In Panel A of Table 2, we present both performance measures for our sample funds and compare them with funds for which ownership data have not yet been disclosed or for which the ownership data are not for year-end 2004 (excluding money market funds). We find no evidence of significant differences in performance across the two groups. For example, the median sample fund exhibits an objective-adjusted return of 0.03%, compared with  $-0.01\%$  for funds in the rest of the universe.

### 3.3. Other explanatory variables

We gather data on the other explanatory variables employed in our regression specifications from the CRSP Mutual Fund Database and Morningstar. These variables are fund size, family size, the fund's expense ratio, the front-end and back-end load, portfolio turnover, and a single-manager dummy. In Section 2.3, we discussed the reasons for including family size and a single-manager dummy in the models. The other variables are control variables commonly used in regressions of fund performance (see, for example, Chevalier and Ellison, 1999). All these explanatory variables are measured in 2005.

Summary statistics on these variables are reported in Panel A of Table 2, together with a comparison between the sample funds and funds in the rest of the universe. We have data only on the fraction of funds managed by a single manager for funds that are part of our sample. We report statistics only for the funds for which we have returns data in 2005, which limits the sample size to 1327. Few differences emerge. The sample funds have higher mean and median loads (mean is 1.53% for sample funds and 1.37% for funds in the rest of the universe) and slightly lower median portfolio turnover (51% versus 55%) than the other funds. No other characteristics are significantly different across the two groups, suggesting that the funds in our sample are representative of the funds in the mutual fund universe.

## 4. Managerial ownership and future performance

In this section, we examine whether there is a relation between the abnormal performance of each fund in 2005 and managerial ownership measured at the end of 2004. In Panel B of Table 2, we start by comparing the characteristics of funds with positive managerial ownership to those with zero managerial ownership. With respect to measures of board effectiveness, we find that funds with managerial ownership pay their

board members more than twice as much as funds without ownership. There is no significant difference in the level of board independence and only a small difference in average board size between the two groups.

Funds with some manager ownership are larger, but belong to smaller families. The average fund with positive managerial investment has \$1.87 billion in assets and belongs to families that have \$84 billion under management. Funds with no ownership have average assets of \$1.06 billion and family assets of \$104 billion. Funds with positive managerial ownership have higher median expense ratios, and they are less likely to be managed by a single individual.

Performance is the key variable of interest for our study, and the evidence in Panel B of Table 2 indicates that funds with positive managerial ownership exhibit superior performance, regardless of the performance measure employed. For example, the average fund with managerial ownership outperforms its peers by 144 basis points per year versus 29 basis points for the zero ownership sample.

We now investigate whether this result persists in a multivariate setting and estimate a regression of performance as a function of lagged managerial ownership, various measures of board effectiveness, and the control variables described in Section 3. To avoid problems with outliers, we focus on returns within 2 standard deviations of the mean (returns between  $-12.28\%$  and  $18.26\%$ ) and remove the other observations. This procedure eliminates 59 observations from the regression models. Further study of these observations indicates that they fall predominantly into three investment objectives: sector funds, international equity funds, and international bond funds. Our procedures for adjusting abnormal returns, i.e., subtracting the performance of other funds in the same objective and computing four-factor alphas, are likely to be less appropriate for these funds because there is substantial heterogeneity in the types of assets they invest in. The results presented in this section are similar, however, if these observations are retained.

Panel A of Table 3 contains the basic regression models. In Models (1)–(4), we employ objective-adjusted returns as the dependent variable, while in Models (5)–(8) we use four-factor alphas. Models (1) and (5) contain only the ownership percentage (computed using the low end of the dollar ownership range) as an explanatory variable. The coefficient on managerial ownership is positive and highly significant. The economic magnitude of the effect is also substantial: For every percentage point increase in managerial ownership, excess performance increases by 2.76% in Model (1) and 2.36% in Model (5). Of course, average ownership levels are modest, so an increase of 1 percentage point is essentially the difference between the lowest and highest ownership levels in the sample.

We add measures of board effectiveness in Models (2) and (6). We find a positive relationship between board size and performance and a negative relationship between four-factor alphas and board independence. However, both of these findings are not robust to the inclusion of other control variables in subsequent models. The lack of significance of the measures of board effectiveness is not surprising. While there is evidence that measures of board effectiveness, such as board structure and compensation, influence fees and merger outcomes, we believe that they are less likely to have a direct impact on the day-to-day performance of the fund. Fund manager ownership continues to be significantly related to future performance in these models. In fact, there is an increase in the coefficients from 2.76 in Model (1) to 3.09 in Model (2), and from 2.36 in Model (5) to 2.79 in Model (6).

To capture other aspects of the fund and a fund family's organization, in Models (3) and (7), we include family assets and a single-manager dummy along with the control variables.

Table 3

Explaining fund performance for 2005

This table reports ordinary least squares regression results in which fund performance [measured using objective-adjusted returns (OARs) and four-factor alphas] is the dependent variable. The objective-adjusted return is computed as the annual return of the fund less the return of the median fund in the matched investment objective. Alpha is the abnormal fund return estimated using separate four-factor models for equity and bond funds. Ownership (low) is computed using the lowest value of the dollar ownership in each range, divided by fund assets. Ownership (average) is computed using the average value of the dollar ownership (i.e., the midpoint) in each range, divided by fund assets, except for the above \$1 million category for which we employ the lowest value of the range. Both ownership measures are expressed in percent. Ownership and fund size are measured as of year-end 2004. Average manager ownership is computed by dividing ownership (low) by the number of fund managers. Board size is the number of directors on the fund board. % independent directors is the percentage of the board members who are unaffiliated with the fund management company. Board member compensation is the log of total board compensation divided by board size. Family assets is the log of total assets of the fund management company. Single manager dummy is equal to one if the fund is managed by one manager and zero otherwise. Fund size is the log of total assets of the fund. Family assets, expenses, fund size, loads, and turnover are measured in 2005. Board characteristics, the single manager dummy, and managerial ownership are measured at the end of 2004. Panel A contains the basic regression models. Panel B reports alternative models using the objective-adjusted return as the dependent variable. Panel C reports regression models with manager fixed effects and is limited to the domestic funds managed by a single manager. Numbers reported in parentheses are *P*-values.

*Panel A. Basic models*

Variable	Objective-adjusted return				Alpha			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Ownership (low)	2.76 (0.00)	3.09 (0.00)	3.55 (0.00)	3.65 (0.00)	2.36 (0.01)	2.79 (0.00)	3.16 (0.00)	3.30 (0.00)
Board size		0.12 (0.00)	0.05 (0.31)	0.05 (0.29)		0.18 (0.00)	0.09 (0.08)	0.05 (0.30)
% independent directors		-0.00 (0.68)	-0.01 (0.58)	-0.01 (0.54)		-0.02 (0.05)	-0.02 (0.05)	-0.02 (0.10)
Board member compensation		0.05 (0.27)	-0.06 (0.20)	-0.07 (0.16)		0.04 (0.38)	-0.04 (0.46)	-0.03 (0.50)
Family assets			0.01 (0.89)	0.00 (0.98)			0.19 (0.02)	0.05 (0.52)
Single manager dummy			0.05 (0.81)	-0.01 (0.95)			-0.19 (0.42)	-0.33 (0.15)
Expenses			0.08 (0.65)	0.26 (0.19)			1.26 (0.00)	1.03 (0.00)
Fund size			0.39 (0.00)	0.44 (0.00)			0.35 (0.00)	0.53 (0.00)
Back-end load			-0.06 (0.70)	-0.11 (0.48)			-0.39 (0.02)	-0.32 (0.05)
Front-end load			-0.04 (0.42)	-0.05 (0.29)			-0.11 (0.05)	-0.08 (0.14)
Portfolio turnover			-0.17 (0.03)	-0.17 (0.03)			-0.18 (0.03)	-0.16 (0.04)
Intercept	-0.13 (0.27)	-1.12 (0.16)	-1.95 (0.05)	-2.83 (0.02)	0.46 (0.00)	0.27 (0.75)	-3.23 (0.00)	-2.11 (0.10)
Objective dummies	No	No	No	Yes	No	No	No	Yes
<i>N</i>	1,265	1,265	1,243	1,243	1,197	1,197	1,176	1,176
Adjusted <i>R</i> <sup>2</sup>	0.01	0.01	0.04	0.04	0.01	0.02	0.06	0.16

Table 3 (continued)

## Panel B. Alternative models using objective-adjusted returns

Variable	Full sample	Single manager	Multiple managers	Full sample	Turnover > 20%
	(1)	(2)	(3)	(4)	(5)
Ownership (low)		4.30 (0.00)	2.93 (0.03)		4.36 (0.00)
Ownership (average)	1.49 (0.00)				
Average manager ownership				4.56 (0.00)	
Board size	0.05 (0.30)	0.02 (0.73)	0.08 (0.21)	0.05 (0.31)	0.06 (0.28)
% independent directors	-0.01 (0.53)	-0.01 (0.68)	-0.01 (0.37)	-0.01 (0.50)	-0.01 (0.38)
Board member compensation	-0.06 (0.18)	-0.11 (0.12)	-0.05 (0.46)	-0.06 (0.20)	-0.04 (0.45)
Family assets	-0.01 (0.92)	-0.09 (0.37)	0.09 (0.41)	-0.00 (0.98)	-0.02 (0.81)
Single manager dummy	-0.03 (0.89)			-0.13 (0.56)	-0.04 (0.89)
Expenses	0.25 (0.21)	-0.37 (0.32)	0.45 (0.07)	0.25 (0.21)	0.42 (0.06)
Fund size	0.45 (0.00)	0.41 (0.00)	0.41 (0.00)	0.44 (0.00)	0.48 (0.00)
Back-end load	-0.11 (0.46)	0.02 (0.95)	-0.17 (0.37)	-0.12 (0.44)	-0.17 (0.32)
Front-end load	-0.06 (0.25)	0.02 (0.73)	-0.14 (0.07)	-0.06 (0.28)	-0.06 (0.28)
Portfolio turnover	-0.17 (0.03)	0.08 (0.46)	-0.36 (0.00)	-0.18 (0.02)	-0.23 (0.01)
Intercept	-2.75 (0.03)	-1.47 (0.40)	-3.03 (0.10)	-2.68 (0.03)	-2.68 (0.05)
Objective dummies	Yes	Yes	Yes	Yes	Yes
<i>N</i>	1,243	600	643	1,243	983
Adjusted <i>R</i> <sup>2</sup>	0.04	0.03	0.05	0.04	0.05

## Panel C. Using manager fixed effects for domestic funds with a single manager

Variable	Objective-adjusted return		Alpha	
	(1)	(2)	(3)	(4)
Ownership (low)	5.04 (0.03)	4.15 (0.06)	4.60 (0.07)	4.53 (0.08)
Board size	0.10 (0.73)	-0.03 (0.93)	-0.04 (0.88)	-0.28 (0.40)
% independent directors	-0.21 (0.08)	-0.14 (0.41)	-0.14 (0.21)	0.02 (0.89)
Board member compensation	0.02 (0.86)	0.05 (0.69)	0.13 (0.21)	0.07 (0.56)
Family assets	0.48 (0.24)	0.35 (0.51)	0.27 (0.50)	-0.14 (0.80)

Table 3 (continued)

Variable	Objective-adjusted return		Alpha	
	(1)	(2)	(3)	(4)
	Expenses		−0.78 (0.32)	
Fund size		0.16 (0.39)		0.17 (0.40)
Back-end load		1.61 (0.54)		2.97 (0.28)
Front-end load		−0.21 (0.10)		−0.21 (0.11)
Portfolio turnover		0.23 (0.26)		0.19 (0.40)
Intercept	10.21 (0.14)	4.55 (0.59)	9.92 (0.15)	1.37 (0.87)
Objective dummies	Yes	Yes	Yes	Yes
<i>N</i>	554	544	532	523
Adjusted <i>R</i> <sup>2</sup>	0.66	0.69	0.70	0.70

We find a positive relation between fund size and performance and a negative relation between a fund's portfolio turnover and performance. A fund's risk-adjusted performance, alpha, is also positively related to assets under management at the fund family. We do not find a relation between performance and whether a fund is managed by a single individual or a team.

In Model (7), we also find a positive relationship between expenses and performance, which appears somewhat counterintuitive. It turns out that this finding is caused by the negative correlation between fund size and expenses. When we remove fund size as an explanatory variable, the effect of fees becomes insignificant. More importantly, the coefficient on ownership increases further when the control variables are included. In Models (4) and (8), we add dummies for the different objective categories reported in Table 1. Again, our findings persist: The coefficient on fund manager ownership in this specification is 3.65 in Model (4) and 3.30 in Model (8).

In Panel B, we perform a variety of additional tests. We report only models using the objective-adjusted return as the dependent variable. Our findings are virtually identical if we employ four-factor alphas, but these results are not reported in a table for the sake of brevity. All models in this panel contain the full set of explanatory variables. First, we focus on different measures of ownership. In Model (1), we replace the percentage of fund manager ownership, computed based on the lowest level of ownership in each range by the percentage computed based on the average of each category (except for the above \$1 million category, for which we continue to employ the low end of the range). The effect of ownership on performance continues to be significant. The coefficient on fund manager ownership declines from 3.65 in Model (4) of Panel A to 1.49 in this model. However, average ownership using this second measure is also twice as high (0.08% versus 0.04%). The economic significance of this result is therefore similar across the two models. Our findings also continue to hold when we use the most aggressive assumption and set ownership at the high-end of the range (except for the above \$1 million category, where we continue to use \$1 million as the ownership figure). These findings are not reported in the table.



A number of funds are managed by more than one manager, and in constructing our ownership measures we simply aggregate all the individual manager ownership stakes. However, the same percentage ownership could provide a stronger incentive effect if it is held by one manager than when it is held by many managers. We therefore estimate separate models for funds with single managers versus funds managed by multiple managers. In these models, we again use the lower value of the ownership range to determine the ownership percentage. As illustrated in Models (2) and (3), the effect of ownership is almost twice as large for funds managed by a single manager relative to funds managed by multiple managers. In Model (4), we divide total ownership by the number of managers to obtain a measure of average manager ownership and employ this measure as an explanatory variable. Our result persists.

If enhanced ownership levels do create an incentive for fund managers to perform better, we would expect this effect to be stronger for actively managed funds than for index funds because managers of index funds have little latitude in stock selection. In Model (5) of Panel B, we remove funds with portfolio turnover in 2005 below 20% for the year. These funds are likely to be index funds or closet indexers, i.e., funds that claim to be actively managed but that follow a passive approach. Consistent with our expectations, we find that the coefficient on manager ownership increases with the exclusion of low turnover funds.

None of the measures of board effectiveness exhibits any statistical significance in explaining abnormal performance. These results are similar to our findings in Panel A.

The analysis so far employs fund manager ownership data at the end of 2004 to predict excess fund performance for 2005. However, the individuals managing the fund in 2005 are perhaps not the same as those individuals for which ownership data are reported at the end of 2004. Managers could switch to other funds or leave the firm. Unfortunately, the entire list of fund managers for 2005 is not available for us to be able to remove funds that have experienced some managerial turnover. There is no reason to believe that this shortcoming is influencing our results. On the contrary, using ownership of individuals who no longer manage the fund adds noise to the data and biases us against finding a relationship. It is possible, though, to perform one test to address this issue, at least partially. The Morningstar database contains information on the average tenure of all managers. Those funds with average manager tenure of less than one year at the end of 2005 have experienced at least some manager turnover over the period. Hence, we remove these funds and re-estimate our regression models. For sake of brevity, we do not report these findings in a table. Across all specifications, we find that the coefficients on fund manager ownership remain positive and highly significant. The magnitude of the coefficients also changes little compared with the specifications reported in Panel A.

In Panel C of [Table 3](#), we focus on managers who run more than one fund and ask whether these managers own a larger fraction of the funds that deliver better subsequent performance. We restrict ourselves to all domestic funds with only one manager (554 funds) and include manager fixed effects in the estimation. These 554 funds are managed by 359 individuals, so 359 manager dummies are included in the regression. This procedure basically dummies out all managers who manage only one fund and therefore captures the effect of ownership by managers who run multiple funds (257 funds are managed by individuals who manage only one fund). The first two models in Panel C of [Table 3](#) employ objective-adjusted returns as the dependent variable, and the last two models use four-factor alphas. The coefficient on ownership remains positive and significant in all four

models. In fact, it is larger than in models we estimated previously. This evidence is powerful and indicates that our findings are not driven by unobservable manager characteristics.

We also investigate whether the effect of ownership on performance depends on the type of asset under management (i.e., bonds versus equities) but do not find this to be the case. We discuss this finding in more detail in Section 5, when we consider the determinants of manager ownership.

Finally, we interact the measures of board effectiveness with managerial ownership to ascertain whether the effect of ownership is enhanced in the presence of certain governance traits. We do not find robust evidence to suggest that this is the case (these findings are not reported in a table).

Overall, the results presented in this section indicate that fund performance improves in instances in which fund managers own a larger stake in the funds they manage. This result holds for a variety of ownership and performance measures and when we focus on managers who run more than one fund. However, various measures of board effectiveness have no significant impact on future fund performance.

## **5. The determinants of managerial ownership**

The analysis in Section 4 assumes that managerial ownership is exogenous. However, managerial ownership could be affected by a number of fund, family, and manager characteristics. We explore this issue next. In Section 6, we revisit the relationship between performance and ownership in light of our findings on the determinants of managerial ownership.

We employ the following variables to explain managerial ownership: fund performance (both contemporaneous and lagged), volatility of fund returns, fund expenses and loads, fund size, tenure of the fund manager, family assets, a single-manager dummy, and investment category dummies. We also include our three measures of board effectiveness to determine whether ownership and board effectiveness act as complements or substitutes to one another.

The effect of contemporaneous and lagged fund performance on managerial ownership can be positive or negative. Three arguments support a positive relationship. First, a positive relationship could ensue if managers are rewarded with additional shares subsequent to good performance. We do not have any evidence to suggest that this practice is commonly employed in the mutual fund industry. Second, in the presence of any performance persistence, managers could increase their ownership stakes in funds that have performed well to take advantage of further expected excess performance in the future. Third, managers of funds with superior performance could simply be overconfident and assign too much weight to their personal portfolio management skills, hence increasing their ownership in the fund. The last two arguments rely on the change in managerial ownership and not the level. Therefore, we can test it only indirectly by looking at the level as a proxy for the change.

The prediction of a negative relationship between past performance and fund manager ownership relies on a diversification argument. If some funds have performed particularly well in the past, resulting in an increase in the managers' dollar ownership in these funds, the managers could sell some shares to diversify their personal portfolios. Again, this argument relies more on the change in ownership than on the level.

We expect a negative relationship between a fund's return volatility and managerial ownership because risk-averse managers will choose to have a lower exposure to investments with more volatile returns. Volatility is computed as the annualized standard deviation of the monthly returns in 2003 and 2004. We also hypothesize a negative relationship between fund size and the fraction of the fund held by managers because the dollar investment required to purchase the same stake in a larger fund is higher.

*Ceteris paribus*, funds with higher expenses have lower performance. Various articles show such a relationship (e.g., Carhart, 1997; Wermers, 2000; Elton, Gruber, and Busse, 2004). We therefore expect portfolio managers to have a lower ownership stake in funds with higher expense ratios. The same argument applies to front-end and back-end loads. (Loads have been found to be negatively related to fund performance (e.g., Carhart, 1997)). Back-end loads often decline, however, as investors hold shares in a fund for a longer period of time. If fund managers have a longer investment horizon, they could pay less attention to back-end loads. Moreover, back-end loads could be used as a mechanism to mitigate portfolio disruptions caused by frequent asset outflows, hence reducing excessive transaction costs and liquidity risk for the fund. Almazan, Brown, Carlson, and Chapman (2004) also argue that load charges dissuade share redemptions and reduce the performance-flow sensitivity. In that case, back-end loads could serve as a desirable attribute and could encourage portfolio managers to invest in their own funds. We examine fund expenses and loads separately in our analysis.

We expect a positive relationship between the tenure of the fund manager(s) and their ownership in the fund: Longer tenures allow the managers more time to build up a personal equity stake in the fund. We use the average tenure of all the fund's managers as an explanatory variable in our empirical analysis.

The size of the family could have a negative impact on ownership. Fund managers in large families could be switched more frequently across funds within the family. As a consequence, they could be less willing and able to accumulate a significant ownership stake in the funds they manage.

We also expect higher managerial ownership for funds with more managers because capital constraints are likely to be less binding for a portfolio management team than for an individual fund manager.

Finally, we control for the investment category dummies. There are two reasons why the type of asset under management could affect ownership. The first reason relates to the manager's portfolio optimization. Before managers decide to invest their personal wealth in a fund, they have to evaluate whether the fund's style fits in their own portfolio. Given that the median age of fund managers is between 40 and 49 years (see Farnsworth and Taylor, 2006), we expect them to seek a relatively greater exposure to equity funds than bond funds. Second, managerial effort and incentives could be more important for equity funds, which are riskier and more difficult to value, than for bond funds. This argument would also imply higher fund manager ownership in equity funds.

Table 4 contains the results of the analysis. For ease of interpretation, we multiply all coefficients by one hundred. Model (1) contains the basic regression model, in which the dependent variable is the percentage ownership of all fund managers, computed using the dollar ownership at the low-end of the range. Several variables are significantly related to managerial ownership. First, we find that objective-adjusted returns (OAR) for both 2004 and 2003 are positively and significantly related to end-of-year 2004 ownership. This result is also economically significant. Increasing OARs in 2004 from their 25th percentile

Table 4

## Determinants of fund manager ownership at year-end 2004

This table reports ordinary least squares (OLS) and interval regression results using fund manager ownership in percent at the end of 2004 as the dependent variable. The OLS models (Models (1)–(4)) use fund manager ownership based on the lowest value of the ownership range. The interval regression model (Model (5)) uses both the lowest and highest possible levels of fund manager ownership in each range. All explanatory variables are measured in 2004 unless indicated otherwise. The objective-adjusted return (OAR) is computed as the annual return of the fund less the return of the median fund in the matched investment objective. Alpha is the abnormal fund return estimated using separate four-factor models for equity and bond funds over the period 2002–2004. Volatility is the annualized standard deviation of the monthly returns in 2003 and 2004. Board size is the number of directors on the fund board. % independent directors is the percentage of the board members who are unaffiliated with the fund management company. Board member compensation is the log of total board compensation divided by board size. Family assets is the log of total assets of the fund management company. Single manager dummy is equal to one if the fund is managed by one manager and zero otherwise. Fund size is measured as the log of total assets. Average tenure is the average tenure of all the fund managers managing a particular fund. A dummy variable is included for each investment objective, with the exception of international bond funds. Expenses and loads are measured in percent. Models (3)–(5) are limited to the sample with average manager tenure longer than one year at the end of 2005. The numbers reported in parentheses are *P*-values. All coefficients are multiplied by one hundred.

Variable	Ordinary least squares regression				Interval regression
	Full sample (1)	Full sample (2)	Average tenure > 1 yr (3)	Average tenure > 1 yr (4)	Average tenure > 1 yr (5)
OAR 2004	0.17 (0.01)		0.22 (0.01)		0.24 (0.01)
OAR 2003	0.09 (0.00)		0.12 (0.01)		0.15 (0.00)
Alpha 2002–2004		0.33 (0.00)		0.35 (0.00)	
Volatility 2003–2004	–0.59 (0.12)	0.13 (0.73)	–0.70 (0.11)	0.21 (0.63)	–0.79 (0.13)
Board size	–0.15 (0.31)	–0.08 (0.62)	–0.08 (0.66)	0.02 (0.91)	–0.08 (0.68)
% independent directors	–0.03 (0.36)	–0.03 (0.40)	0.04 (0.34)	0.03 (0.36)	0.03 (0.41)
Board member compensation	0.45 (0.01)	0.51 (0.01)	0.37 (0.08)	0.40 (0.07)	0.51 (0.03)
Family assets	–0.56 (0.03)	–0.57 (0.04)	–0.37 (0.19)	–0.43 (0.14)	–0.53 (0.10)
Single manager dummy	–0.61 (0.41)	–0.78 (0.30)	–1.06 (0.22)	–1.46 (0.11)	–1.43 (0.15)
Expenses	1.27 (0.18)	1.12 (0.26)	0.94 (0.45)	0.85 (0.52)	1.52 (0.26)
Fund size	–0.82 (0.00)	–0.90 (0.00)	–1.57 (0.00)	–1.58 (0.00)	–1.50 (0.00)
Back-end load	0.17 (0.63)	0.38 (0.32)	0.17 (0.67)	0.45 (0.30)	–0.00 (0.99)
Front-end load	–0.41 (0.08)	–0.40 (0.11)	–0.58 (0.03)	–0.60 (0.03)	–0.89 (0.00)
Average tenure			0.62 (0.00)	0.64 (0.00)	0.82 (0.00)

Table 4 (continued)

Variable	Ordinary least squares regression				Interval regression
	Full sample (1)	Full sample (2)	Average tenure > 1 yr (3)	Average tenure > 1 yr (4)	Average tenure > 1 yr (5)
Equity dummy	5.65 (0.00)	6.64 (0.00)	7.84 (0.00)	8.45 (0.00)	9.92 (0.00)
Sector dummy	5.07 (0.01)	4.59 (0.02)	6.02 (0.01)	5.09 (0.02)	7.63 (0.01)
Intl equity dummy	3.75 (0.03)	3.23 (0.06)	4.50 (0.03)	3.57 (0.08)	5.45 (0.02)
Balanced dummy	2.42 (0.06)		2.72 (0.08)		3.70 (0.07)
Bond dummy	0.48 (0.64)	2.26 (0.05)	−0.26 (0.83)	1.71 (0.21)	−0.73 (0.63)
Intercept	11.44 (0.00)	8.55 (0.01)	6.36 (0.10)	3.21 (0.44)	6.95 (0.11)
<i>N</i>	1,328	1,272	983	943	983
Adjusted <i>R</i> <sup>2</sup>	0.10	0.09	0.16	0.15	N/A

(−2.41%) to their 75th percentile (2.59%) increases managerial ownership by 0.86 basis points. This does not appear large, but given that average ownership is only 4 basis points, this effect is substantial. For the average fund, it implies an additional investment of \$80,100.

Second, not surprisingly, managers own smaller stakes in larger funds. Third, front-end loads are negatively related to fund manager ownership, whereas expense ratios and back-end loads do not matter. Fourth, fund managers in larger families tend to have smaller ownership in their funds. Fifth, fund managers own a larger fraction of funds with higher board member compensation. It is possible that funds with higher board member compensation also have higher managerial compensation, which could be partly invested in the fund. The other measures of board effectiveness, i.e., board size and the proportion of independent directors, are not significant determinants of managerial ownership.

In Table 4, we also include dummy variables for different investment categories. We remove the international bond dummy; hence, objective effects are measured relative to this omitted category. All the equity-related objective coefficients (equity, sector, international equity) are positive and significant. The balanced dummy is also positive and significant, but smaller in magnitude relative to equity oriented funds. The bond dummy is not significantly different from zero. These results indicate that managers seek more exposure to equity funds than to balanced and bond funds. This finding also has implications for our interpretation of the results in Table 3, where we show a positive relation between manager ownership and subsequent performance. As mentioned previously, the magnitude of the coefficient on ownership in those models does not depend on the type of assets under management. However, given that managers own a larger stake in equity funds, on average, the same coefficient in the performance regressions implies that the influence of fund manager ownership on performance is economically more significant for equity funds.

Surprisingly, while the coefficient on past return volatility is negative, it is not significant at conventional levels.

In Model (2) of Table 4, we use the alpha from a four-factor model as a performance measure instead of objective-adjusted returns. The alpha is estimated using 36 monthly returns (with a minimum requirement of at least 30 months of data) spanning the 2002–2004 period, using the same factors as discussed in the Section 3.2. We remove balanced funds from the analysis because it is difficult to identify the appropriate set of factors for these funds. The results are similar to those in Model (1): Managerial ownership is higher in funds with superior performance. However, the economic significance based on risk-adjusted performance is larger than for objective-adjusted performance. Increasing alpha from its 25th percentile (−2.90%) to its 75th percentile (0.84%) increases ownership by 1.24 basis points.

Models (1) and (2) do not contain data on a fund manager's tenure because that information is available only for a subset of funds. In Models (3) and (4) we re-estimate Models (1) and (2) but include average manager tenure. We conduct this analysis only for funds with average manager tenure of greater than one year in 2005. This screening criterion allows us to focus on the determinants of year-end 2004 ownership for the managers who are also associated with the fund when subsequent performance is measured in 2005. Our results are similar if we use all funds with available information on manager tenure. As predicted, we find a positive relation between the tenure of the fund manager(s) and ownership. In terms of economic significance, this effect is the strongest of all the explanatory variables: Increasing average tenure from its 25th percentile to its 75th percentile increases ownership by 3.2 basis points.

In estimating the previous models, we assume independence of the sample observations, but this might not be an appropriate assumption. In particular, ownership could be partially influenced by the fund complex offering the fund, perhaps because fund manager ownership is encouraged to a greater extent by some complexes than by others. We therefore re-estimate the previous models, assuming independence across complexes, but not necessarily within complexes. This procedure potentially increases the standard errors but does not affect the magnitude of the coefficients. With one exception (the effect of the front-end loads), all our findings persist, and the relevant coefficients remain highly significant. We therefore do not report these findings in a table.

All the models estimated in this section employ the most conservative estimate of managerial ownership, based on the lowest possible dollar ownership in each range. An alternative methodology, namely, the interval regression approach, does not require such an assumption. In an interval regression, the researcher specifies the low-end and high-end of the range (both are employed as the dependent variable). If the high-end of the range is unbounded (which is the case for our above \$1 million category), it can also be specified in the setup of the model. We apply this alternative methodology to our sample. For each fund, we compute the lowest and highest possible percentage ownership by aggregating all individual manager stakes. The results of the interval regression estimation are reported in Model (5) of Table 4. The results are consistent with those reported in the previous models: fund managers own a larger fraction of smaller funds, funds that are part of smaller families, funds that performed well in the past, funds with low front-end loads, and funds they have managed for a longer period of time. They also own a larger stake in equity funds than in bond funds and in funds with higher director compensation.

## 6. Decomposing managerial ownership to explain future performance

In light of the evidence presented in the Section 5, we now revisit our findings on the relation between fund manager ownership and future performance. In particular, based on the models of fund manager ownership estimated in Section 5, we separate fund manager ownership into two components: the part that can be explained by the models of the determinants of ownership and the residual. We then examine the relation between future performance and both components of ownership. This decomposition is important for our performance predictability analysis. If only the predicted component of ownership is significant in explaining future performance, it implies that we can explain future performance using other observable variables. If the residual is significant, it implies that the measure of managerial ownership contains new information useful for predicting performance.

The results are presented in Table 5. Each model in Table 5 employs the predicted ownership level and residual estimated using the equivalent model from Table 4. For

Table 5

Explaining 2005 performance with decomposed managerial ownership

This table reports ordinary least squares regression results in which fund performance [measured using objective-adjusted returns (OARs) and four-factor alphas] is the dependent variable. The objective-adjusted return is computed as the annual return of the fund less the return of the median fund in the matched investment objective. Alpha is the abnormal fund return estimated using separate four-factor models for equity and bond funds. The predicted and residual ownership levels are computed using equivalent models in Table 4. Fund size is the log of total net assets. Family assets is the log of total assets of the fund management company. Models (3) and (4) are limited to the sample with average manager tenure longer than one year at the end of 2005. All the control variables are measured in 2005. Numbers reported in parentheses are *P*-values.

Variable	OAR full sample	Alpha	OAR tenure > 1 yr	Alpha tenure > 1 yr
	(1)	(2)	(3)	(4)
Predicted ownership	48.82 (0.00)	18.77 (0.00)	25.90 (0.00)	7.68 (0.06)
Residual ownership	1.68 (0.07)	2.79 (0.00)	1.73 (0.10)	2.90 (0.01)
Expenses	-0.14 (0.56)	0.98 (0.00)	0.20 (0.47)	1.18 (0.00)
Fund size	0.51 (0.00)	0.56 (0.00)	0.51 (0.00)	0.56 (0.00)
Family assets	0.42 (0.00)	0.20 (0.01)	0.27 (0.00)	0.11 (0.20)
Back-end load	-0.05 (0.73)	-0.29 (0.07)	-0.04 (0.79)	-0.29 (0.08)
Front-end load	0.08 (0.10)	-0.03 (0.60)	0.05 (0.33)	-0.05 (0.37)
Portfolio turnover	-0.02 (0.75)	-0.12 (0.13)	-0.06 (0.57)	-0.19 (0.08)
Intercept	-8.64 (0.00)	-5.38 (0.00)	-7.12 (0.00)	-4.39 (0.00)
Objective dummies	Yes	Yes	Yes	Yes
<i>N</i>	1,184	1,134	925	885
Adjusted <i>R</i> <sup>2</sup>	0.10	0.17	0.08	0.13

example, for Model (1) in Table 5, we compute the predicted level of ownership and the residual using Model (1) in Table 4. Given that we employ the predicted ownership level from Table 4 in the regression in Table 5, we do not need to include the explanatory variables that were employed in Table 4 as additional explanatory variables in Table 5. The effect of these variables is already captured indirectly through the ownership measures. However, we continue to include some explanatory variables in Table 5 because these variables are measured during 2005, while the explanatory variables employed in Table 4 are measured during 2004. Also, we do not include a model in Table 5 based on the interval regression in Table 4 because the residual of the interval regression is not defined.

In general, both the predicted and residual components of ownership are significant in explaining future performance. However, the coefficient on residual ownership is less significant in the models that use objective-adjusted returns with a *P*-value of 0.07 in Model (1) and 0.10 in Model (3). In terms of economic significance, increasing predicted ownership from its 25th percentile to its 75th percentile increases performance by 58 basis points (based on Model (4)). Moving residual ownership from its 25th to its 75th percentile increases excess performance by 21 basis points (based on Model (4)). Both of these effects are substantial.

In sum, when we subdivide actual ownership into its predicted ownership and residual components, we find that both elements of ownership have a significant positive effect on future performance. Given that the residual component cannot be predicted using existing information, this evidence indicates that a fund manager's ownership stake provides valuable information to investors in making their portfolio selection decisions, over and above observable fund, family, and manager characteristics.

## 7. Concluding remarks

In response to a number of recent scandals that have tainted the mutual fund industry, the SEC has taken steps to improve transparency and oversight with the objective of better protecting shareholder interests. One such step is the required disclosure of fund managers' ownership stakes in their funds. In this paper, we show the magnitude of these ownership stakes at the end of 2004 and examine whether ownership helps predict subsequent fund performance.

We find that average ownership is modest (0.04%) but that there are substantial cross-sectional differences in the extent to which managers are exposed to the performance of the funds they manage. We explore whether managerial ownership affects future fund performance and find that this is the case. For every basis point of managerial ownership, excess performance of the fund improves by about 3–5 basis points. In addition, we analyze the importance of measures of board effectiveness (i.e., board size, board independence, director compensation) in conjunction with managerial ownership but find no evidence that they are significantly related to future performance.

We also study managers who run more than one fund and analyze whether they own a larger fraction of the funds that exhibit better subsequent performance. We find that this is the case. This implies that the observed relationship between ownership and performance is not a result of unobserved managerial characteristics.

We recognize that fund manager ownership is endogenous and explore the determinants of fund manager ownership. Ownership is higher in funds with better past performance, funds that are smaller, that are part of a smaller family, and that charge lower up-front



loads. It is also higher in funds with higher board member compensation, in equity funds, and in funds managed by the same set of managers for a longer period of time. We then decompose managerial ownership into the portion that can be explained by fund, family, and manager characteristics and the residual component. We find that both components help explain future fund performance.

Our evidence indicates that fund managers have superior information about their future performance or that increased ownership in the fund improves a manager's incentives to generate superior performance or both. While we are unable to distinguish between these two interpretations, both sets of arguments are equivalent from the perspective of the fund's investors, in that they allow them to better predict future performance.

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