

Portfolio Manager Ownership and the Pricing of Closed-End Funds *

Ajay Khorana
Citigroup

Henri Servaes
London Business School, CEPR, and ECGI

Lei Wedge
University of South Florida

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Abstract

We examine the relationship between portfolio manager ownership, closed-end fund premiums/discounts, and future returns. Using a sample of 592 closed-end funds in 2005, representing 95% of the entire industry, we find that fund manager ownership has a positive and economically significant impact on fund premiums and future fund performance measured using both NAV and price returns. Furthermore, a number of board level characteristics, including the fraction of independent directors and directors on the board with financial expertise, are related to premiums and returns. These findings add to our understanding of the closed-end fund discount puzzle and suggest that portfolio manager ownership aligns the interests of fund managers and investors.

Closed-end funds have been the subject of significant attention on part of both academics and professionals in the asset management industry. Much of the focus has been on a number of apparent anomalies in pricing of closed-end funds, with a particular emphasis on the closed-end fund discount. That is, the vast majority of closed-end funds trade at a discount to their Net Asset Value (NAV). However, when first issued, closed-end funds are sold at a premium to NAV, which turns into a discount in subsequent months. Moreover, some funds do trade at a premium during certain stages of their life. Both rational and irrational explanations for the discount have been put forth. Dimson and Minio-Kozerski (1999) divide the rational explanations into four categories: (a) Biases in NAV, (b) Agency costs, (c) Tax timing, and (d) Market segmentation.¹ They argue that while these explanations have some merit, they cannot account for the all the cross-sectional and time-series variation in the observed discount. Instead, they argue that investor-sentiment based explanations may have more merit (see, for example Lee, Shleifer, and Thaler (1991)).

In two recent important papers, Berk and Stanton (2007) and Cherkes, Sagi, and Stanton (2009) argue that rational explanations for the discount may have been dismissed prematurely. Both articles show that many of the features of the data can be explained by simple models where the discount/premium emerges through the trade-off between compensation and either ability (Berk and Stanton (2007) or enhanced liquidity (Cherkes, Sagi, and Stanton (2009)). According to Berk and Stanton (2007) closed-end funds are initially sold at a premium because expected managerial ability exceeds the underlying costs of operating the fund. If actual ability turns out to be less than expected, the premium turns into a discount; however, if ability is better than expected, the premium may initially persist, but managers will demand an increase in compensation, which will eventually cause the premium to revert to a discount. This behavior is anticipated by the market, and therefore completely rational.

¹ Biases in NAV refer to cases where the NAV is not computed accurately because of lack of liquidity in the market for the underlying assets or non-synchronous trading. Agency costs reduce the market value of the fund below the NAV because the managers of the fund do not operate the fund in the best interest of the investors, thereby dissipating some value. Tax timing refers to the fact that direct ownership of the assets in the fund would allow an investor to better optimize taxes than indirect ownership via the fund. Market segmentation implies that assets are valued differently across markets, which can explain why closed-end funds that trade in one market but own assets that trade in another market can have a market value different from the underlying value of their assets.

Ability will lead to persistence in returns computed based on NAVs, but no persistence in market returns. Cherkes, Sagi, and Stanton (2009) argue that closed-end funds provide liquidity benefits because they generally hold illiquid assets. Time variation in this benefit can explain time variation in premium; when the premium is very high, new funds are launched because the premium offsets the IPO costs. All investors in their model are rational and they do not earn abnormal returns.

The goal of this paper is to shed more light on the pricing of closed-end funds by studying the impact of the portfolio manager ownership on the closed-end fund discount. In addition, we analyze whether portfolio manager ownership is related to subsequent returns, and we study the determinants of ownership. This research will also help us understand whether ownership and ability are related.

We take advantage of the new SEC rules that require both open-end and closed-end funds to report the investments of portfolio managers in their respective funds. These data need to be reported within broad ownership ranges. We gather this information for all closed-end funds in existence in the U.S. during the period 2005-2006. Since the disclosure requirements have only recently come into effect, we only have one datapoint available for each fund.

Thirty percent of all closed-end fund managers have an ownership stake in their fund, representing, on average, about \$60,000 or 0.04% of the market value of the fund (based on ownership computed using the low-end of the ownership range). While this average is relatively small, there is substantial cross-sectional variation in ownership across investment objectives with sector and domestic equity funds having ownership of approximately \$180,000 and \$210,000, translating into a percentage stake of 0.05% and 0.08%, respectively. Domestic bond fund managers are at the other end of the spectrum with average ownership of only \$30,000 or 0.01% of the fund's market value.

We document a positive relationship between the fund premium and the fraction of the fund's assets held by its portfolio manager(s). This relationship holds when the premium is measured contemporaneously with ownership, as well as for premiums measured up to 12 months after the ownership date, even after controlling for the lagged premium. These findings are robust to the inclusion of a variety of control variables documented in prior research to be important determinants of the closed-

end fund premiums/discounts. From an economic perspective, the impact of ownership is substantial. Increasing the ownership percentage by one standard deviation is associated with an increase in the fund premium of approximately one percent, which is substantial compared to the median discount of about 5%.

This finding is consistent with several explanations. First, ownership may reflect managerial ability: in that case, the positive relation between ownership and the premium suggests that ability is priced (consistent with Berk and Stanton (2007)). Second, ownership reduces agency costs: the interests of portfolio managers with higher ownership stakes are more aligned with those of other shareholders in the fund, which translates into an increase in the price relative to NAV. Third, managers have better information about the future performance of the fund as it relates to the fund's underlying assets; hence, they obtain higher stakes in funds that are expected to perform well, which translates into a lower discount. We believe that the third explanation is the most plausible. If ability or agency explanations were the predominant reasons for the positive relation between ownership and the fund premium, then this relation should weaken after controlling for past performance (a measure of ability) and other measures of agency costs. We do not find that this is the case. While past performance and other measures of agency costs are related to the premium, the magnitude of the ownership effect remains economically large after controlling for performance and other measures of agency. Additional evidence against the agency cost interpretation is that the relation between ownership and fund premiums is stronger when ownership is measured in dollars instead of as a percentage of the fund's market value. Since agency arguments are based on the fraction of the gains/losses that accrue to the agents versus the principals, one would not necessarily expect dollar ownership to matter.

Consistent with all of the above explanations, we also find a strong positive relation between portfolio manager ownership and future NAV and price returns. While the impact of ownership on NAV returns may be completely rational, the effect of ownership on price returns suggests a possible anomaly. One possibility is that investors learn about managerial ownership with a lag; as a result, it is not fully reflected in the premium, leading to higher price returns in the future.

We also study the determinants of fund manager ownership. Ownership is higher for equity funds than for bond funds. We also find dollar ownership to be higher for larger funds, funds managed by more portfolio managers, and funds whose managers handle fewer other investment companies. Percentage ownership is larger for managers with longer tenure. Interestingly, we find no evidence to suggest that past performance affects portfolio manager ownership.

Another contribution of this paper is that it sheds light on a number of other factors related to closed-end fund discounts and returns. For instance, funds run by multiple managers trade at a larger discount to NAV while funds with higher quality boards, i.e. boards whose members have more expertise in the financial industry, trade at a smaller discount. In addition, future price returns are positively related to the level of independence of a fund's board and the fraction of fund board members with financial expertise. Finally, both price and NAV returns are negatively related to board size.

The remainder of the paper is organized as follows. In Section I, we discuss various reasons why portfolio manager ownership may be related to the closed-end fund discount and to future returns. In section II, we describe the data collection procedure and present summary statistics on fund manager ownership. In Section III, we discuss our findings and Section IV provides concluding thoughts.

I. Hypotheses

A. The relationship between fund manager ownership, premiums, and returns

There are four potential reasons why portfolio manager ownership may be related to fund premiums and returns.

First, ownership may be a reflection of managerial ability. More adept managers may decide to purchase a larger stake in their respective funds. In addition, they may receive higher compensation which they subsequently invest in the fund, either voluntarily or because it is a policy of the fund management company.² If ability is priced and ownership is a reflection of ability, then we would expect

²A number of open-end investment management companies have made it a requirement for their fund managers to purchase shares in the funds they manage (Wall Street Journal, 2006).

the discount to be smaller for funds whose managers have more money at stake in the fund. This effect should weaken when we control for past performance and for the tenure of the portfolio managers, because past performance and tenure are both measures of ability. Finally, if ownership reflects ability, then higher ownership will also translate into higher future NAV returns, but not into price (i.e., market) returns (if markets are efficient).³

Second, higher ownership may help mitigate agency problems between fund managers and shareholders, leading to improved performance. The expectation of improved performance increases the price of the fund relative to its NAV, leading to a lower discount. As with the previous argument, this effect should weaken after controlling for past performance, given that reduced agency problems would also have affected performance in the past. The agency cost explanation further implies improved future NAV returns when ownership is higher, but not price returns (in an efficient market). In addition, agency-based explanations rely on the percentage ownership, and not the dollar level of ownership [see Jensen and Meckling (1976)]; this prediction allows us to compare the agency cost explanation to the alternatives.

Third, fund managers who are better informed about the future prospects of the underlying assets in the fund portfolio may retain higher ownership stakes. If prospective investors become aware of this, they would increase the price of the fund relative to its NAV. This information hypothesis also applies to expected future performance and is not related to past performance, which implies that controlling for past performance should not weaken the relation between ownership and the fund discount. This argument, like the ability and agency hypotheses, implies a positive relation between future NAV performance and ownership.

Fourth, if the magnitude of the discount relative to NAV is caused by investor irrationality, and if discounts are eventually expected to decline, then managers could capitalize on this behavior by buying larger stakes in funds with larger discounts. This would lead to a positive relation between ownership and

³ NAV (price) returns are based on changes in Net Asset Values (market prices) and distributions made by the fund. Section II.B. describes the computation of these return measures in more detail.

fund discounts, and a positive relation between future returns (both NAV and price returns) and ownership.

B. Corporate governance and other determinants of fund discounts

The notion that the closed-end fund discount may be related to agency problems is not new. For example, Barclay, Holderness, and Pontiff (1993) find that the presence of large 5% blockholders in closed-end funds is positively related to the NAV discounts; they argue that large blockholders derive significant pecuniary and non-pecuniary benefits from their ownership stakes. These benefits are priced by the market and lead to the discount. This argument is the opposite of the one we propose in the previous subsection where greater portfolio manager ownership aligns their incentives with those of the shareholders, leading to lower discounts. Clearly, if ownership becomes very large, portfolio managers may become entrenched, [see Morck, Shleifer, and Vishny (1988)] leading to inferior performance; we examine this possibility in our analyses. Moreover, we also control for the presence of large blockholders in our models.

Khorana, Wahal, and Zenner (2002) provide further evidence supporting the agency cost interpretation. They document that rights offerings in closed-end funds result in large increases in investment advisor compensation and increases in pecuniary benefits to affiliated entities. As a result, fund premiums turn into discounts over the course of the offering.⁴

Two other variables have been employed to capture the agency relationship between closed-end fund managers and the investors: expenses and payout ratios. Higher expense ratios have a negative impact on the performance of the fund, thereby reducing the price of the fund relative to net asset values. Higher payout ratios, on the other hand, reduce resources under managerial control and may increase the price of the fund relative to NAV. Cherkes, Sagi, and Stanton (2009) provide support for both effects. In the same vein, Johnson, Lin and Song (2006) find that after adopting policies stipulating minimum

⁴ Note that these findings are also consistent with the liquidity-based argument discussed by Cherkes, Sagi and Stanton (2009).

dividend yields, funds experience a reduction in discounts; the average discount for funds with large distributions (minimum dividend yield of 10% or greater) is about 58% smaller than the average discount for funds without such policies.

There is also some work studying the relation between fund board characteristics, fund fees, and the discount to NAVs at which funds trade. Del Guercio, Dann, and Partch (2003) document lower expense ratios for closed-end funds with smaller and more independent boards and those boards receiving lower compensation. While they find that funds with larger boards trade at a higher discount to NAV, the degree of board independence or the presence of large blockholders does not influence the discounts.

Other research on the effectiveness of fund boards for open-end mutual funds includes Tufano and Sevick (1997), Ding and Wermers (2005), and Khorana, Servaes, and Wedge (2007). Tufano and Sevick (1997) find that smaller fund boards that consist of more independent directors negotiate lower fees. Ding and Wermers (2005) report that funds with more independent boards perform better. However, Khorana, Servaes, and Wedge (2007) do not find a robust relationship between various board characteristics (size, independence, and compensation) and subsequent performance. Thus, while the evidence on the role of boards in explaining fund performance is mixed, it is clearly important to control for these board attributes in our analyses. We also include two additional board variables that have received more recent attention. First, we control for the number of other directorships held by the board members outside the fund complex. Boards whose members have lots of outside commitments may be less effective in monitoring [Fich and Shivdasani (2006)]. Second, we measure what fractions of board members have financial expertise. Agrawal and Chadha (2005) find that companies are less likely to have to restate their earnings if their board members have financial expertise. We investigate whether the impact of financial expertise is also important in explaining the pricing and performance of closed-end funds.

Performance may also be affected by the amount of time the fund managers can dedicate to the funds. Two aspects of fund organization are important in this regard. If more managers share responsibility for managing the fund, the effort of each manager may be diluted and the impact of

manager ownership on discounts and performance may be reduced. In addition, when managers have responsibility for multiple funds, the performance of each individual fund may be affected because of the relative lack of attention. This would manifest itself in a higher discount and lower NAV returns (but not price returns in an efficient market).

II. Data, Methodology, and Descriptive Statistics

A. Ownership information

The SEC requires all closed-end funds to disclose the dollar range of their portfolio managers' ownership stakes, subsequent to December 31, 2005. This disclosure appears in fund annual reports in form N-CSR, which includes basic information such as name, title, tenure and business experience of portfolio managers, and their ownership in their respective funds. We gather managerial ownership data for all funds that filed form N-CSR during the period January 2006 through March 2007. Since there is a lag between the disclosure date and the filing date, the actual managerial ownership corresponds to the period October 2005 through December 2006. Out of the universe of 630 closed-end funds, we are able to identify 592 funds (approximately 95% of all closed-end funds) with available managerial ownership information. Our primary data sources for the remainder of the data are the 2006 Morningstar Principia Closed-End-Funds database and Lipper/Reuters.

Similar to disclosure requirements for open-end mutual funds, closed-end funds are required to disclose the dollar ownership of each portfolio manager in 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. Based on this information, we compute fund manager ownership by summing up (for those funds with multiple managers) how much each individual manager owns in the funds under management. Using the methodology employed by Khorana, Servaes, and Wedge (2007), we use both the lowest value and midpoint of the ranges to estimate the dollar ownership, except for ownership levels above \$1 million, where we employ the low end of the range. Percentage ownership is calculated by dividing the dollar

ownership by the market value of the fund at the end of the month for which the ownership data are disclosed.

Table 1 reports summary statistics on manager ownership. Panel A uses the lowest value of the range to compute fund manager ownership, while Panel B employs the midpoint of the range. Two results stand out. First, only 30% of the portfolio managers invest in their own funds. This low proportion is mainly due to domestic and international bond funds, where the likelihood of any ownership is 22% and 19% respectively. The average dollar ownership is \$60,085 (based on the low end of the range) and \$93,573 (based on the midpoint). On a percentage basis, ownership ranges between 0.04% and 0.05% of total fund assets. For open-end funds, managers own \$96,663 based on the low-end of the reporting range (\$149,570 based on the midpoint) in their funds, equivalent to 0.04% (0.08%) of total fund assets (see Khorana, Servaes, and Wedge (2007)).

Second, sector fund and domestic equity fund managers are more likely to invest in their funds, resulting in higher dollar and percentage holdings. Average dollar holdings range from \$179,774 (Panel A) to \$360,682 (Panel B) for sector funds and from \$211,804 (Panel A) to \$235,082 (Panel B) for domestic equity funds. These numbers are somewhat higher than those documented for open-end funds by Khorana, Servaes and Wedge (2007). The dollar figures translate into percentage ownership between 0.05% and 0.09%.

B. Fund premia/discounts and performance measures

We rely primarily on data from Lipper/Reuters to compute various return and premium/discount measures. These data are available on a monthly basis. The fund premium/discount is computed as (price/NAV)-1. For fund returns, two measures are employed, the price return and the NAV return. For any time period t , returns are calculated as follows:

$$\text{Price return}_t = (P_t + \text{DIST}_t) / P_{t-1}$$

$$\text{NAV return}_t = (\text{NAV}_t + \text{DIST}_t) / \text{NAV}_{t-1}$$

where P_t is the price of the closed-end fund at the end of period t , NAV_t is the net asset value per share after adjusting for expenses, dividends and capital gain distributions; $DIST_t$ is the cash distribution (capital gains and dividends distribution) during period t .

The return measures computed above are raw measures of a fund's performance and do not allow for a comparison across funds with different investment objectives. Hence, we also construct objective-adjusted measures of the price and NAV return for each fund. The median fund return in each objective is employed to make this adjustment, using the following 27 categories: balanced, bank-loan, convertible, financial, health, hybrid bond, intermediate-term bond, international bond, international equity, large blend, large growth, large value, long-term bond, metals, mid-blend, mid-growth, mid-value, multi-sector bond, short-term bond, small-blend, small-growth, small-value, specialty natural resources, state municipal bond, real estate, technology, and utilities. We also compute the objective-adjusted discount, computed as the discount minus the median discount in the investment objective.

Even after adjusting for the median level of performance in the investment objective, there may still be risk differentials across funds within an objective. We therefore also measure excess returns based on a four-factor model. We employ price returns in the four factor model. Since we have limited data for the period after the disclosure, and only have data at the monthly frequency, we estimate the model over a 36 month window starting 24 months before the ownership disclosure. 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 ownership can be employed to predict future performance. To overcome this problem, we estimate the following model for each fund:

$$Return_{it} = \alpha_0 + \alpha_1(post\ dummy) + \sum \beta_j(Factor_{jt}) + \varepsilon$$

where i refers to the specific fund, j refers to the factor, and t refers to the month in the 36 month window starting 24 months before the disclosure period (we require at least 30 months of data to estimate the model). Monthly risk-adjusted abnormal returns in the post-disclosure period are computed by adding the post alpha (α_1) to the intercept (α_0). We then multiply the monthly annual return by 12 to obtain a

measure of the annual abnormal return. Thus, the factor loadings are estimated using some data before the disclosure period, but the estimate of excess performance is for the post-disclosure period only.

To estimate the multi-factor models, we use different sets of factors for equity funds and bond funds. For equity funds, we employ the three Fama/French (1992) factors: excess return on the CRSP value-weighted index, the difference in returns between small and large stock portfolios and the difference in returns between high and low book-to-market equity portfolios. We augment these factors by a momentum factor [Carhart (1997)]. For bond funds, we use the excess return on the Lehman Brothers government/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.

C. Governance and other manager- and board specific variables

Our regression models include a large number of governance-related variables, and especially variables related to fund board effectiveness. Specifically, we gather information on board size, the number of independent and non-independent directors, as well as the following information on each director: financial expertise, number of other directorships held, and compensation received from the fund. This information is gathered from Form DEF 14A. Financial expertise is defined as having a CPA, CFA, experience in corporate financial management (for example, as chief financial officer, treasurer, controller or vice president of finance) or in the money management industry.

We also collect information on the number of portfolio managers, and the number of registered investment companies managed by those managers. Finally, we gather data from the SEC on the presence of 5% blockholders in each fund.

D. Other explanatory variables

We gather information on other explanatory variables from Morningstar Principia Closed-End-Fund CDs and Lipper/Reuters. These variables include fund age, fund expenses, and the payout ratio.

E. Summary statistics

Table 2 compares the funds with manager ownership to those without any ownership. We start by examining the fund discount and various measures of performance. Funds with managerial ownership trade at higher premiums when measured on an objective-adjusted basis. Mean (median) objective-adjusted premium is 3.28% (0.76%) versus 1.08% (-0.42%) for the ownership and non-ownership samples, respectively.

Both the price and NAV returns are higher in the years before and after the ownership disclosure date for funds with manager ownership. Mean (median) NAV returns after the ownership disclosure are 11.55% (9.31%) and 8.16% (4.97%) for the two samples, and the corresponding price-based returns are 13.39% (12.10%) and 8.97% (5.35%), respectively. However, when we adjust the return for the median performance in the objective, the differences in performance between the two groups are no longer significant both before and after the disclosure date. When we adjust for risk using four-factor alphas, the significant difference in performance after the ownership disclosure re-emerges. Alphas in the year after disclosure for funds with non-zero ownership are 2.20%, on average (median of 0.89%), compared to -0.09% (median of -1.11%) for funds without manager ownership.

Next we compare fund characteristics. We find that funds with managerial holdings tend to be larger, but more expensive. Funds with positive ownership also make larger dividend and capital gains distributions.

Finally, we compare board and governance characteristics. While the median number of managers overseeing the fund is the same across the two samples, managers with non zero ownership manage six other investment companies with a corresponding value of 13 for the zero ownership sample. Thus, the managers of funds with ownership oversee a smaller portfolio of funds and can therefore devote more of

their time to each fund. We do not find a significant difference in the fraction of funds with block ownership across funds with and without manager ownership. In fact, the median fund has no blockholders at all.

In terms of board specific characteristics, funds with managerial ownership have smaller boards: 8 versus 9 board members for the median fund, but their boards are less independent (although the difference is small: 80% versus 86% independent board members for the median fund).

We also find that funds with managerial ownership are monitored by more focused boards in terms of their oversight responsibilities. First, the boards of funds with managerial ownership oversee fewer portfolios (52.8, on average) within the fund family compared to boards of funds without managerial ownership (92.2, on average). Second, the average number of other directorships held by the board members outside of the fund complex is smaller for funds with managerial ownership: 1.17, on average, (median=1) compared to 1.44, on average, (median=1.67) for funds without ownership.

Boards of funds with (without) managerial ownership each receive median compensation of \$6,882 (\$2,133) from the fund annually. The difference in pay between the two groups may be explained by the fact that boards with managerial ownership oversee larger funds. In addition, they oversee fewer funds. If board members are paid a fee for all the services provided to the fund management company, it is also likely that they will be paid more per fund if they oversee fewer funds.

Next, we analyze board expertise, defined by the fraction of a fund's board members with relevant financial experience. We find that 57% (68%) of board members of funds with (without) managerial ownership have financial expertise. While the level of board expertise is lower for the managerial ownership sample, ultimately the impact of these variables on the fund discounts has to be examined in a multivariate framework (controlling for other board characteristics such as board independence, other outside commitments of the boards, etc.).

Overall, the univariate comparisons presented in this section indicate that closed-end funds with portfolio manager ownership trade at a higher objective-adjusted premium and have better subsequent performance as measured by four-factor alphas when compared to funds without ownership. However,

these groups of funds also differ from each other in a number of other dimensions. It is therefore important to control for these differences to isolate the effect of portfolio manager ownership.

III. Results

A. Managerial ownership and closed end fund discounts

As discussed previously, a plethora of factors have been put forth to explain fund premiums and discounts. Our study contributes to this literature by examining the role of managerial ownership in influencing this relationship, after controlling for these factors. An additional contribution of our work is that our models include many governance variables that have not been studied previously.

We employ two measures of the fund premium: (1) the premium computed at the end of the month corresponding to the ownership date, both unadjusted and objective-adjusted, (2) the average monthly premium computed over the 12 months commencing the month for which the ownership is disclosed. The objective-adjusted fund premium is computed as the difference between the fund premium and the premium of the median fund in the matched investment objective.

Table 3 reports the results of the multivariate models, estimated using OLS. All models that employ the unadjusted premium as the dependent variable also include 27 objective dummies to control for the influence of specific objectives on the premium. For example, Cherkes, Sagi and Stanton's (2009) argument that the premium is influenced by differences in liquidity between the fund and the underlying assets will be captured by these dummies. In model 1, we only include the fraction of the fund owned by the portfolio manager(s). The fund premium is positively and significantly related to the percentage ownership stake of the fund manager(s). The magnitude of the ownership coefficient is 12.53. The economic impact of this variable is substantial: increasing the ownership percentage by one standard deviation (0.073%) leads to an increase in the premium of 0.91%. which is large given that the average premium in the sample is -4.11%.

In model 2, we also include past performance and various fund characteristics. Including these variables has little effect on the coefficient. It is 12.37 in this specification, significant at the 3% level.

Four of the five control variables are also significant. Premiums are higher (discount are smaller) when the fund has performed well in the past. If past NAV returns are a good predictor of future returns, investors will bid up the price of funds that performed well relative to their NAVs, leading to an increase in the premium. This result is consistent with Berk and Stanton's (2007) argument that ability is priced, and with the evidence of Bleaney and Smith (2003). Larger funds trade at a smaller premium, a finding consistent with Chen, Hong, Huang, and Kubik (2004) who document that fund size adversely affects performance for a sample of open-end funds, especially those funds investing in small and illiquid stocks. Fund age is negatively related to the premium; funds start out trading at a premium, which slowly erodes over time and turns into a discount [see, for example, Weiss (1989)]. Finally, consistent with Cherkes, Sagi, and Stanton (2009), we find a higher premium for funds that make larger distributions. We find no evidence that the fund premium is related to the fund's expense ratio.

In model 3, we also include an indicator variable to capture block ownership above 5%, the number of portfolio managers running the fund, the (log of the) total number of investment companies managed by the portfolio manager(s), and the average tenure of the portfolio managers. Portfolio manager ownership continues to be significant in this specification. Moreover, the magnitude of its coefficient remains virtually unchanged compared to models 1 and 2. In addition, the premium is lower when more managers oversee the fund; this negative impact is not surprising if we believe that team management dilutes individual incentives. However, we find evidence of a positive relation between the premium and the number of investment companies overseen by the manager. This result appears counterintuitive, but may be due to the fact that better managers are rewarded with more management responsibilities, and it is the higher ability that leads to a higher premium. We also find a higher premium for funds whose managers have been in charge for a longer period of time. Given the negative relationship between tenure and performance [see Khorana (1996)], managers with longer tenure are likely to have performed better. Thus, this result provides further evidence for the view that ability is priced. Block ownership is not related to the premium, consistent with DelGuercio, Dann, and Partch (2003).

Finally, in model 4, we add various board characteristics. Inclusion of these variables has little effect on the importance of portfolio management ownership; it remains positive and significantly related to the premium. Most board characteristics are not significant, except for board independence. Funds with more independent boards trade at a lower premium. This effect appears to be counterintuitive. One possibility is that causality is reversed: funds with higher discounts attract more outside directors, whose expertise is required to turn the fund around, a phenomenon documented by Hermalin and Weisbach (1988) for corporate boards.⁵

In models 5 and 6 we examine whether our results are robust when we employ different measures of the premium. In model 5, we adjust the premium by subtracting the median premium in the investment objective; objective dummies are therefore not included in this model. Measuring the premium on an objective adjusted basis reduces the coefficient on ownership somewhat, but it remains statistically and economically important. The impact of the other explanatory variables changes little, except that board expertise enters the model significantly. We find that the fund premium is higher for boards with more financial expertise. The impact of board expertise has not been studied previously in the mutual fund and closed-end fund literature. It is not only statistically but also economically important. Increasing the fraction of the board with financial expertise from its 25th percentile (0.43) to its 75th percentile (0.875) increases the fund premium by 1.2 percentage points. This is substantial compared to the mean discount in the sample of 4.11%. The positive impact of financial expertise indicates that investment advisors in the closed-end fund industry need to pay closer attention to the background and qualifications of their board members.

In model 6 we employ the average premium for the 12 months after the date for which ownership is disclosed as the dependent variable, and also include the premium during the reporting month as an additional explanatory variable. This specification allows us to deal with any concerns about reverse causality: our finding that the premium is positively related to ownership may not be due to the fact that

⁵ In unreported models, we also included manager ownership squared as an explanatory variable to determine whether the premium declines for large levels of ownership. This is not the case; the squared term is never significantly different from zero.

premiums are higher because the funds have higher portfolio manager ownership, but because managers buy more shares in funds with a higher premium. By looking at premiums in the future and controlling for the current premium, this interpretation can be ruled out. Portfolio manager ownership continues to be significantly related to the premium and the coefficient on ownership is only slightly smaller than in the models where we measure the premium contemporaneously. The model also illustrates that premiums are persistent (the coefficient on the current month premium is 0.84). Many of the control variables are significant as well. Future premiums are lower when past NAV returns are higher, pointing toward possible mean reversion in performance. The effect of the number of investment companies managed is negative, which is the opposite of the effect in the models where we measure the premium contemporaneously. One possibility is that high quality managers get assigned more funds to oversee, but the resulting lack of focus hurts performance, leading to a lower premium. We investigate the performance issue in the next sub-section.

The presence of a block owner also has a positive impact on the future premium. This result is inconsistent with the work of Barclay, Holderness, and Pontiff (1993) who find a negative relationship. However, they estimate the relationship contemporaneously, while this model looks at the effect on the future premium. As we discussed previously, in models 3 and 4, where we look at the contemporaneous relationship between block ownership and the fund premium, we do not find a significant effect, consistent with Del Guercio, Dann, and Partch (2003).

In terms of board characteristics, future premiums are higher for more independent boards and when a greater proportion of the board has financial expertise. The impact of financial expertise is the same for this model as for the model where the premium is measured contemporaneously, but the impact of board independence reverses. This reversal is consistent with our previous interpretation: funds with a larger discount add more independent board members to the board because they add valuable expertise. When these members have been added, the discount declines in subsequent months.

Models 7 through 9 employ different measures of portfolio manager ownership. In these models, we revert back to the raw-unadjusted premium as the dependent variable, but our findings are very similar

if we employ the other measures of the premium discussed previously. In model 7, we measure manager ownership using a 0/1 dummy. Our findings persist: the premium is 2.19 percentage points higher when managers own part of the fund. In model 8, we measure the percentage ownership computed using the midpoint of the dollar ownership range. Again, we find a positive effect. The coefficient is smaller than in the equivalent model where we use the low point of the ownership range (model 4), but the ownership percentage using the median of the range is higher, of course, so the net effect is similar. We employ the log of dollar ownership (plus 1) in Model 9. Again, we find a positive and significant coefficient.

Overall, the findings reported in Table 3 indicate that fund premiums are positively influenced by portfolio manager ownership. This is consistent with all three arguments we propose: ability, agency, and information. However, our findings do not weaken when we include past performance, which should also be a reflection of ability and/or the lack of agency problems, in our regressions models. This evidence is therefore most supportive of the information argument, because information is less likely to be related to past performance. One other piece of evidence also supports the information argument: the impact of ownership persists when it is measured in dollars, while the agency explanation applies more to percentage ownership. Moreover, the explanatory power of the model is slightly higher when we measure ownership in dollars. The adjusted r-squared is 0.29 in model 9, which includes dollar ownership, and 0.28 in model 4, which is based on percentage ownership.⁶

One concern with the above analysis is that ownership is endogenous. However, many of the explanatory variables included in the regression models are variables that may also affect ownership, such as prior performance, the size of the fund, fund age, and investment objective. Controlling for these effects is equivalent to estimating a model of ownership as a function of these factors, computing the residual, and including the residual in the model explaining fund premiums. Thus, we have implicitly

⁶ A small number of equity funds in our sample (20) have adopted a minimum dividend payout policy. As we reported, Johnson, Lin, and Song (2006) find that these funds have a smaller discount. We find that this is the case for our sample as well. More importantly, inclusion of a minimum dividend payout dummy in our models has no impact on the magnitude or significance of the effect of portfolio manager ownership.

addressed the endogeneity concern. However, we believe that studying the determinants of portfolio managers is a contribution in its own right, and report results of such an analysis in Section III.C.

B. Explaining future fund performance

In Table 4, we investigate whether future performance is related to fund manager ownership. Unlike for open-end funds, for closed-end funds we can examine both the price return and the NAV return of the fund where the price return is a measure of the investor's earned return on the fund while the NAV return is a measure of the actual returns generated by the fund's portfolio manager(s). We present models for objective-adjusted NAV returns and price returns, as well as for four-factor alphas. As mentioned previously, the alphas are computed based on price returns.

For each of the performance measures, we present three models. The first model only includes the fraction of the fund owned by portfolio managers and objective dummies. The second specification includes fund manager ownership and all the control variables, while the third model employs the log of the dollar ownership of the portfolio managers (based on the low end of the reported range) instead of fractional ownership, and the control variables.

Across all three performance measures we find that returns increase with the fraction of the fund owned by portfolio managers. However, this is not the case when ownership is measured in dollars instead; while the coefficient on dollar ownership is positive for all three performance measures, the effect is only significant in the model that uses the four-factor alpha as the dependent variable. The magnitude of the coefficient of the percentage ownership does not decline when control variables are added to the model. In fact, it increases substantially in two of the three sets of models. The positive impact of ownership on performance is consistent with all three arguments proposed in Section 2: (a) ownership proxies for ability and managers with better ability perform better; (b) ownership reduces agency costs, and funds whose managers have lower agency costs perform better; (c) ownership is higher for managers with more positive information about future performance. The fact that the importance of ownership does not decline when we add control variables and both past performance and manager tenure

(which should capture both ability and agency) suggests that the information explanation has more merit. However, the information explanation should also bear out when we look at dollar ownership, which is only the case for four factor alphas. If the alphas capture risk-adjusted performance better than objective-adjusted measures, then our findings provide the strongest support for the superior information argument.

It is also interesting to note that the impact of ownership is similar for NAV returns as for price returns and four-factor alphas. As we pointed out earlier, finding predictability in NAV returns is not inconsistent with efficient markets because expected excess performance can be reflected in the price of the fund relative to its NAV. However, our finding that price returns and alphas can also be predicted based on managerial ownership does suggest the possibility of a trading rule. What is also interesting is that the magnitude of the coefficient on ownership increases for the price return models compared to the NAV return regressions. Thus, if anything, fund manager ownership is more important in predicting price returns than NAV returns.

The impact of ownership on future performance is also economically important. Increasing the ownership percentage by one standard deviation (0.073%) increases objective adjusted price returns by 1.61%, which is 17% of the standard deviation of price returns (9.63%) (based on the model with all control variables included).

With respect to the control variables, there is evidence of performance persistence in NAV returns, but not in price returns or alphas. There is negative relation between the fund premium and future performance in all models. This finding is consistent with Pontiff (1995), who attributes this correlation to mean reversion in fund premiums.

Fund size is negatively related to fund performance in certain specifications, consistent with Chen, Hong, Huang, and Kubik (2004). Performance is also poorer when the portfolio managers oversee more investment companies; this effect is always significant for four-factor alphas and for objective-adjusted price returns. Thus, the dilution of effort that accompanies the increase in the number of funds overseen appears to have a negative impact on performance.

In terms of the various measures of board composition and quality, the variables with the strongest statistical significance levels are board size and independence. Funds with more independent boards have better subsequent price returns and alphas. From an economic perspective, increasing board independence by one standard deviation (7.68%) leads to an increase in objective-adjusted price returns of 0.97% (based on model 5), which is about 10% of its standard deviation. Board size has a negative impact on future returns, but only the impact on price and NAV returns is significant. This effect is consistent with Tufano and Sevick (1997) who suggest that there are organizational complexities and inefficiencies embedded in larger boards. Finally, funds whose board members have greater financial expertise exhibit larger four-factor alphas. The other board-related variables (other directorships held by board members and director compensation) are insignificant in all specifications.

In summary, managerial ownership is positively related to fund future performance, even after controlling for a number of factors previously examined in the literature, and for a number of new factors. A strong governance structure (small boards with more independent directors who have financial expertise) also improves returns for investors.

C. The determinants of portfolio manager ownership

As discussed previously, portfolio manager ownership is likely endogenous. We addressed the endogeneity problem through the inclusion in the regression models of many of the variables that are possibly related to ownership. However, such analysis does not tell us which factors are related to ownership and which are not. This section addresses this issue.

We consider the following elements in our analysis: fund size, prior performance, volatility of performance, number of fund managers, manager tenure, and number of investment companies managed.

The relationship between performance and ownership can be positive or negative. A positive relationship emerges if managers receive higher compensation for good performance and invest part of this compensation in the fund, either voluntarily or because it is company policy. Managers who have performed well may also be overconfident and purchase more shares in the fund, leading to a positive

relationship. Alternatively, managers who owned shares in the fund previously may decide to reduce their ownership after they performed well because they wish to rebalance their portfolios. We use two of the performance measures employed previously: objective-adjusted NAV returns computed over the previous 12 months and managerial tenure. Managers with longer tenure have also had more opportunity to acquire stakes in the fund. As before, we employ the average tenure of all managers.

We expect risk averse managers to own lower stakes in more volatile funds. We measure volatility as the standard deviation of monthly price returns over the 12 month period before the month of the ownership disclosure.⁷ Managers are expected to own a smaller stake in larger funds, but there could be a positive relation between dollar ownership and fund size if managers of larger funds are wealthier or receive higher compensation that they invest in the fund.

The impact of the number of fund managers on ownership could go either way. Because of reduced capital constraints, funds with more managers should have higher ownership. On the other hand, managers may want to invest less of their own money in a fund if they do not have full control of its management. Managers who run multiple funds are expected to own less in each specific fund.

We also include dummies for each of the broad investment objectives listed in Table 1. Given that international bond and stock funds contain assets that are somewhat specialized (e.g., many international equity funds are country funds), we expect managers to have lower ownership in them. The same argument applies to bond funds, many of which are municipal bonds funds.

Table 5 contains the results. We estimate two models, one with the percentage ownership as the dependent variable, and one with the log of dollar ownership. Because ownership is specified in a range, we estimate interval regression models, which allow us to specify the lower and upper limit of the ownership range, even if the upper limit is unbounded. The interpretation of the regression coefficients is the same as for OLS models.

⁷ Volatility is the only explanatory variable employed in the ownership model that was not employed to explain the fund premium and fund performance. When we include it in those models, it is never significant and does not affect the magnitude or significance of the coefficient on ownership.

None of the fund and manager variables are consistently significant across the two models. We find that the percentage ownership is higher for fund managers with longer tenure, but this effect is not statistically significant for dollar ownership. We do not find percentage ownership to be lower for larger funds, suggesting that wealth constraints do not play an important role, while there is a positive relation between dollar ownership and fund size. We also find dollar ownership to be lower when managers have responsibility for more companies and when there are fewer managers running the fund. Most importantly, perhaps, fund manager ownership is not related to past performance. This is consistent with our earlier evidence that the impact of ownership on the fund premium and on future performance does not weaken when we control for past performance.

In terms of investment objectives, all coefficients are measured relative to international bond funds (the omitted category). Managers invest more in balanced funds, domestic equity funds, and sector funds, compared to international bond funds; these results hold for both percentage and dollar ownership. There is also some evidence that dollar ownership is higher for domestic bond funds.

Overall, we have relatively little success in explaining the level of fund manager ownership in the fund industry. While we find several variables to be important, their impact depends on how ownership is measured.

IV. Concluding remarks

This paper demonstrates that portfolio manager ownership has a substantial impact on the closed-end fund discount and subsequent returns. Higher ownership leads to lower discounts and better subsequent performance. We explore several explanations for this finding. Ownership may be a reflection of ability, but the effect of ownership does not decline when we include other measures of ability, so that explanation is not fully supported by the data. Ownership may be a measure of agency costs, but as with ability, including other measures of agency costs does not weaken the effect of ownership on discounts and performance. Finally, ownership may be higher for managers that have better information about the future performance of the fund. This explanation relies more on dollar

ownership than on percentage ownership, and we do find that the explanatory power of models of the discount is higher when we include dollar ownership rather than percentage ownership. However, dollar ownership is only related to future returns when measured as four-factor alphas. As alphas may be the best measure of performance, though, our findings are most consistent with the notion that managers increase their ownership in the fund when they have better information about improved future performance. From the perspective of the fund investor, our findings are useful no matter what ultimately drives the relationship we uncover, because they can be employed to earn excess returns.

We also uncover a number of other factors that are related to discounts and performance. Funds trade at a higher premium (lower discount) when past performance has been good, when they are younger and smaller, have fewer managers with longer tenure, who manage more investment companies, when there are fewer outsiders on the board, and when board members have more expertise in finance. Future returns are higher for funds with smaller boards that consist of more independent directors who have greater financial expertise.

Collectively, our results indicate that closed-end fund investors should pay close attention to board structure, in general, and portfolio manager ownership, in particular, when considering which funds to invest in.

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Table 1
Summary statistics of manager holdings in closed-end funds

This table reports the dollar amount and percentage of managers' ownership in their funds during a disclosure period of October 31, 2005 and December 31, 2006. All funds are categorized into the following objectives: balanced, domestic bond, domestic equity, international bond, international equity and sector. Mean, 50th, 75th, 90th, and 100th percentiles of manager ownership are reported. Since funds only report the range of each manager's fund ownership (\$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), we sum them up for all managers in each fund. Panel A assumes that each manager holds the lowest value of the range, while Panel B assumes the midpoint of the range. For the over \$1 million range, we set manager ownership at the bottom of the range. Percentage of managerial ownership is the percentage of all managers' total ownership in a fund scaled by its total assets. % own refers to the percentage of managers 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 percentage)				
			Mean	50th	75th	90th	100th	Mean	50th	75th	90th	100th
All funds	592	0.30	60,085	0	2	100,002	2,000,002	0.04	0.00	0.00	0.03	9.94
Balanced	8	0.63	130,001	5,001	15,003	1,000,001	1,000,001	0.10	0.00	0.01	0.80	0.80
Domestic bond	409	0.22	29,096	0	0	50,001	2,000,002	0.01	0.00	0.00	0.02	0.62
Domestic equity	61	0.57	211,804	1	70,003	1,000,001	2,000,002	0.08	0.00	0.02	0.14	1.85
International bond	21	0.19	7,143	0	0	1	100,001	0.00	0.00	0.00	0.00	0.03
International equity	49	0.24	33,674	0	0	110,002	1,000,001	0.21	0.00	0.00	0.03	9.94
Sector	44	0.70	179,774	50,001	225,004	600,002	1,000,002	0.05	0.01	0.04	0.12	0.70

Panel B. Summary statistics of manager holdings (based on midpoint of range)											
Fund Type	N	Managerial ownership (in dollars)					Managerial ownership (in percentage)				
		Mean	50th	75th	90th	100th	Mean	50th	75th	90th	100th
All funds	592	93,573	0	10,000	300,000	2,000,002	0.05	0.00	0.00	0.08	9.94
Balanced	8	141,875	17,500	50,000	1,000,001	1,000,001	0.11	0.01	0.03	0.80	0.80
Domestic bond	409	51,137	0	0	75,000	2,000,002	0.02	0.00	0.00	0.04	0.83
Domestic equity	61	235,082	5,000	135,000	1,000,001	2,000,002	0.09	0.00	0.03	0.20	1.85
International bond	21	18,333	0	0	5,000	300,000	0.01	0.00	0.00	0.02	0.08
International equity	49	56,122	0	0	330,000	1,000,001	0.22	0.00	0.00	0.09	9.94
Sector	44	360,682	75,000	640,000	1,000,001	1,500,000	0.09	0.03	0.09	0.28	0.70

Table 2
Univariate statistics of funds with/without managerial ownership

This table reports the univariate statistics of funds with/without managerial ownership. Premium is computed as (fund price-NAV)/NAV. Premium/discount (current) refers to the fund premium/discount at the end of the ownership month. Obj-adj premium/discount is computed as the fund premium/discount minus that of the median fund with the same investment objective. Obj-adj return is computed as the fund return less that of the median fund with the same investment objective. Alpha is the abnormal fund return estimated using separate four-factor models for equity and bond funds respectively computed for time period (-24, 0) and (0, +12), where 0 refers to the month for which we have ownership data. Payout ratio is the sum of dividend and capital gains distributions during the year for which ownership is disclosed, divided by the NAV of the fund. Manager tenure is the log of the average tenure of all managers managing the fund. Number of investment co. managed is the average number of investment companies managed by the portfolio managers. Number of other directorships refers to the average other directorships outside the fund complex held by fund board members. Board member compensation is the average dollar amount each board member receives from the fund. Board member with expertise is the fraction of a fund's board members with relevant financial expertise. All performance measures are in percent. *, **, *** indicates that the difference between funds with and without ownership is significant at the 10%, 5%, and 1% levels. A t-test is conducted for differences in means and a rank sum test for differences in medians.

	With ownership		No ownership	
	Mean	Median	Mean	Median
<i>Performance</i>				
Premium/discount (current)	-3.89	-5.44	-4.20	-5.15
Obj-adj prem/disc (current)	3.28***	0.76***	1.08***	-0.42***
NAV return -12 month	9.06***	7.39***	6.99***	5.26***
NAV return +12 month	11.55***	9.31***	8.16***	4.97***
Price return -12 month	8.57*	7.16**	6.76*	4.94**
Price return +12 month	13.39*	12.10***	8.97**	5.35***
Obj-adj NAV return -12 month	0.70	0.30	0.80	0.04
Obj-adj NAV return +12 month	-0.04	0.20	0.44	0.05
Obj-adj price return -12 month	0.69	0.11*	-0.38	-0.91*
Obj-adj price return +12 month	-0.65	-0.47	0.12	-0.69
Prior alpha	-3.29	-3.14**	-2.18	-1.95**
Post alpha	2.20**	0.89***	-0.09**	-1.11***
<i>Fund characteristics</i>				
Fund age	11.21	4.00***	10.70	13.00***
Total assets	539***	336***	284***	183***
Expenses	1.41***	1.20***	1.19***	1.15***
Payout ratio	7.93***	7.30***	6.46***	5.45***

	With ownership		No ownership	
	Mean	Median	Mean	Median
<i>Board and other governance characteristics</i>				
N of portfolio managers	2.60 ^{***}	2.00 ^{***}	2.05 ^{***}	2.00 ^{***}
Manager tenure	6.38	3.65 [*]	5.99	4.70 [*]
N of investment co. managed	8.99 ^{***}	6.00 ^{***}	23.66 ^{***}	13.00 ^{***}
Block ownership	0.29	0.00	0.27	0.00
Board size	7.59 ^{***}	8.00 ^{***}	8.58 ^{***}	9.00 ^{***}
Percent of board independence	0.81 ^{***}	0.80 ^{***}	0.86 ^{***}	0.86 ^{***}
Portfolios overseen by board	52.84 ^{***}	24.00 ^{***}	92.25 ^{***}	71.38 ^{***}
N of other directorships	1.17 ^{***}	1.00 ^{***}	1.44 ^{***}	1.67 ^{***}
Board member compensation	10,438 ^{***}	6,882 ^{***}	4,606 ^{***}	2,133 ^{***}
Board member with expertise	0.59 ^{***}	0.57 ^{***}	0.69 ^{***}	0.68 ^{***}

Table 3
Determinants of fund premium

This table presents OLS regressions of the fund premium. In models 1 through 4 and 7 through 9, the dependent variable is the raw fund premium (current), as defined in Table 2. In model 5, the dependent variable is the objective-adjusted premium, computed as the raw fund premium less the premium of the median fund with the same investment objective. In model 6, premium (1, +12) refers to the average fund premium in the 12 months following the date for which managerial ownership is disclosed. The explanatory variables are measured at the same time as the period for which ownership is disclosed. The explanatory variables are defined in Tables 1 and 2, except for ownership dummy, which is equal to one if the fund manager has positive ownership invested in the fund. Numbers reported in parentheses are p-values.

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
	Premium	Premium	Premium	Premium	Obj-adj premium	Premium (1, +12)	Premium	Premium	Premium
Ownership percentage (low)	12.53 (0.01)	12.37 (0.03)	11.98 (0.04)	9.88 (0.09)	7.97 (0.08)	9.17 (0.00)			
Ownership dummy							2.19 (0.01)		
Ownership percentage (midpoint)								6.10 (0.10)	
Log of dollar ownership (low)									0.28 (0.00)
Premium						0.84 (0.00)			
Obj-adj NAV return (-12, 0)		0.12 (0.06)	0.09 (0.16)	0.12 (0.06)	0.11 (0.08)	-0.06 (0.07)	0.13 (0.04)	0.12 (0.06)	0.13 (0.05)
Log fund age		-1.24 (0.00)	-2.01 (0.00)	-1.39 (0.00)	-1.16 (0.01)	-0.34 (0.18)	-1.30 (0.01)	-1.38 (0.00)	-1.35 (0.00)
Log TNA		-1.20 (0.00)	-1.01 (0.00)	-1.04 (0.01)	-0.91 (0.02)	-0.15 (0.50)	-1.24 (0.00)	-1.02 (0.01)	-1.31 (0.00)
Expense ratio		0.46 (0.55)	0.59 (0.46)	0.08 (0.93)	0.55 (0.46)	0.03 (0.95)	-0.07 (0.94)	0.08 (0.92)	-0.24 (0.77)

Payout ratio		1.04 (0.00)	1.00 (0.00)	0.98 (0.00)	0.94 (0.00)	-0.00 (0.97)	0.98 (0.00)	0.98 (0.00)	0.97 (0.00)
Block ownership dummy			0.09 (0.91)	-0.79 (0.34)	-0.10 (0.89)	1.06 (0.02)	-0.52 (0.53)	-0.72 (0.38)	-0.49 (0.55)
N of fund managers			-0.92 (0.00)	-0.93 (0.00)	-0.86 (0.00)	-0.00 (0.99)	-1.01 (0.00)	-0.97 (0.00)	-1.02 (0.00)
Manager tenure			1.35 (0.00)	1.26 (0.00)	1.41 (0.00)	-0.02 (0.91)	1.22 (0.00)	1.24 (0.00)	1.19 (0.00)
Log N of investment co. managed			0.77 (0.04)	0.80 (0.04)	0.75 (0.02)	-0.40 (0.05)	0.89 (0.02)	0.83 (0.03)	0.87 (0.02)
Board size				-0.14 (0.46)	-0.19 (0.32)	-0.01 (0.95)	-0.11 (0.59)	-0.13 (0.52)	-0.11 (0.58)
Pct of board independence				-19.68 (0.00)	-17.02 (0.00)	4.95 (0.07)	-17.70 (0.00)	-19.31 (0.00)	-17.49 (0.00)
N of other directorships				-0.45 (0.20)	-0.08 (0.80)	0.29 (0.14)	-0.45 (0.20)	-0.47 (0.19)	-0.44 (0.22)
Pct of board with expertise				1.96 (0.12)	2.69 (0.03)	1.69 (0.01)	2.00 (0.11)	2.00 (0.12)	2.17 (0.08)
Log of board compensation				0.14 (0.69)	0.08 (0.81)	0.26 (0.15)	0.20 (0.56)	0.15 (0.65)	0.18 (0.58)
Objective Dummies	Included	Included	Included	Included	Excluded	Included	Included	Included	Included
Intercept	-4.29 (0.00)	-3.00 (0.22)	-4.19 (0.14)	12.04 (0.05)	13.41 (0.02)	-5.16 (0.12)	10.05 (0.10)	11.31 (0.07)	10.55 (0.08)
N	589	563	554	548	548	548	548	548	548
Adjusted R ²	0.05	0.22	0.25	0.28	0.26	0.77	0.29	0.28	0.29

Table 4
Explaining future fund performance

This table reports the results of OLS regressions where the dependent variable is fund performance over the 12 month period after the ownership date. Obj-adj return is computed as the fund return less that of the median fund with the same investment objective. Alpha is the abnormal fund return estimated using separate four-factor models for equity and bond funds respectively computed for time period (-24, 0) and (0, +12), where the numbers in parentheses refer to months before and after the ownership date. The explanatory variables are measured at the same time as the period for which ownership is disclosed. The explanatory variables are defined in Tables 1 and 2. Numbers reported in parentheses are p-values.

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
	Obj-adj NAV return (0, +12)			Obj-adj price return (0, +12)			Alpha (0, +12)		
Ownership percentage (low)	12.88 (0.00)	12.35 (0.00)		17.07 (0.01)	22.12 (0.00)		25.36 (0.00)	37.21 (0.00)	
Log of dollar ownership (low)			0.00 (0.97)			0.09 (0.34)			0.32 (0.01)
Obj-adj NAV return (-12, 0)		0.19 (0.00)	0.20 (0.00)						
Obj-adj price return (-12, 0)					0.01 (0.89)	0.01 (0.81)			
Alpha (-24, 0)								0.00 (0.97)	-0.01 (0.92)
Premium		-0.11 (0.00)	-0.11 (0.00)		-0.48 (0.00)	-0.48 (0.00)		-0.37 (0.00)	-0.38 (0.00)
Log fund age		-0.10 (0.79)	-0.05 (0.88)		-0.82 (0.15)	-0.77 (0.19)		-0.51 (0.50)	-0.19 (0.80)
Log TNA		-0.09 (0.75)	-0.16 (0.60)		-0.92 (0.05)	-1.11 (0.02)		-0.89 (0.13)	-1.32 (0.03)
Dividend payout ratio		0.37 (0.00)	0.37 (0.00)		0.36 (0.01)	0.36 (0.01)		-0.18 (0.29)	-0.15 (0.39)
Block ownership dummy		-0.23 (0.72)	-0.02 (0.97)		0.55 (0.59)	0.97 (0.34)		2.57 (0.04)	3.26 (0.01)

N of fund managers		0.02 (0.92)	-0.00 (0.99)		0.37 (0.27)	0.30 (0.38)		0.74 (0.08)	0.59 (0.17)
Manager tenure		0.37 (0.27)	0.42 (0.20)		0.45 (0.39)	0.53 (0.33)		-0.35 (0.57)	-0.30 (0.63)
Log N of investment co. managed		-0.20 (0.49)	-0.16 (0.59)		-0.88 (0.06)	-0.77 (0.10)		-1.33 (0.02)	-1.12 (0.05)
Board size		-0.32 (0.03)	-0.34 (0.03)		-0.49 (0.04)	-0.51 (0.04)		-0.29 (0.33)	-0.26 (0.39)
Pct of board independence		3.13 (0.41)	2.96 (0.45)		12.73 (0.04)	13.10 (0.03)		14.57 (0.05)	17.07 (0.03)
N of other directorships		-0.01 (0.97)	-0.08 (0.79)		0.55 (0.21)	0.45 (0.32)		-0.16 (0.76)	-0.33 (0.54)
Pct of board with expertise		0.75 (0.45)	0.63 (0.53)		2.19 (0.16)	2.09 (0.19)		5.20 (0.01)	5.14 (0.01)
Log of board compensation		-0.37 (0.15)	-0.38 (0.14)		0.07 (0.87)	0.04 (0.91)		-0.05 (0.93)	0.06 (0.90)
Objective Dummies	Included	Included	Included	Included	Included	Included	Included	Included	Included
Intercept	0.09 (0.73)	0.11 (0.98)	1.03 (0.82)	-0.31 (0.46)	-6.91 (0.33)	-5.99 (0.41)	0.13 (0.78)	-5.54 (0.54)	-7.87 (0.39)
N	567	546	546	567	546	546	521	512	504
Adjusted R ²	0.06	0.14	0.12	0.03	0.19	0.17	0.19	0.28	0.27

Table 5
Determinants of fund manager ownership

This table reports the results of interval regressions where the dependent variable is the percentage ownership range (model 1) and the dollar ownership range (model 2). Return volatility is the standard deviation of the fund price returns over the over the 12 month period prior to date for which ownership is disclosed. All other explanatory variables are defined in Table 2. Numbers reported in parentheses are p-values. All coefficients have been multiplied by 100 for ease of presentation.

	Model 1	Model 2
	Ownership percentage (low)	Dollar ownership (low)
Log market value of assets	-0.26 (0.46)	1.04 (0.00)
Obj-adj NAV return (-12, 0)	0.04 (0.54)	-0.02 (0.65)
Return volatility	0.39 (0.14)	0.08 (0.60)
N of fund managers	-0.04 (0.87)	0.46 (0.00)
Manager tenure	0.87 (0.01)	0.12 (0.56)
Log N of investment co. managed	-0.16 (0.63)	-0.85 (0.00)
Balanced dummy	12.43 (0.00)	5.56 (0.01)
Domestic bond dummy	0.66 (0.72)	2.22 (0.05)
Domestic equity dummy	5.42 (0.01)	5.00 (0.00)
International equity dummy	-1.47 (0.50)	0.57 (0.67)
Sector fund dummy	6.16 (0.00)	5.99 (0.00)
Intercept	0.16 (0.96)	-4.32 (0.02)
N	572	572