Governance and Shareholder Value in Delegated Portfolio Management: The Case of Closed-End Funds

Youchang Wu* Russ Wermers† Josef Zechner‡

January 2013

*Department of Finance, Investment and Banking, School of Business, University of Wisconsin-Madison. Email: ywu@bus.wisc.edu.

†Department of Finance, Smith School of Business, University of Maryland, Email: rwermers@rhsmith.umd.edu.

‡Department of Finance and Accounting, Vienna University Economics and Business Administration, Email: josef.zechner@wu-wien.ac.at.

Abstract

Based on the records of 1183 individual fund managers from 1985 to 2010, we investigate the compensation and disciplining mechanisms in the closed-end fund industry and their implications for manager performance and fund discounts. We find that managers generating high surplus, as proxied by fund premium, capture rents on their skills by expansions of assets under management and increases in management fees; however, managers with a high discount are not penalized accordingly. Managers with poor NAV performance suffer from asset contractions, but such discipline is insignificant for managers with long tenure. Consistent with manager entrenchment and decreasing returns to scale, NAV performance and premium decline with manager tenure and the size of assets under management. Finally, in support of the notion that adjustments of assets under management and management fees in response to extreme performance break the premium-performance relation, we find that the fund premium responds positively only to the NAV performance in the medium range.

Given the more than $25 trillion in assets under management worldwide, the economics of the mutual fund industry has become of major importance. One of the big puzzles of the industry is the overwhelming predominance of open-end funds (OEFs), in light of potential transactions and liquidity costs associated with capital in- and outflows. Another long-standing puzzle is the closed-end fund (CEF) discount, i.e., the fact that shares issued by CEFs tend to trade at a discount to the underlying portfolio held by CEFs. While these two puzzles are obviously related to each other, no studies that we are aware of have tried to answer them from a common perspective. We aim to fill this gap by focusing on the relative control of CEF managers versus shareholders over the potential rents generated by the combination of their human capital and assets under management.

The total net asset value of U.S. OEFs was $11.6 trillion at the end of year 2011, while the corresponding number for closed-end funds was only $239 billion.[1] This overwhelming dominance of OEFs is difficult to explain this since the closed-end structure has important advantages over the open-end structure in delegated portfolio management. While short-run fluctuations in fund flows impose serious constraints on the investment strategies of OEF managers, the non-redeemability of CEF shares give managers much more flexibility in pursuing the value of their information and skills. It allows them to take less liquid positions, or positions that may not pay off well in the short run but are attractive from a long-run perspective.[2] Such considerations have led some economists to argue that the degree of open-ending we observe in practice may be *socially excessive* (Stein (2005)).

However, as Fama and Jensen (1983) point out, open-end and closed-end fund structures represent very different organizational responses to agency issues. The redeemability of OEF shares is an important disciplining mechanism, because it allows shareholders to withdraw capital from unskilled managers at any time. On the other hand, Berk and Green (2004) show that the low frictions involved in moving capital to and from an OEF, combined with diseconomies-of-scale, also prevent shareholders from extracting rents generated by managers, because new money inflows quickly eliminate any expected outperformance to investors. In essence, existing shareholders face competition from potential new investors.

[1] See the 2012 Investment Company Fact Book of the Investment Company Institute.

[2] Chordia (1996), Nanda, Narayanan, and Warther (2001), and Cherkes, Sagi, and Stanton (2009) model explicitly these advantages of the closed-end structure.

By charging a management fee that is tied to the size of assets under management (AUM), skilled managers fully capture the value of their skills.

In the CEF, the governance and compensation mechanism based on continuous fund flows is not available. Because shares are not redeemable, individual investors cannot force contractions of assets controlled by unskilled managers independently. They have to rely on internal or external governance mechanisms, such as boards of directors and activist arbitrageurs, to take away assets from unskilled managers, or to force them to lower fees. Similarly, well-performing managers do not automatically get rewarded by money inflows. To increase AUM, they have to either issue shares through a seasoned equity offering, launch a new CEF, or take over the management of other funds. Alternatively, they can increase fees, as postulated by Berk and Stanton (2007), but this requires a shareholder vote. Conceivably, both the upward and downward adjustments of CEF managers' AUM and fees are costly, therefore they do not take place continuously. The slow adjustment then implies that shareholders may under- or overpay for the services provided by CEF managers, resulting in fund premiums or discounts.

Finance academics have long been intrigued by the widespread discount observed in CEFs, and its surprisingly weak relation with fund performance.[3] With the notable exceptions of Chay and Trzcinka (1999) and Wermers, Wu, and Zechner (2008), past studies typically do not find a significant correlation between fund performance and discounts. However, from our discussion above, the CEF discount, as well as its relation with fund performance, crucially depends on how costly it is to adjust management fees and AUM in response to learning about managerial skills. Without any frictions, and with scarce manager talent, managers will perfectly capture the rents they generate. In this case, AUM and fees will be continuously adjusted to an equilibrium level that implies zero fund premium, and there will be no relation between past NAV performance and premium (because the latter is always zero).[4] The higher the adjustment frictions, the stronger should be the performance-premium

[3]See Dimson and Minio-Paluello (2002) for an extensive review and Cherkes (2012) for a recent review of this literature.

[4]In the absence of frictions, a manager could always leave and set up a new fund if the combination of current assets under management and management fee does not compensate him fully for his skill. Similarly, shareholders would be able to open-end the fund or close it if the combination of assets under management and management fee exceeds the value of the manager's skill.

relation. Therefore, an important step in understanding the closed-end fund puzzle, is to understand the frictions in the AUM and fee adjustment process of CEFs. Surprisingly, as far as we know, no empirical work has been done along this line to approach the CEF discount puzzle. We aim to fill this gap in this paper.

Specifically, we explore the following main questions. How do frictions in AUM and fee adjustments affect the sharing of economic rents between managers and shareholders? Are well-performing CEF managers able to capture their rents, and are underperforming managers properly disciplined through reduced fees or AUM? Further, what are the implications of the adjustment frictions on the dynamics and the cross-section of CEF performance and discounts?

To facilitate the tests of these important issues, we formulate two extreme hypotheses about governance in the CEF industry. The Shareholder Control Hypothesis postulates that market frictions allow shareholders to extract rents generated by skilled managers, and that effective governance prevents unskilled managers from destroying shareholder value. The Manager Control Hypothesis postulates that market power allows skilled managers to fully capture rents they generate, and that unskilled managers are entrenched due to weak governance.

Returns to scale are a key determinant of the conflict of interest between shareholders and portfolio managers. If returns to scale are increasing, both shareholders and managers benefit from AUM expansions. Conflicts of interest arise if an expansion of AUM lowers the economic rents that managers generate on the existing AUM, as would be the case when returns to scale are decreasing. This paper provides novel results on the returns to scale in active portfolio management using data from the CEF industry.

Diseconomies of scale play a key role in the Berk and Green (2004) equilibrium of the mutual fund industry; however, the empirical relevance of this assumption is still a subject of debate. Chen, Hong, Huang, and Kubik (2004) and Yan (2008) find that fund size indeed erodes fund returns, while Reuter and Zitzewitz (2011) find little evidence for that using a regression discontinuity approach. Empirical measurement of diseconomies of scale faces two challenges. First, fund size is endogenously determined. More talented managers tend to manage bigger funds. As a result, expected abnormal performance is equal across funds

of different sizes, even in the presence of diseconomies of scale. This is particularly true in the OEF world, where fund size is constantly adjusted in response to investors' beliefs about managers' skills. Second, it is well-known that empirical evaluation of fund returns is difficult. The alpha estimate depends on the asset pricing model used, and is usually subject to significant noise.

CEFs may provide a better opportunity to examine potential diseconomies of scale. First, high adjustment costs imply that the AUM of CEF managers can deviate from its equilibrium size, as derived in Berk and Green (2004) for a relatively long time. Such deviations from the equilibrium size makes the detection of diseconomies of scale possible. Second, a forward-looking measure of fund performance, which reflects investors' beliefs about managers' ability to generate alpha in excess of fees in all future periods, is directly observable. This is the fund premium.

We combine two comprehensive databases of U.S. CEFs and CEF managers, and construct a record of 1183 managers. A unique feature of our analysis is that it is done at the manager instead of the fund level. Past empirical studies typically explore data at the fund level. In practice, it is frequently observed that one fund is managed by multiple managers and one manager simultaneously manages multiple funds. In fact, an important way for a well-performing CEF manager to expand his AUM is to manage an additional fund. Fund-level analysis may therefore mismeasure the true size of a manager's AUM. Our focus on the manager-level analysis allows us to better understand compensation and disciplining mechanisms in the CEF industry. It also makes our study more suitable for investigating diseconomies of scale in portfolio management, which are likely to accrue mostly at the manager level.

We find some evidence that managers are punished by AUM contractions after poor performance, but our results generally provide much stronger support for the Manager Control Hypothesis. First, we find that managers generating high surplus, as proxied by fund premium, capture rents on their skills by expansions of AUM and increases of management fees; however, managers with a high discount are not penalized accordingly. Second, managers with poor NAV performance suffer from asset contractions, but such discipline is insignificant for managers with long tenure. Third, consistent with adjustment costs being non-trivial

(and, thus, adjustments becoming economic only after extremely good or bad performance), fund premium responds positively only to NAV performance in the medium range. Fourth, manager tenure is negatively related to both NAV performance and fund premiums. Fifth, lower premium and poor NAV performance show stronger persistence than high premium and good NAV performance, primarily among funds managed by long-tenure managers. These findings suggest that CEF shareholders have little capacity to extract rents from skilled managers, and have difficulty in disciplining unskilled managers.

We also find strong evidence of decreasing returns to scale in CEF management. Asset expansions lead to a sharp decline of peer-adjusted fund premium, with or without controlling for the prior premium level. Also, both the NAV performance and premium measured at the manager level are strongly negatively related to the size of managers' AUM.

Our paper contributes to our understanding of the agency issues and governance mechanisms in delegated portfolio management. It is well-known in the OEF literature that the flow-based governance mechanism has problems. For example, investors may be reluctant to withdraw money from poorly-performing funds (see Gruber (1996), Berk and Tonks (2007)), and the convexity in the flow-performance relation may distort the risk-taking behavior of fund managers (Chevalier and Ellison (1997)). However, the evidence we find in our study suggests that manager discipline and shareholder control in CEFs may be even weaker. This may be an important reason why the mutual fund world is dominated by OEFs.

Our paper also contributes to our understanding of the long-standing puzzle why CEFs normally trade at a discount. Our finding that outperforming managers are able to capture rents by AUM expansions and fee increases while poorly-performing managers are entrenched provides an explanation for the widespread CEF discounts observed in the real world. Our results also provide an explanation for the weak relation between NAV performance and fund premium, which has long puzzled researchers in this area. Endogenous AUM and fee adjustments in response to past NAV performance break the link between premium and extreme performance. Only the medium range performance has a positive impact on fund premium. Due to adjustment costs, modest positive or negative performance does not trigger AUM or fee adjustments, while extreme good or bad performance does trigger such adjustments.

Our evidence of diseconomies of scale in CEF management helps to clarify the nature of active portfolio management. It provides support to a key assumption underlying the Berk and Green (2004) equilibrium, i.e., decreasing returns to scale in asset management. It also supports the notion that asset expansions represent a transfer of rents from shareholders to managers.[5]

Our paper is most closely related to Wermers, Wu, and Zechner (2008), who study the replacement of managers in CEFs and the implications for CEF discount, using manager data from 1985 to 2004. A key difference between these two papers is that Wermers, Wu, and Zechner (2008) conduct their analysis at the fund level, and focus only on manager departures. This paper examines both the expansion and contraction of managers' AUM, thus it provides a much more complete picture of manager compensation and discipline in CEFs. Several other studies have examined the replacement of fund managers in mutual funds, including Khorana (1996), Chevalier and Ellison (1999), Rowe and Davidson III (2000), Ding and Wermers (2009). Like Wermers, Wu, and Zechner (2008), these papers all focus on termination of managers, and are silent about how successful managers capture rents. Also, with the exception of Rowe and Davidson III (2000), they all study OEFs.[6]

Our paper is related to the managerial performance and agency theory of closed-end fund discounts (Ferguson and Leistikow (2001), Ross (2002), Berk and Stanton (2007)), which argues that the economic value of a closed-end fund is lower than the value of the underlying assets if managerial ability is not sufficient to offset management expenses. Our findings of manager entrenchment are most consistent with the model of Berk and Stanton (2007). While their model focuses on fee increases as channel for outperforming managers to capture rents, our empirical evidence suggests that AUM expansions may play an even more important role, just as they do for OEF managers.

Our paper is also related to the agency theory of the closed-end fund discount. Barclay, Holderness, and Pontiff (1993) find that closed-end fund discounts are positively related

[5]A caveat is in order here. Since CEFs tend to hold less liquid assets than OEFs, they may face stronger diseconomies of scale. Therefore the exact magnitude of diseconomies of scale we find in this study may not be directly applicable to the OEF world.

[6]Dangl, Wu, and Zechner (2008) show that in the case of OEFs, due to the response of fund flows to performance, a fund management company has a strong incentive to fire underperforming managers even without the intervention of board directors.

to the aggregate fund shares owned by the management and blockholders friendly to the management. Coles, Suay, and Woodbury (2000) show that fund discounts are lower when the compensation of the fund advisor is more sensitive to fund performance. Del Guercio, Dann, and Partch (2003) focus on various proxies for board independence and find that they are associated with lower expense ratios and value-enhancing restructurings. However, they do not find any direct relation between these board characteristics and fund discounts. Our paper differs from these studies by focusing on the asymmetry of AUM and fee adjustments in response to past performance.

The rest of the paper is structured as follows. Section 1 develops the hypotheses and the empirical predictions. Section 2 describes the data sources and summary statistics. Section 3 presents the results on AUM adjustment in response to manager performance. Section 4 presents results on management fee adjustments. Section 5 shows the response of premiums to past performance and AUM growth. Section 6 explores the relation of manager tenure and AUM to NAV performance and premium, as well as the persistence of premiums and NAV performance. Section 7 concludes.

1 Empirical Questions and Hypotheses

We now describe the empirical questions investigated in this paper and formulate our hypotheses.

1.1 Conflict of Interest Between Managers and Shareholders

Mutual funds, closed-end or open-end, typically charge a management fee proportional to AUM. As a result, manager compensation is directly tied to the size of their AUM. In the OEF world, well-performing managers are rewarded by attracting fund flows, whereas poorly-performing managers are punished as investors withdraw capital from their funds. As shown by Berk and Green (2004), in equilibrium the ability to attract new fund flows allows portfolio managers to extract the full value of expected rents generated by their skills. At the same time, the ability to withdraw money ensures investors to earn a fair expected rate of return.

In the CEF, the compensation and disciplining mechanism based on continuous fund flows is not available. Well-performing managers are not automatically rewarded by growing AUM. To increase AUM, they have to issue more shares through a seasoned equity offering, launch a new CEF, or take over other funds. Alternatively, they can negotiate a fee increase. By contrast, poorly-performing managers are not automatically penalized since investors cannot redeem their shares. They must rely on internal governance mechanisms of the CEF, such as the board of directors, to ensure a fair rate of return in the future. In order to do that, the board of directors may force the manager to lower fees, or reduce AUM. The contraction of AUM can be achieved via a share repurchase, by assigning additional managers to co-manage the fund, by replacing the manager, or by liquidating the fund.

The threat to unskilled managers may also come externally. As shown by Bradley, Brav, Goldstein, and Jiang (2010), a fund with a high discount has a substantially higher chance of getting attacked by an activist arbitrageur, such as a hedge fund. Just like an active corporate control market disciplines the managers of industrial firms, such an outside threat has become an increasingly important component of the CEF governance system.

Conceivably, both the upward and downward adjustments of CEF managers' AUM are costly, therefore they do not take place continuously. For example, closed-end fund IPO fees generally range from 4.5%-4.75%. Replacing a manager can be difficult, because searching for a new manager is costly, and the existing manager may be entrenched. Fee changes are also hard to make. Any management fee increase must be reviewed by the fund's board of directors and approved by shareholders. Although fund managers can decide to waive all or a portion of the management fee in order to boost shareholder returns, they only have an incentive to do so when facing enough pressure from shareholders.

The slow adjustment of AUM and management fees leads to under- or overpayment for the services provided by the CEF managers. When the managers are underpaid, investors are able to share rents generated by the manager's skills, as reflected by the premium of some outperforming CEFs. When the managers are overpaid, the CEF will trade at a discount. Which scenario occurs depends on the relative power of shareholders and managers, which is determined by both the outside options and the effectiveness of the internal and external governance mechanisms, such as the board of directors or activist arbitrageurs. For example,

if it is easy for outperforming managers to quit and launch a new fund, and difficult for shareholders to fire an underperforming manager because finding a replacement is hard, or because the board is dominated by insiders, then managers will not only be able to fully capture their rents, but may even be able to become overpaid once shareholders have contributed their capital.

We postulate two competing hypotheses, representing two possible polar cases:

Shareholder Control Hypothesis: Frictions in the labor market for portfolio managers allow CEF shareholders to extract rents generated by skilled managers, while effective governance prevents unskilled managers from destroying shareholder value.

Manager Control Hypothesis: Skilled managers capture rents they generate, while unskilled managers are entrenched due to weak governance.

1.2 Implications of the Manager vs. Shareholder Control

We first explore the implications of the Shareholder Control and Manager Control Hypotheses for the dynamics of AUM and management fees in response to manager performance.

In a world with diseconomies of scale, existing shareholders have an incentive to limit the expansion of AUM by managers and management fee increases, because this would transfer rents from shareholders to managers by increasing total fees earned by managers and eroding expected fund returns in the future.[7] On the other hand, shareholders have strong incentives to reduce the capital managed by unskilled managers. Therefore, if shareholders are in control, we should expect decreases of AUM or management fees after poor performance, but no increases of AUM or management fees after good performance. Since reductions of AUM or management fees will not occur instantaneously and costlessly, one should observe poor performance to coincide with CEF discounts (low premia) and good performance to coincide with CEF premia (low discounts). By contrast, if managers are entrenched, and have market power (for example, if it is easy for them to quit and launch a new fund), then we should expect the opposite. We formulate these two opposite predictions as follows.

[7] An exception occurs when a CEF only issues shares to existing shareholders. In this case shareholders may find it optimal to earn a lower premium on a larger amount of assets, because the total surplus is bigger. However, such expansions typically only account for a small fraction of a manager's AUM growth.

Prediction 1A (Shareholder Control): AUM and management fees decrease after poor NAV performance and high discount, but do not increase after good NAV performance and high premium.

Prediction 1B (Manager Control): AUM and management fees increase after good NAV performance and high premium, but do not decrease after poor performance and high discount.

Our second set of empirical predictions focus on how fund governance affects NAV performance and premiums. Here again the Shareholder Control and Manager Control Hypotheses have very different implications.

First, fund governance affects the relation between manager tenure and fund performance. If shareholders exert strong control, and are able to fire poor managers relatively fast while extracting rents from good managers, we should expect NAV performance and fund premiums to be positively related to manager tenure. Alternatively, if managers are in control, and good managers fully capture their rents while poor managers are entrenched, we should see NAV performance and premium decline over manager tenure. The negative tenure-performance effect is even more pronounced if managers with longer tenure are more entrenched, as one may expect in an environment with weak shareholder control. This suggests the following opposite predictions from the two hypotheses.

Prediction 2A (Shareholder Control): NAV performance and premiums increase with manager tenure.

Prediction 2B (Shareholder Control): NAV performance and premiums decrease with manager tenure.

Second, fund governance affects the persistence of NAV performance and premium. Under the Shareholder Control Hypothesis, shareholders can force downward adjustments of AUM and management fees after poor performance relatively quickly, and can delay the increase of AUM and fees after good performance. This implies that poor performance is short-lived, and that good performance is persistent. By contrast, if outperforming managers can increase AUM or management fees relatively quickly, while poor managers are entrenched, then poor performance is persistent while good performance is short-lived. This suggests the following two opposite predictions:

Prediction 3A (Shareholder Control): Good NAV performance and high premiums are more persistent than poor NAV performance and high discounts.

Prediction 3B (Manager Control): Poor NAV performance and high discounts are more persistent than good NAV performance and high premiums.

Third, fund governance also affects the relation between fund premiums and past NAV performance. If poor NAV underperformance can be reversed by corrective actions imposed by shareholders relatively quickly, while good NAV performance tends to persist, then fund premium should respond more strongly to good than to poor NAV performance. Alternatively, if poor NAV performance is more persistent, then fund premiums should respond more strongly to poor NAV performance.

Prediction 4A (Shareholder Control): Fund premiums respond more strongly to good than to poor NAV performance.

Prediction 4B (Manager Control): Fund premiums respond more strongly to poor than to good NAV performance.

1.3 Returns to Scale in CEF Management

Our argument that the expansion of AUM represents a transfer of rents from shareholders to managers implicitly assumes decreasing returns to scale in active portfolio management. If returns to scale are increasing, both shareholders and managers benefit from AUM expansions. If they are constant, then AUM expansions do not directly affect existing shareholders. A conflict of interest arises if an expansion of AUM lowers the economic rents that managers generate on the existing AUM, as would be the case when returns to scale are decreasing.[8]

As we discuss in the introduction, measuring returns to scale using OEF data faces significant challenges due to the endogenous fund size adjustments that take place continuously, and the difficulty in measuring fund alpha. CEFs provide a better opportunity to examine returns to scale because asset size is only adjusted infrequently, and because a forward-looking measure of fund performance is available, namely the fund premium or discount. Our focus

[8]Some funds adopt a tiered fee structure, in which the fee ratio declines as the AUM increases. This mitigates the negative effect of diseconomies of scale on returns to shareholders, but whether it can fully offset is an empirical question.

on the manager-level analysis also makes our study more suitable for investigating returns to scale in portfolio management.

We formulate two alternative hypotheses concerning the relation between AUM and manager performance.

Nondecreasing Returns to Scale Hypothesis: The size of a managers AUM is non-negatively related to future NAV performance and premiums.

Decreasing Returns to Scale Hypothesis: The size of a manager's AUM is negatively related to future NAV performance and premiums.

2 Data and Summary Statistics

2.1 Sample

Our sample covers almost the entire universe of U.S. closed-end funds over the period from January 1985 to December 2010. This database is constructed from two sources. First, we obtain the investment objective, weekly share price and net asset value, monthly total net assets, annual expense ratio, daily information on distributions from Lipper Inc., a leading provider of mutual fund data. Second, we obtain fund manager information from Morningstar Inc. The Morningstar database provides the start- and end-dates of each manager for each closed-end fund. We link together the Lipper fund data with the Morningstar manager data using fund CUSIP numbers, ticker symbols, fund names, and other fund information, such as inception dates. Both the Lipper and the Morningstar databases cover dead funds as well as active funds, therefore, survivorship bias is not a concern for our study.

After eliminating a small number of convertible bond, preferred stock, real estate, and international debt funds, the Lipper database contains 717 funds that have weekly NAV data for at least two years. 693 of them are matched to the Morningstar database. We exclude the funds that are marked as "team-managed" by Morningstar, in which case the managers' names are undisclosed, and a small fraction of observations (3.6%) for which there are five or more persons listed as the fund managers at the same time. Our final sample consists of 680 funds with a total of 1183 individual managers. These funds fall into four categories:

domestic equity (83), international equity (86), taxable bond (181), and municipal bonds (330). 185 of them are merged or liquidated before the end of the sample period. This sample reflects an important feature of the US closed-end fund market: the large fraction of bond funds. Municipal bond funds constitute almost one half, while domestic equity and international equity funds together constitute only about one quarter of the sample.

2.2 Summary Statistics of Closed-End Funds

Table 1 presents the summary statistics of our closed-end fund sample. We report the mean and standard deviation of the annual observations of total net asset value (TNA), discount level, NAV return, stock return, management fee ratio, expense ratio, and the number of managers per fund for the full sample and for each fund category.

TNA measures the fund size in million dollars at the year end. The average fund size in our sample is $ 251 million. Domestic equity funds are largest among the four categories, followed by taxable bond funds.

Fund premium is defined as

$$Premium_t \equiv \frac{P_t - NAV_t}{NAV_t}. \tag{1}$$

where P_t is the per-share market price of the closed-end fund at the end of period t and NAV_t is the per-share net asset value. Fund discount is defined as the negative of fund premium. The average fund discount in our sample is 4.9%.

The NAV return, Rn, is the return on a fund's underlying assets, while the stock return, Rs, is the return on the shares issued by a fund. Formally, the period-t returns are calculated as follows,

$$Rn_t \equiv \ln(NAV_t + DIST_t) - \ln(NAV_{t-1}) \tag{2}$$

$$Rs_t \equiv \ln(P_t + DIST_t) - \ln(P_{t-1}) \tag{3}$$

where $DIST_t$ is the cash distribution (capital gains and dividends) in period t. Both returns are continuously compounded, so that a multi-period return is the sum of returns in each

constituent period. Table 1 reports the annualized returns calculated as 52 times average weekly returns. Only funds with at least 40 weekly return observations in a given year are included. The average NAV return and stock return in our sample are both 5.8%, suggesting that stock performance of CEFs closely mimic NAV performance in the long run.

Management fee ratio is the ratio of annual fees paid to the investment adviser to the average total net asset under management. It also includes fees paid to a sub-adviser or a co-adviser when such parties exist. Expense ratio captures both management fees and other expenses that are deducted from the fund assets, including fees paid to administrators, custodians, and directors etc. Management fees account for around one half (0.8%) of the expense ratio (1.5%) in our sample. Our management fee and expense ratio are net of any fees waived by investment advisors or other service providers.

As Massa, Reuter, and Zitzewitz (2006) document for the OEF industry, it has become increasingly common for a fund to have multiple managers. Our data also show such a trend in the closed-end fund markets. The last block of Table 1 reports the average number of managers per fund observed at the year end. It shows that funds on average employ a management team of 1.69 members.

2.3 Summary Statistics of Fund Managers

Table 2 reports the summary statistics for our sample of 1183 closed-end fund managers.

While it is common for a fund to hire multiple managers, it is even more so for a manager to simultaneously manage multiple funds, especially in the municipal bond fund sector. Table 2 shows that our managers on average manage 2.2 funds at a given time. This suggests an advantage of combining the performance of multiple funds to evaluate the skill of a manager instead of focusing on a single fund.

Since we have no information about the role each manager plays in the team, we split the TNA of a fund at the year end equally among all its managers. We then sum up a manager's share of assets in all funds he simultaneously manages to get his personal AUM. The average AUM per manager in our sample is $ 324 million, which is about 1/6 higher the average fund size. However, the standard deviation of AUM per manager is about two times as high as that of TNA per fund ($ 629 million vs. $ 307 million), indicating a larger dispersion of

asset size across managers than across funds. If the size of AUM is in accordance with the level of skills, then this finding suggests substantial variation in manager skills.

We calculate the annual *Asset growth* rate to measure the change of a manager's AUM over time. To account for the mechanical relation between the asset growth and a fund's NAV return (in the absence of cash distributions), we subtract from a manager's AUM at the year end the cumulative asset value changes resulting from the realized NAV returns over the year. This is consistent with how researchers compute the fund flow for OEFs, which is usually defined as the asset growth rate minus the realized fund return (see for example, Sirri and Tufano (1998)). It allows us to focus on managers' asset value changes due to deliberate actions such as issuing new shares and acquiring new funds instead of returns on an existing portfolio. Formally, for a particular manager,

$$Asset\ Growth\ Rate = \frac{AUM_t - AUM_{t-1}(1 + r_t)}{AUM_t}, \tag{4}$$

where AUM_t is the aggregate assets under management at the end of year t, r_t is the weighted average NAV return in year t across the funds that are still under management by a manager at the year end.[9]

The average annual asset growth rate of managers in our sample is -9.7%. This negative number is due to two reasons. First, by definition, a manager's asset growth rate is -100% whenever he leaves the industry, even though the funds he managed may still be growing. Second, the actual NAV return of the fund has been subtracted when we calculate the managers' asset growth rate.

Table 2 also reports the average tenure and experience of the closed-end fund managers. *Tenure* is the number of years that a manager has managed his funds. More precisely, we measure a manager's tenure for each fund at the year end, and then average across all funds he simultaneously manages, with each fund weighted by the inverse of the number of its managers. *Experience* is the total number of years since a manager starts to manage his first closed-end fund. The average manager tenure and experience in our sample is 4.8 and

[9]A fund's weight in the r_t is defined by the manager's AUM in that fund (i.e., TNA divided by the number of managers of the fund). If a manager starts to manage a fund in the middle of the year, that fund enters the calculation of r_t only after he becomes the manager.

5.7 years, respectively.

NAV Performance is annualized NAV return adjusted by the contemporaneous category mean, divided by the annual volatility of the category-adjusted NAV return calculated from weekly data. Formally, for each fund,

$$NAV\ Performance = \frac{\frac{1}{N}\sum_{t=1}^{N}(Rn_t - \overline{Rn_t})}{\sigma(Rn_t - \overline{Rn_t})} * \sqrt{52}, \tag{5}$$

where $\overline{Rn_t}$ is the equally weighted weekly NAV return of all funds in the same category. *Stock Performance* is defined similarly using the mean and volatility of category-adjusted stock returns. These performance measures can be interpreted along the line of the well-known Treynor-Black information ratio (Treynor and Black (1973)), which is the ratio of the mean to the volatility of the return relative to a benchmark. This intuitive performance measure is widely used both in practice and in academic research. It adjusts the mean of a fund's relative performance by its variability, which reflects a manager's risk-tolerance in using his skills and the noisiness of the performance signal. It is applicable to different categories of funds, which is an important advantage given the heterogeneity of funds in our sample.

A manager's *NAV performance* and *Stock Performance* in a given year are the weighted averages of these measures across all funds he manages for at least 40 weeks during the year. Each fund's weight is defined by the inverse of the number of its managers. Since both measures are based on returns relative to the category mean, they are close to zero as expected. The standard deviation of *NAV Performance* is higher than that of *Stock Performance*. This is due to the larger volatility of relative stock return than that of relative NAV return, which tends to dampen the information ratio towards zero.

Category-Adjusted Premium and *Category-Adjusted Management Fee* are the fund premium and management fee ratio at the year end, adjusted by the contemporaneous category means, respectively. These variables are also first calculated at the fund level, and then averaged across all simultaneously-managed funds, using the inverse of the number of managers of each fund as the weight.[10] *Changes in Adjusted Management Fee* are the changes in a manager's category-adjusted management fees computed from year to year.

[10] As with the *NAV* and *Stock* performance, only funds that a manager manages for not less than 40 weeks in a year enter into the calculation of his premium.

2.4 AUM Expansions, Contractions and Management Fee Changes

Unlike the OEF, the number of shares issued by a closed-end fund is constant most of the time, therefore its asset size is relatively stable. However, at the manager level, AUM can change much more frequently, as the number of funds under management can increase or decrease in response to past performance. This is exactly why we conduct our analysis at the manager level instead of the individual fund level.

Given the discrete nature of AUM adjustment for CEF managers, a large part of our analysis focuses on large expansions or contractions in a manager's AUM, as such major movements in the career path of CEF managers are more likely to reflect the deliberate actions of either the manager, the management company or the shareholders. We adopt two alternative definitions of an AUM expansion, one is an increase of manager AUM by more than 50%, the other is an increase by 25%. Correspondingly, AUM contraction is defined by a decrease of AUM by more than 50% or 25%. A simple count of such events is reported in Panel (A) of Table 3. There are 409 expansion events in our sample by the first definition, and 614 by the second. There are 956 and 1325 contraction events according to these two alternative definitions, respectively.

AUM expansions and contractions as defined above can occur for a variety of reasons. For example, a manager's AUM jumps discretely when he gets to manage an additional fund or switches to a bigger fund, or when his fund issues new shares, or when his management team shrinks. Panel A of Table 3 reports the number of expansions and contractions in different (but not mutually exclusive) scenarios. It shows that most expansions are accompanied by an increase of the number of funds managed. Only a small fraction of them (55 out of 409, or 131 out of 614, depending on the definition) occur purely through the asset growth of a manager's existing portfolio of funds. Table 3 also shows that the most common reason for the AUM contraction is the departure of a manager from our sample (759 out of 960 or 1325, depending on the definition).

We also examine changes in management fees of more than 10 basis points. Given the average management fee of around 80 basis points per year, this cutoff point represents a change of 12.5%. Panel B of Table 3 presents the numbers of such changes: 474 fee increases

with a mean change of 38 basis points, 585 fee decreases with a mean change of 32 basis points.

3 Effects of Manager Performance on AUM

We now investigate how a manager's AUM is adjusted in response to his performance. According to the Shareholder Control Hypothesis, shareholders can force a contraction of AUM, or fire an underperforming manager, relatively easily; at the same time, market frictions such as search costs and IPO costs make it difficult for outperforming managers to expand their AUM. Therefore AUM declines more quickly after poor performance than it expands after good performance. Alternatively, the Manager Control Hypothesis postulates that the costs of AUM expansion for well-performing managers are relatively small, while firing a poorly-performing manager is difficult due to entrenchment.

3.1 Multilogit Regression Results

We first examine the determinants of discrete jumps of a manager's AUM by more than 50% within a given year (after subtracting the AUM changes due to fund return over the year). We use multilogit regressions, where the dependent variable is 1 for an expansion, -1 for a contraction, and zero otherwise, for a given manager-year. The estimation is done with fixed-time effects, where year dummies are used to account for variation in AUM that is common across funds (such as a wave of CEF originations). We account for error clustering at the manager level.

Table 4 presents estimated coefficients for two models. In Model 1, we regress the expansion/contraction indicator variable on average NAV performance (peer-adjusted and normalized) in the prior two years; the peer-adjusted fund premium, logged manager tenure and logged fund age (both in years), all averaged across all funds overseen by the portfolio manager at the end of year $t-1$; and logged aggregate AUM (after dividing by the number of managers at each fund). Tenure, AUM, and fund age are adjusted by the contemporaneous mean of each variable.

We include NAV performance as an explicit indicator of performance available to the

market, and fund premium (or discount) as a proxy for "soft" information known by the market about the ability of the manager to generate surplus for CEF shareholders in the future. We control for the potential impact of other factors, including manager tenure, AUM, and fund age, on the AUM changes. These factors can affect the probability of AUM expansion or contraction not directly related to performance. For example, a large AUM may be less likely to grow fast, while long-tenure managers may be more likely to retire. Also, fund age may be associated with brand image in the market. Older funds may be able to add assets more easily due to a more well-known brand image. To the extent that these variables may also be correlated with performance beyond what is captured by our performance measures, they may also pick up some additional impact of manager performance on AUM adjustments.

The results from Model (1) show evidence of both upward and downward AUM adjustments in response to manager performance during the prior two years. The coefficient of *NavPerf* is significant at the 1% level, with opposite signs, for both expansion and contraction. This suggests that despite the frictions in the fund size adjustment in the CEF industry, AUM of CEF managers do responds to past performance. However, the effect does not seem to be symmetric, the coefficient of lagged NAV performance for expansion is about twice as high as it is for contraction (0.284 vs. 0.153). More strikingly, the prior premium level has strong impacts on expansion, but not on contraction. The coefficient of *Premium* is 3.121 for expansion, significant at the 1% level, while it is only -0.480 for contraction, insignificantly different from zero. These results suggest that outperforming managers are more likely to expand AUM than underperforming managers are to reduce it. "Soft" information appears to be disregarded when it is negative. Perhaps management companies blame low premiums (or high discounts) on investor sentiment, rather than being a reflection of soft information on manager skills.

Manager tenure is negatively related to the probability of AUM expansion, suggesting that long-tenure managers are less likely to see their AUM expanded. This may be due to their higher propensity to retire. It may also be because long-tenure managers tend to underperform and their poor performance is not fully captured by the performance measures in the model. AUM has a significantly negative coefficient for both expansion and contraction, which is not surprising because bigger AUM is less likely to grow or decline by a large

proportion. Fund age is negatively correlated with the probability of expansion, suggesting managers managing older funds are less likely to expand their AUM, perhaps because these funds have already reached or exceeded their optimum economic scale.

Model (2) examines how manager tenure affects the impact of past performance and past premium. While the effect of tenure on the impact of fund premium is insignificant, there is an asymmetric effect on the impact of NAV performance. The positive coefficient of 0.211 on *Tenure*NavPerf* indicates that longer tenure reduces the impact of negative peer-adjusted NAV performance on AUM contraction. Specifically, for a manager whose tenure is close to the industry average (i.e. *Tenure=0*), the impact of NAV performance on expansion or contraction is almost symmetric. However, for a manager with tenure 2.59 (=exp(0.262/0.205)-1) times above the average, the impact of negative NAV performance on AUM contraction probability completely vanishes. By contrast, the impact of past NAV performance on expansion is not affected by tenure. This suggests that managers with long-tenure are entrenched.

Table 5 implements our two models when we redefine expansion/contraction in a more sensitive way. Here, expansion is defined as AUM increasing by 25% during a year, while contraction is defined as AUM decreasing by 25%. The results are qualitatively similar to those of Table 4, except that coefficient of lagged NAV performance becomes more symmetric. Apparently, the increased likelihood of expansion or contraction due to this redefinition is mainly captured by the intercept term.

3.2 AUM Growth Rate

We next measure asset growth rate continuously, rather than through the discrete "expansion" and "contraction" approaches. Note that asset growth rate is measured after controlling for NAV returns, therefore, it captures only deliberate additions to AUM given to (or taken away from) a portfolio manager. We also adjust a manager's asset growth rate by the contemporaneous mean of his category to account for the effect of time-varying sector-wide asset growth. We estimate our models with manager-fixed effects.

The Shareholder Control Hypothesis predicts a stronger link between AUM and poor performance, while Management Control Hypothesis predicts a stronger link between AUM

and good performance. Table 6 implements regressions of the growth rate of manager AUM on NAV performance and fund premium. Model (1) indicates that both NAV performance and premium level strongly predict the growth rate managers' AUM. In Model (2), we introduce two dummy variables, *HighN* and *HighP*, to indicate whether the *NavPerf* and *Premium* are above zero (i.e., whether a manager outperforms his peer group). We interact these dummies with *NavPerf* and *Premium*, respectively, to capture potential deferences in the impacts of good and bad performance. The effect of lagged $NAVperformance$ on asset growth seems symmetric, as the coefficient of the interaction term *HighN*NavPerf* is close to zero; however, the asymmetry of the effect of lagged premium is very pronounced. Consistent with previous multilogit results on discrete AUM expansion/contraction, high premium has a much stronger impact on asset growth than low premium. In fact, the coefficient of premium is even negative, although insignificant, when the premium is below average. This suggests that managers who are expected to generate surplus for investors in the future quickly expand their AUM, while those who are expected to destroy shareholder values in the future do not suffer a reduction of AUM proportionally.

In Model (3) we add more control variables. In Model (4) we allow manager tenure to affect the impact of NAV performance and premium. The positive effect of NAV performance and the asymmetric effect of lagged premium remain largely unchanged in both models. Tenure seems to attenuate the sensitivity of asset growth rate to NAV performance, but the effect is not statistically significant (t=-1.55).

To further explore the relation between past performance and manager AUM growth, we sort managers into five quintiles based on lagged two-year NAV performance and lagged premium, respectively. Figure 1 shows the average category-adjusted asset growth of each NAV performance quintile, while Figure 2 shows it for each premium quintile. Panel A of each figure shows results for the whole sample, while Panel B shows results for two subsamples based on whether the lagged manager tenure is above the contemporaneous sample average. Figure 1 indicates that asset growth rate increases steadily as lagged NAV performance improves. This is true for both the long- and short-tenure subsamples. Figure 2 shows a convex relation between asset growth rate and lagged premium level, confirming our regression results. Both figures show a steeper slope for the short-tenure sample, suggesting

a higher sensitivity of asset growth to the performance for short-tenure managers.

To summarize our results of this section, we find evidence that the AUM of CEF managers are indeed adjusted in response to past performance. Managers are rewarded for good performance by asset expansion, and punished for bad performance by asset contraction. Some of the reward comes as a result of recent performance, while some comes as a result of expected future outperformance (as reflected by fund premium). However, punishments and rewards are not meted out symmetrically. For managers with sufficiently long tenure, poor NAV performance does not have the same impact on the likelihood of punishment, as the impact of good performance of the same magnitude on the likelihood of reward. In addition, irrespective of manager tenure, high premium predicts AUM expansion, while low premium does not predict AUM contraction.

4 Effects of Manager Performance on Management Fees

As an alternative to punishment in the form of reduced AUM, the fund board has the option of negotiating a fee reduction with the management company. For a particular fund, it is much easier to reduce fees, which does not require a shareholder vote, than to increase them, which does. However, at the manager level, fees can also increase or decrease as a manager switches between funds with different fee ratios. In this section, we explore whether fees respond to our measures of manager performance. Our management fee data are net of waived fees, so it is appropriate for this analysis. We focus on fee changes of more than 10 basis points per year. Fee changes defined by other cutoff points yield similar results.

Both the Shareholder Control and the Manager Control Hypotheses predict that fees will have an asymmetric response to NAV performance, but they differ in the specific form of the asymmetry. Table 7 shows results when we implement a multilogit regression of fees levels on lagged two-year NAV performance and lagged fund premium, along with the following control variables: lagged manager tenure, lagged AUM, lagged fund age. In addition, we include lagged management fees to account for potential mean reversion in fees. The dependent variable is equal to -1 during year t when manager fee levels drop by at least 10 bps, and +1 when fee levels increase by at least 10 bps.

The results show, in Model (1), that fee rates tend to increase after good NAV performance, but do not decrease after poor NAV performance. In addition, fees positively respond to higher premiums, but show an insignificant response to low premiums. These results are in favor of the Manager Control Hypothesis. The results also show mean-reversion of fees, since lagged category-adjusted fee level is positively related to the probability of fee reduction and negatively related to the probability of fee increase.

In Model (2), we add two interaction terms with lagged manager tenure, one with lagged NAV performance and the other with lagged premium. The results show that managers with short tenure indeed tend to decrease fees, managers with long tenure do not. The values of the coefficients suggest that for managers whose tenure is about 63.5% (=exp(0.123/0.250)-1) above the industry average, the point estimate of the NAV performance effect on the likelihood of fee decrease is zero. The results also suggest that for managers with average tenure, the tendency of increasing fee after good NAV performance is insignificant. Therefore this tendency is primarily driven by long-tenure managers. These results point to stronger control power of long-tenure managers, as investors are less likely to be able to pressure long-tenure managers to reduce fees after poor NAV performance, and prevent them from increasing fees after good performance. Somewhat surprisingly, manager tenure attenuates the tendency of fee increases after high premium, but the effect is significant only at the 10% level.

Overall, our results on the response of management fees to past performance provide further support for the Manager Control Hypothesis.

5 Effects of NAV Performance and AUM Growth on Premium

Perhaps the most intriguing question related to CEFs is what drives fund premiums. In this section we investigate the implications of diseconomies of scale on CEF premia under the Shareholder Control and Manager Control Hypothesis, respectively. To do so, we analyze how a manager's NAV performance, asset growth and fee changes are related to the premiums

of the funds he manages. Specifically, we regress the change in premium during year t on NAV performance during year $t-1$. According to the Shareholder Control Hypothesis, positive NAV performance, which leads to a upward revision of investors' beliefs about manager skills, should have a significant impact on the CEF premium, because market frictions prevent the manager from fully capturing the rents he generates. If management exerts more control, however, the relation between lagged negative NAV performance and premium will be stronger, since skilled managers capture their rents and unskilled managers are entrenched.

We are also interested in the impact of AUM adjustments and fee changes on fund premiums. While a fee increase represents a direct transfer of rent from shareholders to managers, which should lower the premium, the effect of asset growth on premium depends on the returns to scale in CEF management. The Decreasing Return to Scale Hypothesis predicts that premium should respond negatively to AUM growth, while the Constant Return to Scale Hypothesis predicts that AUM growth should have no impact on premium.

Table 8 shows the results. Models (1) and (2) test a simple specification, which shows that lagged NAV performance does, indeed, affect fund premium during the following year, with or without controlling for the mean reversion of premium level. However, it is not clear whether this effect is symmetric with regard to the impact of high vs. low lagged NAV performance. Therefore, Model 3 breaks lagged NAV performance into three intervals: high, medium, and low, and estimate a piecewise linear equation. The high and low intervals correspond to performance more than one standard deviation above and below the sample mean, respectively. The results uncover an interesting impact of NAV performance: NAV performance in the medium range positively impacts fund premium, but this slope is completely eliminated for NAV performance in the high and low ranges. That is, shareholders appear to benefit from good performance up to a limit–then, the manager captures the performance surplus through fees and growth in assets, as we show in the previous sections. Also, they are harmed by unskillful managers to a limit. When the underperformance becomes too severe, the manager will be fired, or be forced to reduce AUM. These results are consistent with the two-way adjustments of AUM we find Section 3.

The positive coefficient on NAV performance in the mid-range indicates that skilled man-

agers cannot fully capture the rents they are expected to generate, nor can shareholders immediately force unskilled managers to reduce AUM or management fees. This is consistent with frictions involved in adjusting fees or AUM of CEF managers.

The highly significant negative coefficient on lagged asset growth indicates that the expected shareholder surplus per unit of NAV is reduced when the manager is given more assets to manage. This is consistent with the Decreasing Returns to Scale Hypothesis, and supports the notion that AUM expansion represents a transfer of rents from shareholders to managers.

Models (4) to (6) repeat the analysis of Models (1)-(3), except they substitute the lagged asset growth by two lagged expansion and contraction dummy indicators, indicating whether the AUM increases or declines by more than 50% in the prior year, respectively. They show that managers with an AUM expansion of more than 50% on average see a decrease of 160 to 170 basis points in fund premium, significant at the 1% level. This economic magnitude is fairly large, suggesting strong diseconomies of scale in CEF management. Interestingly, the positive impact of AUM contraction is only about half of that in magnitude, and is statistically insignificant, suggesting underperformance cannot be easily reversed by reducing asset size.

The coefficients on the three lagged NAV performance regions are similar to those in the prior three regressions, indicating that the promotion dummy variable captures the majority of the effect of using the continuous asset growth variable. Interestingly, the effect of fee increase on premium, although negative in all models, is insignificant, potentially because the magnitude of such changes is usually rather small. Also, since NavPerf is net of fees, it may already pick up the fee effect.

Panel (A) of Figure 3 shows the average increase of category-adjusted fund premium within each of the five quintiles of managers sorted on their lagged one-year NAV performance. Consistent with our regression analysis, the positive relation between premium changes and lagged NAV performance is only observed for the medium range performance quintiles. Panel (B) of the same figure shows that the relation between lagged NAV performance and premium changes is much stronger among the long-tenure managers, suggesting investors expect NAV performance of long-tenure managers to be more persistent, poten-

tially due to the entrenchment of such managers, and the lower sensitivity of their AUM to past performance, as indicated by Figures 1 and 2.

To summarize, our results in this section are consistent with our previous finding of both upward and downward AUM adjustment in response to past NAV performance. Such adjustment reduces the persistence of both top and bottom performance, thus limiting their impact on fund premium. The positive response of premium to medium range performance supports the notion that frictions in AUM and fee adjustments prevent those adjustment from taking place immediately, thus introducing persistence in medium NAV performance. Our results also provide strong support to the Decreasing Returns to Scale Hypothesis, suggesting large scale AUM expansion may be more detrimental in shareholder welfare than minor increases in management fees.

6 Further Evidence of Entrenchment and Decreasing Returns to Scale

Our results in the previous sections provide evidence of manager entrenchment and diseconomies of scale. We now perform further tests by investigating the effects of manager tenure and AUM on manager performance, and the time series properties of NAV performance and premium.

6.1 Effects of Tenure and AUM on Manager Performance

As explained in Section 1, the relation between performance and manager tenure depends on the relative control power of managers and shareholders in fund governance, while the relation between performance and the size of AUM depends on returns to scale in CEF management. Shareholder Control Hypothesis 2 predicts that manager tenure is positively related to NAV performance and fund premium, since skilled managers cannot capture their rents and unskilled managers are terminated. By contrast, the Manager Control Hypothesis predicts a negative relation, as skilled managers capture their rents and unskilled managers are retained.

Model (1) of Table 9 regresses fund manager NAV performance, across all funds managed during year t, on lagged tenure, AUM, expenses, and fund age at the end of year $t-1$. The results suggest a significant entrenchment effect, as NAV performance is significantly negatively related to manager tenure. Specifically, for a manager whose tenure is twice as high as the industry average, the NAV performance, measured by the information ratio, is lower than the average by 0.085 (=0.122*log(2)). Model (2) substitutes log manager tenure by log manager career experience, and finds similar results – indeed, the estimated regression coefficients are very similar.

Table 9 also shows that NAV performance is negatively related to manager AUM, providing further support for the Decreasing Return to Scale Hypothesis. The coefficients of AUM in Models (1) and (2) are very similar, suggesting that the NAV performance, measured by the information ratio, declines by 0.139 (=0.20*log(2)) if AUM doubles.

Table 10 analyzes the determinants of category-adjusted fund premium calculated at the manager level. Model (1) uses lagged one-year NAV performance, logged manager tenure, logged AUM, expense ratio and logged fund age as the explanatory variables. Consistent with the relation between premium changes and past NAV performance in Section 5, the premium level is positively related to past NAV performance. Interestingly, longer manager tenure and larger AUM are both associated with lower premium level, providing further evidence for manager entrenchment and decreasing returns to scale. Model (2) replaces manager tenure by manager career experience, and shows similar results. In Model (3) and (4), we interact lagged NAV performance with manager tenure and experience, respectively. The results show that the positive relation between premium and lagged NAV performance is primarily driven by long-tenure and long-experience managers. The stronger performance-premium relation among the long-tenure managers is consistent with the higher persistence of NAV performance due to entrenchment.

6.2 Persistence of NAV Performance and Premium

Finally, we investigate the persistence of NAV performance and fund premium. As stated in Section 1, strong shareholder control should translate into persistence of good NAV performance and high premium, as shareholders will prevent skilled managers from capturing the

large fraction of the rents that they produce. By contrast, strong manager control in fund governance predicts higher persistence of low premium and poor NAV performance.

Table 11 tests these alternative hypotheses. First, Model 1 shows that the category-adjusted premium strongly persists, but the persistence of the above-average premium is significantly lower (i.e., stronger mean-reversion). Specifically, the coefficient on the interaction term *HighP*Premium* is significantly negative, where *HighP* equals 1 if the category-adjusted premium is positive, and zero, otherwise. Model (2) performs the same test for NAV performance. The below-average NAV performance shows some degree of persistence, with a coefficient of 0.157 on lagged NAV performance, but it is not significant. The above-average NAV performance shows no persistence. The gap between the degrees of persistence in these two groups is significant at the 10% level. The stronger persistence of low premium and poor NAV performance relative to high premium and good NAV performance is consistent with the asymmetric AUM and fee adjustments and the diseconomies-of-scale we show in the prior sections.

For comparison, we also examine the persistence of CEF stock performance, calculated at the manager level, in Model (3). The efficient market hypothesis (weak-form) implies that stock performance should have no persistence, because the CEF shares are freely traded on exchanges. Any information that helps to predict future stock return will be reflected in current stock price. The result of Model (3) confirms this prediction and indicates no any evidence of persistence in CEF stock performance.

Since a manager's performance is observed only when he continues to manager a fund, we repeat the analysis at the fund level. We break funds into two groups according to the average tenure of its managers during year $t-1$. Models (1) and (2) in Table 12 test the persistence of premium and NAV performance of the long-tenure funds, while Models (3) and (4) do it for the short-tenure funds. The results show that long-tenure funds exhibit more persistence with low premiums and NAV performance, relative to higher premiums and NAV performance. However, short-tenure funds exhibit no such asymmetry.

The higher persistence of low premium and poor NAV performance relative to high premium and good NAV performance favors the Manager Control as opposed to the Shareholder Control Hypothesis. Outperforming managers respond faster to good performance to capture

rents than shareholders react to underperforming managers. The fact that such asymmetry is only observed among funds whose managers have longer-than-average tenure further indicates that long-tenure managers are especially entrenched.

7 Conclusion

Two prominent phenomena of the mutual fund industry have long puzzled finance academics. One is the overwhelming predominance of OEFs in comparison to closed-end funds. Another is the widespread presence of CEF discounts. In this paper we provide insights on both phenomena by investigating the relative control power of CEF managers and shareholders over the potential CEF rents, and the ability of shareholders to discipline unskilled managers.

We formulate two polar hypotheses about the governance in the CEF industry. The Shareholder Control Hypothesis postulates that market frictions allow shareholders to extract rents generated by skilled managers, and that effective governance prevents unskilled managers from destroying shareholder value. The Manager Control Hypothesis postulates that market power allows skilled managers to fully capture the rents they generate, and that unskilled managers are entrenched due to weak governance.

Based on the performance and AUM records of 1183 individual fund managers from 1985 to 2010, we find some evidence that underperforming managers are punished by AUM contractions, but overall the results provide much stronger support for the Manager Control Hypothesis. Specifically, we find that managers generating high surplus, as proxied by fund premium, capture rents on their skills by expansions of AUM and increases of management fees; however, CEF managers with a high discount are not penalized accordingly. Managers with poor NAV performance suffer from asset contractions, but such discipline is insignificant for managers with long tenure. NAV performance and premium declines with manager tenure, and with the size of AUM. Lower premium and poor NAV performance show stronger persistence than high premium and good NAV performance, primarily among funds managed by managers with long-tenure. These findings suggest that CEF shareholders have little capacity to extract rents from skilled managers, and have difficulty in disciplining unskilled managers. The weak shareholder control in CEFs may be an important reason why CEFs

are so rare compared to OEFs, and why they usually trade at discount.

Our results also provide an explanation for the weak relation between NAV performance and fund premium. Consistent with the adjustments of AUM after extremely good or bad performance, we find that fund premium responds positively to NAV performance only in the medium range. The endogenous AUM and fee adjustment in response to past NAV performance breaks the link between premium and extreme performance. Only the medium range performance has a positive impact on fund premium, because such performance does not trigger AUM or fee adjustments due to adjustment costs.

We find both NAV performance and premium decline with managers' AUM, suggesting diseconomies of scale in CEF management. This finding provides support to a key assumption underlying the Berk and Green (2004) equilibrium. It also supports the notion that asset expansions represent a transfer of rents from shareholders to managers.

References

Barclay, Michael, Clifford Holderness, and Jeffrey Pontiff, 1993, Private benefits from block ownership and discounts on closed-end funds, *Journal of Financial Economics* 33, 263–291.

Berk, Jonathan B., and Richard C. Green, 2004, Mutual fund flows and performance in rational markets, forthcoming, *Journal of Political Economy*.

Berk, Jonathan B., and Richard Stanton, 2007, Managerial ability, compensation, and the closed-end fund discount, *Journal of Finance* 62, 529–556.

Berk, Jonathan B., and Ian Tonks, 2007, Return Persistence and Fund Flows in the Worst Performing Mutual Funds, NBER Working Paper No. 13042.

Bradley, Michael, Alon Brav, Itay Goldstein, and Wei Jiang, 2010, Activist Arbitrage: A Study of Open-Ending Attempts of Closed-End Funds, *Journal of Financial Economics* pp. 1–19.

Chay, Jong-Bom, and Charles Trzcinka, 1999, Managerial performance and the cross-sectional pricing of closed-end funds, *Journal of Financial Economics* 52, 379–408.

Chen, Joseph, Harrison Hong, Ming Huang, and Jeffrey D. Kubik, 2004, Does fund size erode mutual fund performance? The role of liquidity and organization, *American Economic Review* 24, 1276–1302.

Cherkes, Martin, 2012, The 2012 Survey of Closed-End Funds' Literature, Columbia University working paper.

Cherkes, Martin, Jacob Sagi, and Richard Stanton, 2009, A Liquidity-Based Theory of Closed-End Funds, *Review of Financial Studies* 2009.

Chevalier, Judith, and Glenn Ellison, 1997, Risk taking by mutual funds as a response to incentives, *Journal of Political Economy* 105, 1167–1200.

Chevalier, Judith, and Glenn Ellison, 1999, Career concerns of mutual fund managers, *Quarterly Journal of Economics* 114, 389–432.

Chordia, Tarun, 1996, The structure of mutual fund charges, *Journal of Financial Economics* 41, 3–39.

Coles, Jeffrey L., Jose Suay, and Denise Woodbury, 2000, Fund advisor compensation in closed-end funds, *Journal of Finance* 55, 1385–1414.

Dangl, Thomas, Youchang Wu, and Josef Zechner, 2008, Market discipline and internal governance in the mutual fund industry, *Review of Financial Studies* 21, 2307–2343.

Del Guercio, Diane, Larry Y. Dann, and M. Megan Partch, 2003, Governance and boards of directors in closed-end investment companies, *Journal of Financial Economics* 69, 111–152.

Dimson, Elroy, and Carolina Minio-Paluello, 2002, The closed-end fund discount, *The Research Foundation of the Association for Investment Management and Research.*

Ding, Bill, and Russ Wermers, 2009, Mutual fund performance and governance structure: The role of portfolio managers and boards of directors, working paper, University of Maryland.

Fama, Eugene F., and Michael C. Jensen, 1983, Agency problems and residual claims, *Journal of Law and Economics* 26, 275–302.

Ferguson, Robert, and Dean Leistikow, 2001, Valuing Active Managers, Fees, and Fund Discounts, *Financial Analysts Journal* 57 (May/June), 52–62.

Gruber, Martin, 1996, Another puzzle: The growth in actively managed mutual funds, *Journal of Finance* 51, 783–810.

Khorana, Ajay, 1996, Top management turnover: an empirical investigation of mutual fund managers, *Journal of Financial Economics* 40, 403–427.

Massa, Massimo, Jonathan Reuter, and Eric Zitzewitz, 2006, The Rise of Anonymous Teams in Fund Management, working paper, INSEAD.

Nanda, Vikram, M. P. Narayanan, and Vince Warther, 2001, Liquidity, investment ability and mutual fund structure, *Journal of Financial Economics* 57.

Reuter, Jonathan, and Eric Zitzewitz, 2011, How Much Does Size Erode Mutual Fund Performance? A Regression Discontinuity Approach, Boston College working paper.

Ross, Stephen A., 2002, Neoclassical finance, alternative finance and the closed end fund puzzle, *European Financial Management* 8, 129–137.

Rowe, Wei Wang, and Wallace N. Davidson III, 2000, Fund manager succession in closed-end mutual funds, *The Financial Review* 35, 53–78.

Sirri, Erik R., and Peter Tufano, 1998, Costly search and mutual fund flows, *Journal of Finance* 53, 1589–1622.

Stein, Jeremy, 2005, Why Are Most Funds Open-End? Competition and the Limit of Arbitrage, *Quarterly Journal of Economics* 120, 247–272.

Treynor, Jack L., and Fischer Black, 1973, How to Use Security Analysis to Improve Portfolio Selection, *Journal of Business* pp. 66–88.

Wermers, Russ, Youchang Wu, and Josef Zechner, 2008, Portfolio Performance, Discount Dynamics, and the Turnover of Closed-End Fund Managers, University of Maryland working paper.

Yan, Xuemin, 2008, Liquidity, Investment Style, and the Relation Between Fund Size and Fund Performance, *Journal of Financial and Quantitative Analysis* 43, 741–768.

Table 1: Summary statistics of closed-end funds

Our Lipper-Morningstar matched sample has a total of 680 funds, including 83 domestic equity funds, 86 international equity funds, 181 taxable bond funds, and 330 municipal bond funds. This table presents summary statistics based on annual observations. NAV return and stock return are annualized continuously-compounded returns estimated using funds with at least 40 weekly observations of net asset value and stock price. Total net asset value (TNA), discount, and number of managers per fund are measured at year end.

Variable	**Mean**	**Std. Dev.**	**N**
TNA ($ million): All Funds	251	307	9173
Domestic Equity	374	529	1043
International Equity	203	264	1207
Taxable Bond	290	307	2282
Muni Bond	217	230	4641
Discount: All Funds	0.049	0.1	9187
Domestic Equity	0.072	0.136	1017
International Equity	0.069	0.159	1202
Taxable Bond	0.034	0.086	2300
Muni Bond	0.046	0.073	4668
NAV Return: All Funds	0.058	0.202	8411
Domestic Equity	0.069	0.253	914
International Equity	0.064	0.361	1099
Taxable Bond	0.06	0.197	2085
Muni Bond	0.054	0.117	4313
Stock Return: All Funds	0.058	0.24	8411
Domestic Equity	0.07	0.3	914
International Equity	0.064	0.405	1099
Taxable Bond	0.057	0.225	2085
Muni Bond	0.054	0.164	4313
Management Fee: All Funds	0.008	0.004	8895
Domestic Equity	0.009	0.008	948
International Equity	0.01	0.003	1146
Taxable Bond	0.007	0.003	2204
Muni Bond	0.007	0.002	4597
Expense Ratio: All Funds	0.015	0.009	8953
Domestic Equity	0.017	0.017	969
International Equity	0.019	0.007	1167
Taxable Bond	0.018	0.011	2208
Muni Bond	0.012	0.004	4609
Number of Managers: All Funds	1.69	0.958	9239
Domestic Equity	1.74	0.930	1053
International Equity	1.685	0.928	1214
Taxable Bond	1.93	0.98	2302
Muni Bond	1.561	0.938	4670

Table 2: Summary statistics of closed-end fund managers

This table presents the summary statistics for a sample of 1183 closed-end fund managers. *Number of Funds per Manager* is the total number of funds simultaneously managed by a manager. *AUM per Manager* is total asset under management, aggregated across all simultaneously-managed funds (each fund' asset is divided by the number of its managers). *Asset growth* is the annual growth rate of a manager's AUM, adjusted by the growth due to NAV return over the year. *Tenure* is the number of years that a manager has been managing his current funds. *Experience* is the total number of years since a manager starts to mange his first closed-end fund. *NAV Performance* is the mean of category-adjusted NAV return divided by volatility. Similarly, *Stock Performance* is the mean of category-adjusted CEF stock return divided by volatility. Both performance measures are calculated using weekly data and then annualized. *Category-Adjusted Premium* and *Category-Adjusted Management Fee* are the fund premium and management fee ratio adjusted by the contemporaneous category mean, respectively. All the category-adjusted variables (including NAV and stock performances), as well as *Tenure*, are first calculated at the fund level, and then aggregated across all simultaneously-managed funds. Each fund is weighted by the inverse of the number of its managers. *Changes in Adjusted Management Fee* is the changes in management fees computed at the manager level from year to year.

Variable	**Mean**	**Std. Dev.**	**N**
Number of Funds per Manager	2.178	3.774	6982
AUM per Manager ($ million)	324	629	6982
Asset Growth	-0.097	0.582	6595
Tenure	4.837	4.723	6914
Experience	5.666	5.262	6957
NAV Performance	0.048	1.372	6275
Stock Performance	0.061	0.814	6275
Category-Adjusted Premium	0.001	0.096	6275
Category-Adjusted Management Fee	0	0.004	6667
Changes in Adjusted Management Fee	0	0.004	5551

Table 3: AUM and management fee changes: event count

Panel A presents the number of AUM expansion and contraction events. An AUM expansion (contraction) is defined as an increase (decrease) of AUM by more than 50% (column 1) or 25% (column 2) in a given year after adjusting for growth due to the realized NAV return. These events are further divided into subgroups (not mutually exclusive) according to the reasons for the AUM changes: changes in the number of fund managed, changes in the number of managers in a fund, changes of fund size, and manager switches between funds. Panel B presents the number of cases with a management fee changes of more than 10 basis points, and the average fee changes within each category.

Panel A. AUM changes

Change type	by 50%	by 25%
Expansion	409	614
Increased number of funds	290	351
Same funds: decreased number of managers	60	124
Same funds: increased size	55	131
Switch to bigger funds	9	12
Contraction	956	1325
Leaving the sample	759	759
Decreased number of funds	101	196
Same funds: increased number of managers	76	223
Same funds: decreased size	88	334
Switch to smaller funds	1	7

Panel B. Management fee changes

Change type	Number of cases	Average change
Increase (by more than 10 bps)	474	0.0038
Decrease (by more than 10 bps)	585	-0.0032

Table 4: Manager AUM changes by more than 50%

This table presents the multilogit regression results on AUM expansion and contraction. The dependent variable is 1 (expansion) if a manager's AUM (net of changes due to realized NAV return) increases by more than 50% in a given year, -1 (contraction) if it decreases by more than 50%, and 0 (base case) otherwise. *NavPerf* is the average NAV performance in the prior two years; *Premium* is the category-adjusted fund premium at the end of year $t-1$;*Tenure* and *FundAge* are logged manager tenure and fund age (both in years), respectively, at the end of year $t-1$; AUM is logged total asset under management (in million dollars) at the end of year $t-1$. AUM is aggregated across funds simultaneously managed by a manager (after dividing by the number of managers of each fund). All other explanatory variables are computed by averaging across simultaneously managed funds. Each fund is weighted by the inverse of the number its managers. $Tenure$, AUM and $FundAge$ are adjusted by the contemporaneous sample mean. Year dummies are included in all regressions. Z-statistics based on robust standard errors allowing for clustering of error terms at the manager level are in parentheses.

	(1)		(2)	
	50% cutoff		50% cutoff	
	-1	1	-1	1
NavPerf	-0.153***	0.284***	-0.262***	0.282***
	(-3.43)	(4.16)	(-4.63)	(3.69)
Tenure*NavPerf			0.205***	-0.015
			(3.27)	(-0.13)
Premium	-0.480	3.121***	-0.409	3.293***
	(-0.97)	(5.19)	(-0.61)	(4.82)
Tenure* Premium			-0.238	-0.409
			(-0.33)	(-0.42)
Tenure	0.112	-0.497***	0.133*	-0.470***
	(1.42)	(-3.45)	(1.65)	(-3.23)
AUM	-0.137***	-0.177***	-0.141***	-0.178***
	(-4.00)	(-3.06)	(-4.07)	(-3.07)
FundAge	-0.117*	-0.376***	-0.118*	-0.373***
	(-1.71)	(-3.67)	(-1.72)	(-3.63)
Constant	-1.645***	-2.730***	-1.653***	-2.740***
	(-10.13)	(-10.63)	(-10.19)	(-10.60)
YearDummies	Yes	Yes	Yes	Yes
Observations	4710		4710	

* $p < 0.1$, **$p < 0.05$, *** $p < 0.01$

Table 5: Manager AUM changes by more than 25%

This table presents the multilogit regression results on AUM expansion and contraction. The dependent variable is 1 (expansion) if a manager's AUM (net of changes due to realized NAV return) increases by more than 25% in a given year, -1 (contraction) if it decreases by more than 25%, 0 (base case) otherwise. *NavPerf* is the average NAV performance in the prior two years; *Premium* is category-adjusted fund premium at the end of year $t-1$; *Tenure* and *FundAge* are logged manager tenure and fund age (both in years), respectively, at the end of year $t-1$; AUM is lagged logged total asset under management (in million dollars) at the end of year $t-1$. AUM is aggregated across funds simultaneously managed by a manager (after dividing by the number of managers of each fund). All other explanatory variables are computed by averaging across simultaneously managed funds. Each fund is weighted by the inverse of the number its managers. $Tenure$, AUM and $FundAge$ are adjusted by the contemporaneous sample mean. Year dummies are included in all regressions. Z-statistics based on robust standard errors allowing for clustering of error terms at the manager level are in parentheses.

	(1)		(2)	
	25% cutoff		25% cutoff	
	-1	1	-1	1
NavPerf	-0.137***	0.137**	-0.176***	0.184***
	(-3.61)	(2.39)	(-3.52)	(2.97)
Tenure*NavPerf			0.136**	-0.096
			(2.54)	(-1.07)
Premium	-0.021	2.981***	0.290	3.440***
	(-0.05)	(5.92)	(0.49)	(5.22)
Tenure* Premium			-0.352	-0.707
			(-0.52)	(-0.83)
Tenure	0.084	-0.294**	0.074	-0.272**
	(1.20)	(-2.44)	(1.04)	(-2.17)
AUM	-0.059**	-0.110**	-0.066**	-0.123***
	(-1.96)	(-2.49)	(-2.12)	(-2.67)
FundAge	-0.143**	-0.396***	-0.132**	-0.412***
	(-2.48)	(-4.70)	(-2.17)	(-4.64)
YearDummies	Yes	Yes	Yes	Yes
	(-26.16)	(-32.29)	(-8.48)	(-10.13)
Constant	-1.239***	-2.286***	-1.226***	-2.302***
Observations	4710		4710	

* $p < 0.1$, **$p < 0.05$, *** $p < 0.01$

Table 6: Growth rate of manager AUM

This table presents the multilogit regression results on the growth rate of managers' AUM. The dependent variable, *AssetGrowth*, is the growth rate of assets managed by individual managers (net of realized NAV return), adjusted by the contemporaneous mean of all other managers in the same category; *NavPerf* is the average NAV performance in the prior two years; *Premium* is category-adjusted fund premium at the end of year $t-1$; $HighN$ and $HighP$ are indicator equal 1 if *NavPerf* and *Premium* are higher than zero, respectively. *Tenure* and *FundAge* are logged manager tenure and fund age (both in years), respectively, at year $t-1$; AUM is the logged total assets under management (in million dollars) at the end of year $t-1$. AUM is aggregated across funds simultaneously managed by a manager (after dividing by the number of managers of each fund). All other explanatory variables are computed by averaging across simultaneously managed funds. Each fund is weighted by the inverse of the number its managers. $Tenure$, AUM and $FundAge$ are adjusted by the contemporaneous sample mean. Year dummies are included in all regressions. The models are estimated with fixed-effects of managers. The t-statistics in parentheses are based on heteroscedasticity-consistent standard errors.

	(1)	(2)	(3)	(4)
	AssetGrowth	AssetGrowth	AssetGrowth	AssetGrowth
NavPerf	0.050***	0.050***	0.062***	0.076***
	(5.62)	(3.21)	(3.93)	(4.06)
HighN*NavPerf		0.003	-0.009	-0.013
		(0.12)	(-0.34)	(-0.52)
Tenure*NavPerf				-0.020
				(-1.54)
Premium	0.417***	-0.215	-0.191	-0.172
	(3.34)	(-0.90)	(-0.76)	(-0.67)
HighP * Premium		0.855***	0.658**	0.636**
		(2.71)	(2.06)	(2.00)
Tenure* Premium				0.003
				(0.02)
Tenure			-0.184***	-0.183***
			(-5.65)	(-5.62)
AUM			-0.185***	-0.183***
			(-6.85)	(-6.80)
FundAge			-0.099	-0.098
			(-1.59)	(-1.57)
Constant	-0.037***	-0.067***	0.070***	0.071***
	(-42.42)	(-4.65)	(3.76)	(3.81)
Observations	4713	4702	4701	4701

* $p < 0.1$, **$p < 0.05$, *** $p < 0.01$

Table 7: Management fee changes

This table presents the multilogit regression results on changes of management fees. The dependent variable is 1 if the category-adjusted fee increase by more than 10 basis points, -1 if it decreases by more than 10 basis points, and zero otherwise. *NavPerf* is the average NAV performance in the prior two years; *Premium* is category-adjusted fund premium at the end of year $t-1$; *Tenure* and *FundAge* are logged manager tenure and fund age (both in years), respectively, at the end of year $t-1$; AUM is logged total asset under management (in million dollars) at the end of year $t-1$; *ManagementFee* is category-adjusted management fee ratio in the year $t-1$. AUM is aggregated across funds simultaneously managed by a manager (after dividing by the number of managers of each fund). All other explanatory variables are computed by averaging across simultaneously managed funds. Each fund is weighted by the inverse of the number its managers. $Tenure$, AUM and $FundAge$ are adjusted by the contemporaneous sample mean. Year dummies are included in all regressions. Z-statistics based on robust standard errors allowing for clustering of error terms at the manager level are in parentheses.

	(1)		(2)	
	10 bps cutoff		10 bps cutoff	
	-1	1	-1	1
NavPerf	-0.010	0.202***	-0.123*	0.143
	(-0.17)	(3.05)	(-1.80)	(1.64)
Tenure*NavPerf			0.250***	0.130
			(2.64)	(1.40)
Premium	-0.187	1.465**	0.404	2.411***
	(-0.30)	(2.44)	(0.49)	(3.31)
Tenure* Premium			-1.104	-1.757*
			(-1.25)	(-1.82)
Tenure	0.292**	-0.002	0.282**	0.008
	(2.18)	(-0.02)	(2.14)	(0.06)
AUM	-0.159**	-0.126**	-0.162**	-0.132**
	(-2.22)	(-1.96)	(-2.26)	(-2.03)
ManageFee	195.263***	-95.006*	193.372***	-92.014*
	(5.56)	(-1.73)	(5.52)	(-1.74)
FundAge	-0.024	-0.051	-0.016	-0.048
	(-0.18)	(-0.40)	(-0.12)	(-0.37)
Constant	-2.814***	-3.840***	-2.822***	-3.855***
	(-9.71)	(-8.45)	(-9.73)	(-8.38)
YearDummies	Yes	Yes	Yes	Yes
Observations	4039		4039	

* $p < 0.1$, **$p < 0.05$, *** $p < 0.01$

Table 8: Response of premium to NAV performance, AUM growth and fee changes

This table presents regression results for changes in fund premium. The dependent variable, $\Delta Premium$, is change in category-adjusted fund premium in the current year. *NavPerf* is the NAV performance in the year $t-1$; *AssetGrowth* is the category-adjusted growth rate of a manager's AUM after adjusting for realized NAV returns in the year $t-1$; *Expansion* is an indicator equal 1 if *AssetGrowth* is higher than 50% and zero otherwise, *Contraction* is an indicator equal 1 if *AssetGrowth* is below -50% and 0 otherwise; ΔFee is the change in category-adjusted management fee ratio in the year $t-1$; *Premium* is the category-adjusted premium at the end of year $t-1$; $NavPerf\_H, NavPerf\_M$, and $NavPerf\_L$ are defined as follows:

$$\begin{aligned} NavPerf\_L &= min(NavPerf, -Std), \\ NAVPerf\_M &= max[0, min(NavPerf + Std, 2 * Std)], \\ NAVPerf\_H &= max(0, Navperf - Std), \end{aligned}$$

where Std is the standard deviation of $NavPerf$ in the sample. The models are estimated with manager fixed-effects. The t-statistics in parentheses are based on heteroscedasticity-consistent standard errors.

	(1)	(2)	(3)	(4)	(5)	(6)
	Δ Premium	Δ Premium	Δ Premium	Δ Premium	Δ Premium	Δ Premium
NavPerf	0.003***	0.002**		0.003***	0.002**	
	(2.76)	(2.34)		(2.79)	(2.38)	
NavPerf_H			-0.004*			-0.004
			(-1.78)			(-1.61)
NavPerf_M			0.005***			0.005***
			(4.16)			(4.10)
NavPerf_L			-0.004			-0.004
			(-1.09)			(-1.09)
AssetGrowth	-0.008***	-0.007***	-0.007***			
	(-2.81)	(-3.32)	(-3.31)			
Expansion				-0.016***	-0.017***	-0.016***
				(-2.88)	(-4.22)	(-4.14)
Contraction				0.006	0.008	0.008
				(0.80)	(1.34)	(1.31)
Δ Fee	-0.136	-0.061	-0.048	-0.131	-0.056	-0.044
	(-0.60)	(-0.50)	(-0.39)	(-0.58)	(-0.46)	(-0.36)
Premium		-0.711***	-0.708***		-0.712***	-0.709***
		(-23.19)	(-23.10)		(-23.28)	(-23.19)
Constant	0.000	0.002***	-0.011*	-0.000	0.002***	-0.011*
	(0.35)	(8.00)	(-1.77)	(-0.04)	(6.57)	(-1.76)
Observations	4732	4732	4732	4732	4732	4732

* $p < 0.1$, **$p < 0.05$, *** $p < 0.01$

Table 9: Determinants of NAV performance

This table presents the regression results for managers' NAV performance(*NavPerf*). *Tenure*, *Experience*, *AUM*, *FundAge* are logged tenure, logged total number of years since becoming a CEF manager, logged total assets under management (in $ million) at the end of year $t-1$, all adjusted by the contemporaneous sample mean. *Expense* is the category-adjusted expense ratio in the year $t-1$. The models are estimated with manager fixed-effects. The t-statistics in parentheses are based on heteroscedasticity-consistent standard errors.

	(1)	(2)
	NavPerf	NavPerf
Tenure	-0.122***	
	(-4.04)	
Experience		-0.096***
		(-3.24)
AUM	-0.208***	-0.196***
	(-5.72)	(-5.43)
Expense	-1.987	-2.088
	(-0.77)	(-0.81)
FundAge	0.088*	0.056
	(1.91)	(1.24)
Constant	0.068***	0.068***
	(32.31)	(32.45)
Observations	5774	5777

* $p < 0.1$, **$p < 0.05$, *** $p < 0.01$

Table 10: Determinants of premiums

This table presents the regression results for the determinants of category-adjusted fund premium. *NavPerf* is the NAV performance in the year $t-1$; *Tenure*, *Experience*, *AUM*, *FundAge* are logged tenure, logged total number of years since becoming a CEF manager, logged total assets under management (in $ million) at the end of year $t-1$, all adjusted by the contemporaneous sample mean. *Expense* is the category-adjusted expense ratio in the year of $t-1$. The models are estimated with manager-fixed effects. The t-statistics in parentheses are based on heteroscedasticity-consistent standard errors.

	(1)	(2)	(3)	(4)
	Premium	Premium	Premium	Premium
NavPerf	0.002**	0.002**	0.001	0.001
	(2.35)	(2.27)	(1.47)	(1.54)
Tenure* NavPerf			0.003**	
			(2.53)	
Experience* NavPerf				0.003**
				(2.30)
Tenure	-0.009**		-0.009**	
	(-2.32)		(-2.40)	
Experience		-0.012***		-0.012***
		(-3.33)		(-3.40)
AUM	-0.009**	-0.008**	-0.009***	-0.008**
	(-2.54)	(-2.31)	(-2.64)	(-2.37)
Expense	-0.040	-0.064	-0.029	-0.049
	(-0.23)	(-0.37)	(-0.16)	(-0.28)
FundAge	0.020***	0.022***	0.020***	0.022***
	(3.40)	(4.20)	(3.44)	(4.26)
Constant	0.003***	0.004***	0.003***	0.004***
	(3.72)	(4.17)	(3.96)	(4.33)
Observations	5131	5132	5131	5132

* $p < 0.1$, **$p < 0.05$, *** $p < 0.01$

Table 11: Persistence of NAV performance and premium.

This table presents the regression results for the persistence of managers' NAV performance ($NavPerf$), stock performance ($StockPerf$), and category-adjusted fund premium ($Premium$). Each variable is regressed on its own one-year lag, and an interaction term. $HighN_{t\text{-}1}$ and $HighS_{t\text{-}1}$ are indicators equal 1 if $NavPerf_{t\text{-}1}$ and $StockPerf_{t\text{-}1}$ are higher than zero, respectively.$HighP_{t\text{-}1}$ is an indicator equal 1 if $Premium_{t\text{-}1}$ is higher than zero. The t-statistics are adjusted for clustering at both year and manager levels.

	(1)	(2)	(3)
	Premium	NavPerf	StockPerf
$\text{Premium}_{\text{t-1}}$	0.741***		
	(9.38)		
$\text{HighP}_{\text{t-1}}$ * $\text{Premium}_{\text{t-1}}$	-0.220**		
	(-2.23)		
$\text{NavPerf}_{\text{t-1}}$		0.157	
		(1.54)	
$\text{HighN}_{\text{t-1}}$* $\text{NavPerf}_{\text{t-1}}$		-0.183*	
		(-1.75)	
$\text{StockPerf}_{\text{t-1}}$			-0.022
			(-0.33)
$\text{HighS}_{\text{t-1}}$ * $\text{StockPerf}_{\text{t-1}}$			0.013
			(0.16)
Constant	0.008**	0.151**	0.068***
	(2.58)	(2.57)	(2.72)
Observations	5198	5204	5204

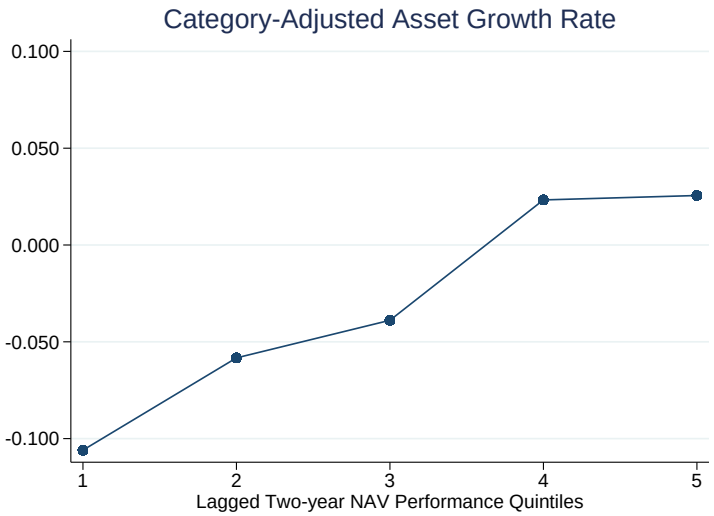
* $p < 0.1$, **$p < 0.05$, *** $p < 0.01$

Table 12: Persistence of NAV performance and premium: Long- vs. short-tenure funds.

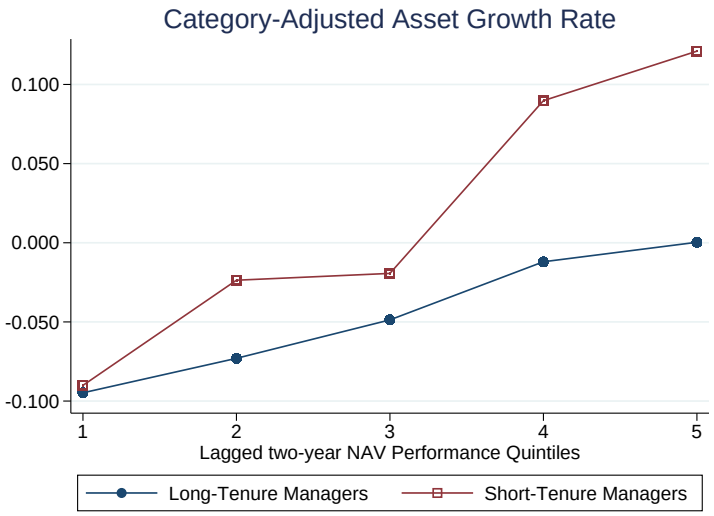
This table presents the regression results for the persistence of NAV performance and premium at the fund level. Models (1) and (2) are results for the subsample of fund-year observations for which the manager tenure in the prior year is longer than the contemporaneous sample mean, while models (3) and (4) are results for the subsample of fund-year observations for which the manager tenure in the prior year is shorter than the contemporaneous sample mean. Manager tenure for a fund is measured by the average tenure of all managers in the management team in the case of a team-managed fund. $NavPerf_{t\text{-}1}$ is NAV performance in the year $t-1$, and $Premium_{t\text{-}1}$ is category-adjusted premium at the end of the year $t-1$. $HighN_{t\text{-}1}$ is an indicator equal 1 if $NavPerf_{t\text{-}1}$ is higher than zero. $HighP_{t\text{-}1}$ is an indicator equal 1 if $Premium_{t\text{-}1}$ is higher than zero. The t-statistics are adjusted for clustering at both year and manager levels.

	(1)	(2)	(3)	(4)
	Premium	NavPerf	Premium	NavPerf
$\text{Premium}_{\text{t-1}}$	0.825***		0.616***	
	(12.24)		(9.62)	
$\text{HighP}_{\text{t-1}}$* $\text{Premium}_{\text{t-1}}$	-0.289***		-0.017	
	(-2.68)		(-0.29)	
$\text{NavPerf}_{\text{t-1}}$		0.242**		0.016
		(2.09)		(0.16)
$\text{HighN}_{\text{t-1}}$* $\text{NavPerf}_{\text{t-1}}$		-0.328**		-0.018
		(-2.22)		(-0.14)
Constant	0.011***	0.124	0.000	0.124*
	(2.72)	(1.27)	(0.16)	(1.67)
Observations	3093	3104	5096	5100

* $p < 0.1$, **$p < 0.05$, *** $p < 0.01$

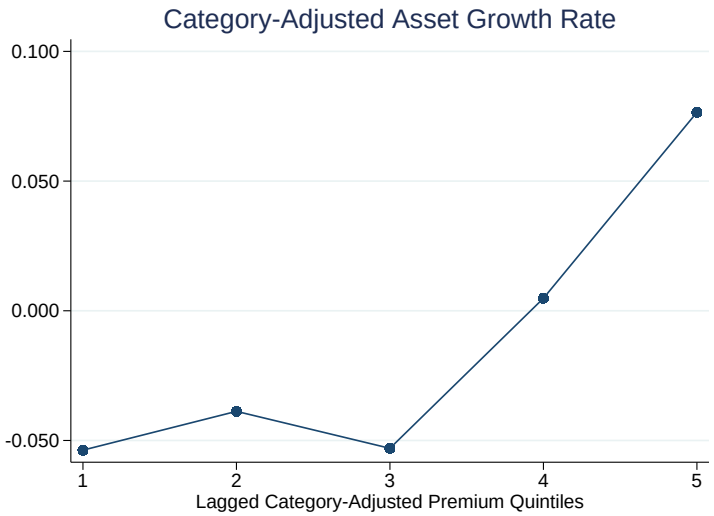


(a) Full sample

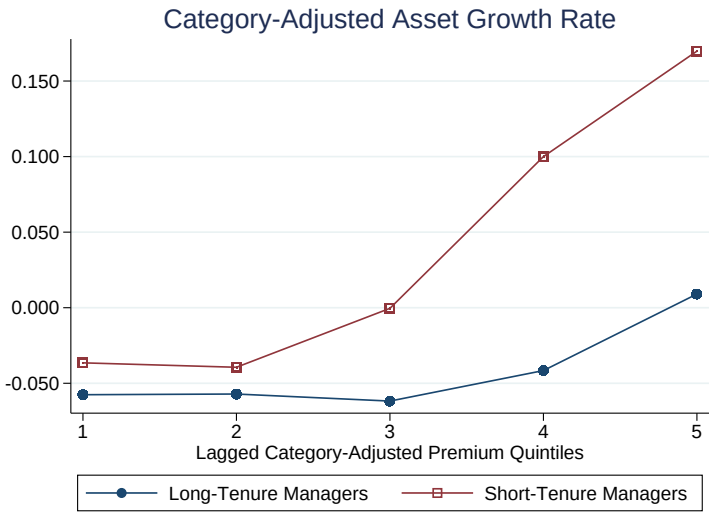


(b) Subsamples classified by manager tenure

Figure 1: **Category-adjusted asset growth and lagged two-year NAV performance.** Managers are sorted into five quintiles based on their average NAV performance in the lagged two years. The figures show the average category-adjusted asset growth rate of each quintile. Panel A reports results for the whole sample. Panel B reports results for two subsamples classified by lagged manager tenure. A manager-year observation is in the short-tenure sample if the lagged manager tenure is shorter than the sample mean in the prior year, and is in the long-tenure sample otherwise. Within each subsample, managers are sorted into five quintiles based on their average NAV performance in the lagged two years.

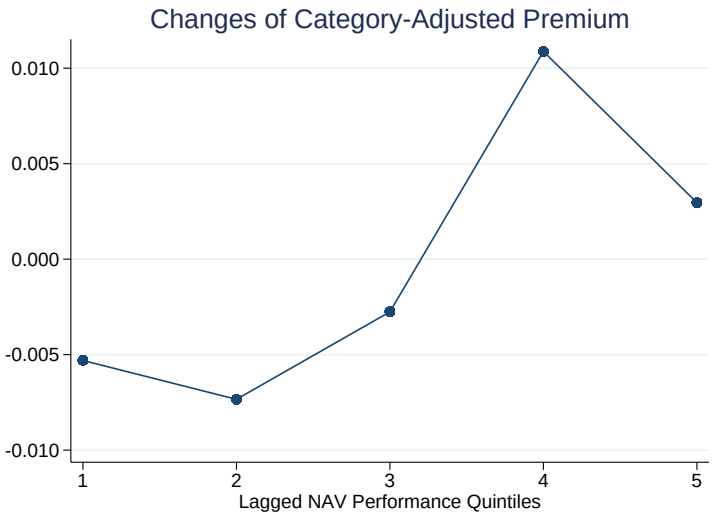


(a) Full sample

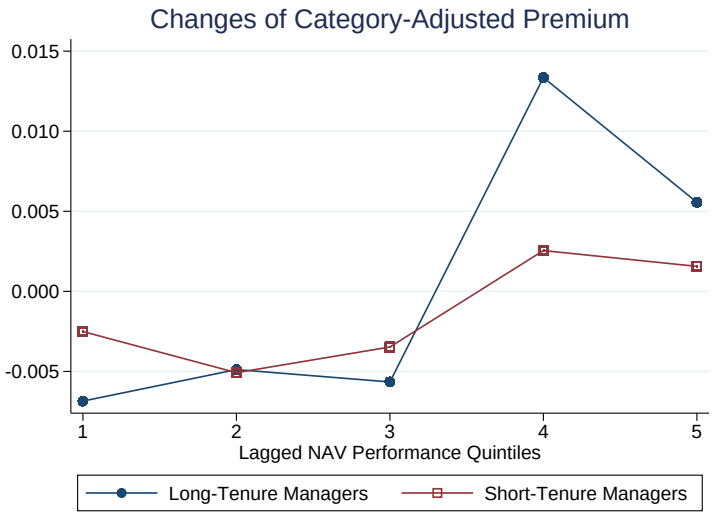


(b) Subsamples classified by manager tenure

Figure 2: **Category-adjusted asset growth and lagged fund premium.** Managers are sorted into five quintiles based on the lagged category-adjusted premium level. The figures show the average category-adjusted asset growth rate of each quintile. Panel A reports results for the whole sample. Panel B reports results for two subsamples classified by lagged manager tenure. A manager-year observation is in the short-tenure sample if the lagged manager tenure is shorter than the sample mean in the prior year, and is in the long-tenure sample otherwise. Within each subsample, managers are sorted into five quintiles based on the lagged premium.



(a) Full sample



(b) Subsamples classified by manager tenure

Figure 3: **Premium changes and lagged NAV performance.** Managers are sorted into five quintiles based on their one-year lagged NAV performance. The figures show the average change of category-adjusted premium of each quintile. Panel A reports results for the whole sample. Panel B reports results for two subsamples classified by lagged manager tenure. A manager-year observation is in the short-tenure sample if the lagged manager tenure is shorter than the sample mean in the prior year, and is in the long-tenure sample otherwise. Within each subsample, managers are sorted into five quintiles based on their lagged NAV performance.