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It Pays to Set the Menu

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ABSTRACT

This paper investigates whether mutual fund families acting as service providers in 401(k) plans display favoritism toward their own affiliated funds. Using a hand-collected dataset on the menu of investment options offered to plan participants, we show that fund deletions and additions are less sensitive to prior performance for affiliated than for unaffiliated funds. We find no evidence that plan participants undo this affiliation bias through their investment choices. Finally, the subsequent performance of poorly-performing affiliated funds indicates that this favoritism is not information driven.

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Employer-sponsored defined contribution (DC) accounts have gained significant importance around the world. In the United States, the value of 401(k) assets reached \$4.6 trillion in 2014.¹ The growth represents important business opportunities for mutual funds as they manage approximately half of the 401(k) investment pool. In addition to asset management, many fund families also provide administrative services to the plans and, therefore, play an active role in creating the menu of investment options for the plans' participants.

Fund families involved in the plan's design often face conflicting incentives. While they are pressured by plan sponsors to create menus that serve the interests of plan participants, they also have an incentive to include their own proprietary funds on the menu, even when more suitable options are available from other fund families.² Surprisingly, little is known about whether and how these conflicting incentives influence 401(k) menus. This is concerning given that DC accounts are the main source of retirement income for many of the beneficiaries.

In this paper, we examine the conflicting incentives of mutual fund companies in the 401(k) industry. Building on Cohen and Schmidt (2009), we collect information on the identity of the trustee of employer-sponsored 401(k) plans. Focusing on menu changes, we hypothesize that these service providers are inclined to include their own affiliated funds on the investment menu and subsequently reluctant to remove them. Furthermore, their addition and deletion decisions may be less sensitive to the prior performance of their own funds as they have an incentive to smooth money flows across their funds with differential past performance.

To investigate this *favoritism* hypothesis, we hand collect information on the menu of mutual fund options offered in a large sample of 401(k) plans for the period 1998 to 2009 from

annual filings of Form 11-K with the U.S. Securities and Exchange Commission (SEC). Our sample includes plans that are trustee by a mutual fund family as well as plans with non-mutual fund trustees. Most 401(k) plans in our sample adopt an *open architecture* whereby investment options include not only funds from the trustee’s family (“affiliated funds”) but those from other mutual fund families as well (“unaffiliated funds”). An interesting feature of our dataset is that a given fund often contemporaneously appears on several 401(k) menus that are administered by different fund families. This data feature provides us with a unique identification strategy and allows us to contrast how the very same fund is viewed across menus where the fund is affiliated with the trustee and menus where it is not.

Our results reveal significant favoritism toward affiliated funds. Mutual funds affiliated with the service provider of a 401(k) plan are significantly less likely to be removed from the plan menu than unaffiliated funds. The biggest relative difference between how affiliated and unaffiliated funds are treated occurs for the worst-performing funds, which have been shown to exhibit significant performance persistence (Carhart, 1997). For example, mutual funds ranked in the lowest decile based on their prior three-year performance have a deletion rate of 25.5% per year if they are unaffiliated with the plan’s trustee and a deletion rate of just 13.7% if they are affiliated with the trustee. On the other hand, funds in the top performance decile have a deletion rate of around 15% for both affiliated and unaffiliated trustees. Similarly, we find that the propensity to add funds to 401(k) menus is less sensitive to performance for affiliated funds than for unaffiliated funds. These results suggest that decisions to change the composition of 401(k) menus are not simply driven by meritocracy, but also by favoritism.

Protecting poorly-performing funds by keeping them or adding them to plan menus helps mutual fund families to smooth the money flows into their various offerings.

Although the investment opportunity set of the plan is limited to the available menu choices, participants can freely allocate their contributions among these options. If participants are aware of provider biases or are simply sensitive to poor performance, they can - at least partially - undo favoritism in their own portfolios by, for instance, not allocating capital to poorly-performing affiliated funds. Therefore, to test whether menu favoritism has an impact on the overall allocation of plan assets, we examine the sensitivity of participant flows to the performance of affiliated and unaffiliated funds. Consistent with studies documenting that DC plan participants are naive and inactive (Benartzi and Thaler, 2001; Madrian and Shea, 2001; Agnew, Balduzzi, and Sunden, 2003), we show that participants are generally not sensitive to poor performance and do not undo the menu's bias toward affiliated families. This in turn indicates that plan participants are affected by the affiliation bias.

Finally, while our evidence on favoritism is consistent with adverse incentives, fund families may also have superior information about their own proprietary funds. Therefore, it is possible that they show a preference for these funds not because they are necessarily biased toward them, but rather, due to favorable information they possess about these funds. To investigate this possibility, we examine future fund performance. For instance, if - despite lackluster past performance - the decision to keep poorly-performing affiliated funds on the menu is information driven, then these funds should perform better in the future. We find that this is not the case: affiliated funds that rank poorly based on past performance but are not

deleted from the menu do not perform well in the subsequent year. We estimate that, on average, they underperform by approximately 3.96% annually on a risk- and style-adjusted basis. These results suggest that the menu bias we document in this paper has important implications for the employees' income in retirement.

Our study belongs to a nascent literature on the effect of business ties in DC plans. Davis and Kim (2007) and Cohen and Schmidt (2009) study conflicts of interest in the 401(k) industry and argue that to protect the valuable business relation that arises between the sponsoring company and mutual fund service providers, families cater to the sponsors while compromising their own fiduciary responsibilities. In particular, Cohen and Schmidt (2009) find that trustee fund families overinvest in the sponsor's stock. They also show that when other mutual funds sell the stock, trustees tend to trade in the opposite direction thereby supporting the stock price of distressed firms. Davis and Kim (2007) document that mutual fund votes in shareholder meetings are influenced by 401(k) business ties.

Our paper is also related to two additional areas of study. First, we contribute to the broader literature that focuses on the design and characteristics of DC plans.³ Second, our paper is related to the literature on favoritism in mutual fund families. Gaspar, Massa, and Matos (2006) show that fund families strategically transfer performance across member funds to favor those funds that are more likely to increase overall family profits.⁴ We provide evidence that families favor their proprietary funds when they act as service providers of 401(k) plans.

The rest of the paper is structured as follows. Section I provides information on the institutional, economic, and legal background of DC plans. Section II describes our data

collection and provides summary statistics of our 401(k) plans as well as the mutual funds offered on the plans' menu. Sections III–V discuss our results. Section VI concludes.

I Institutional Background

401(k) menus are jointly determined by the plan sponsor (i.e., employer) and the plan's service providers. Service providers often offer bundled arrangements through which the same entity provides trustee, recordkeeping, and educational services.⁵ In addition to these administrative services, service providers often also serve as investment managers by offering their own funds on the menu. The dual role of administering the plan while managing plan assets may create opportunities for these companies to favor their own proprietary investment options, even when more suitable alternatives are available from other fund families.

Service providers are selected by the plan sponsor and their compensation structure is negotiated along multiple dimensions. The first component of compensation is explicit and consists of fees collected from the investment options offered on the menu, from sponsors, or from participants. In practice, most administrative fees are asset-based and are typically built into the expense ratios paid by participants when investing in the funds offered by the plan. Whereas service providers can keep the management fees they generate from their own funds on the menu, they are often compensated by the unaffiliated funds through revenue sharing arrangements. Under these arrangements they receive a fixed proportion of the total fees collected by unaffiliated investment management companies.⁶ Such revenue sharing arrangements increase the incentives to include unaffiliated investment options in the plan.⁷

The second component is implicit compensation, which arises from the indirect benefits that fund families obtain from administering a 401(k) plan. These benefits include the ability to control the set of affiliated fund options on the menu. In addition, service providers obtain access to participants and can build a long-term relation with these employees. For example, such access allows them to motivate plan participants to roll over their 401(k) assets to an affiliated Individual Retirement Account (IRA) after they retire or leave their jobs.⁸

A 2011 Deloitte survey of 401(k) fees finds that negotiations between sponsors and service providers include the number and type of investment options offered on the menu, the choice of offering proprietary vs. non-proprietary funds, or whether and what type of educational services may be offered to participants.⁹ Sponsors may benefit from structuring provider compensation in the form of asset-based fees in combination with implicit compensation arrangements, if their employees do not recognize the potential conflicts of interest in the 401(k) plan design. Thus, sponsors may be able to reduce their own costs of administering a plan by allowing providers to favor their own proprietary investment options on the menus.

There are safeguards to mitigate conflicts of interest in 401(k) plans. In particular, sponsors face pressure to offer 401(k) plans that satisfy legal and regulatory requirements. Employer-sponsored 401(k) plans are subject to regulatory and legal constraints imposed by the Employee Retirement Income Security Act (ERISA). ERISA requires that plan fiduciaries act “solely in the interest of the participants and beneficiaries and (...) for the exclusive purpose of (...) providing benefits to participants and their beneficiaries.” ERISA fiduciary actions are those involving discretionary plan administration, asset or plan management, or investment

advice. Over the last decade numerous lawsuits have been filed against plan sponsors and service providers alleging excessive or hidden fees or improper monitoring of options.¹⁰

These legal and regulatory constraints and the sponsor’s involvement in the plan’s design significantly contribute to the prevalence of open architecture 401(k) plans.¹¹ For example, providers are motivated for legal reasons to outsource funds from unaffiliated families if their own fund offerings are limited or specialized, as ERISA mandates plans to offer a diversified menu, or if their own fees are not competitive, as this reduces the risk of costly litigation.

In the rest of the paper, we use an identification strategy that takes advantage of the existence of the open architecture plan design to investigate favoritism in 401(k) plans.

II Data and Summary Statistics

A Data Collection

We manually collect the investment options offered in 401(k) plans from Form 11-K filed with the U.S. Securities and Exchange Commission (SEC). A plan is required to file this form if it offers the stock of the sponsoring company as an investment option for participants. The filing provides a description of the plan, identifies the trustee, and lists the accumulated value of assets invested in the various investment options at the end of the fiscal year. We collect 26,624 links to 11-K filings but restrict this sample to companies covered by COMPUSTAT.

From these documents we collect the tables that describe the “Schedule of Assets.” In most cases, the table reports the complete set of investment options offered by the plan,

including the employers' own stock, other common stocks, mutual funds, separate accounts, or commingled trusts. We supplement our Form 11-K information with plan level data from Form 5500 filed with the Department of Labor.

We match these data to the CRSP Survivorship Bias-Free U.S. Mutual Fund database. Since most plans do not identify the exact share class of the fund offered on the menu, we establish the link between our 401(k) sample and CRSP at the fund level. Accordingly, fund age is calculated as the age of the oldest share class, fund size is the sum of the total net assets (TNA) of all share classes, and fund returns and expense ratios are calculated as the TNA-weighted average returns and expense ratios of the share classes, respectively. We also classify each mutual fund into style categories of “balanced,” “bond,” “domestic equity,” “international equity,” or “other.” We create separate dummy variables for money market, target date, and index funds. We manually group funds into target date and index fund categories based on fund name. Around 62% of the funds in the average plan in our sample are equity funds and 20% are bond funds. There is a steady increase in the number of target date funds over our sample period, especially after the passage of the Pension Protection Act (PPA) of 2006, also documented by Mitchell and Utkus (2012).

B Sample Description

Table I describes the composition of our final sample by year. Our data cover 2,494 distinct plans sponsored by 1,826 firms from 1998 to 2009.¹² Overall, the final dataset has 13,367 plan-year observations. The number of plans is smaller during the early part of the sample as

plan disclosures were generally less comprehensive. Similarly, our data for 2009 are potentially incomplete as they do not include late filers or filers with a late fiscal year end. Our sample covers 30-35% of the 401(k) assets of publicly listed companies that report Form 5500.

[Table I about here.]

In our sample, average plan size is approximately \$324 million (with a median of \$61 million). In 2009, our plans cover around \$400 billion in retirement assets and 9 million total participants. The average account size is \$42,107 and employees contribute \$5,303 per year. The mean (median) percentage of assets invested in employer stock is 17% (10%).

The table also describes information on the structure of the plans. Around 76% of plans have trustees that are affiliated with mutual fund management companies. The sample has 112 distinct mutual fund trustees with, on average, 70 unique mutual fund trustees per year. The remaining plans are trustee'd by commercial banks, consulting companies, individuals, or by the sponsoring company itself. We collectively refer to these other entities as “Non-Mutual Fund Trustees.” Non-mutual fund trustees are generally appointed by smaller plans.

The number of investment options has increased substantially over our sample period. Whereas a typical menu includes only around 7 options in 1998, it includes around 18 options in 2009. The average number of affiliated options has also increased substantially over time.

During our sample period the popularity of open architecture has increased significantly. To illustrate this development we report four metrics: *Trustee Share* represents the average proportion of total plan assets invested in mutual funds offered by the trustee family. The average trustee share amounts to around one-third in our sample.¹³ We also report the

proportion of plans that follow an open architecture by including funds sponsored by more than one mutual fund management company. The proportion of open architecture plans has increased from 65.9% of plans in 1998 to 92.4% in 2009. Additionally, we summarize the average number of management companies that offer at least one fund on the menu and the Herfindahl index of the menu calculated based on the dollar share of each of these management companies. These measures point to a decline in the share of the assets managed by trustee families and an increase in the number of families on the menu. These secular changes in 401(k) plan architecture reflect legal and regulatory pressures to offer a larger and more diversified set of options to participants.

Table II describes the characteristics of mutual funds that are kept on, deleted from, or added to the menu by affiliation. Standard errors of the difference between the mean characteristics of affiliated and unaffiliated funds are clustered at the fund level.¹⁴

[Table II about here.]

Our sample contains 134,789 fund-year observations involving funds that stay on the plan for at least two consecutive years, 18,474 fund deletions, and 29,688 fund additions. On average, each deleted affiliated (unaffiliated) fund accounts for 7.19% (7.60%) of plan assets. About 11.35% (14.57%) of all affiliated (unaffiliated) assets on the menu are deleted each year. By the end of the calendar year, affiliated and unaffiliated funds that are added to the menu during the year represent 14.35% and 20.74% of plan assets, respectively.¹⁵

Overall, funds that are deleted have significantly lower performance than those that are added to or kept on the menus, as measured by their percentile performance among funds of

the same style in the CRSP fund universe using the past three-year returns.

Table II also shows that affiliated funds tend to have lower expense ratios, lower turnover, and lower standard deviations of monthly returns, regardless of whether they are kept, deleted, or added. These differences occur as affiliated funds are more likely to be more basic investment options (such as standard domestic equity funds or passively managed index funds), whereas unaffiliated funds are more likely to be specialized funds (such as international or sector funds). For example, approximately 13% of the affiliated funds in our sample are passively managed index funds compared to 6% of unaffiliated funds. One reason why service providers outsource more specialized funds is that they may not offer these investment options in their own product lineup. Nonetheless, the results in the table may point to a potential benefit of offering affiliated mutual fund options. These explicit benefits may come as a result of increased implicit costs however, as described earlier. We next investigate the costs associated with including affiliated investment options on the menu.

III Menu Changes

Investment allocations in 401(k) accounts are driven by the plan sponsor, the service providers, and plan participants. In a first step, service providers along with the sponsor select the menu of investment options for the plan. In a second step, participants allocate their retirement savings and contributions across these options. To ensure that the plan continuously offers a suitable set of investment choices, 401(k) plans dynamically adjust their menus by deleting some investment options and adding others. In this section, we study these menu altering de-

cisions to test whether mutual funds affiliated with the plan’s trustee are treated preferentially relative to funds from other mutual fund companies.

A Univariate Analysis of Fund Deletions

We first provide univariate analyses to investigate whether the propensity to delete a fund from the menu depends on whether the fund is affiliated with the trustee. In each year, for each fund, we count the number of menus on which the fund is an affiliated fund and the number of menus on which it is an unaffiliated fund, respectively. We then count the number of affiliated and the number of unaffiliated menus from which the fund is delisted during the year. This allows us to determine the deletion rates for each fund in each year by affiliation. To make the comparison between the deletion frequencies of affiliated and unaffiliated funds more meaningful, we group funds into deciles based on past performance. In particular, we compute the percentile performance of each fund among funds of the same style in the CRSP fund universe.

Figure 1 reports mean annual deletion frequencies by trustee affiliation for each performance decile using the prior 36 months to evaluate performance. We construct the figure by first computing the deletion rates of each fund each year in affiliated and unaffiliated plans. We then average these rates within the performance deciles by year. Finally, we average the decile deletion rates across time. Panel A shows these averages using our entire sample. Panel B only includes those funds that contemporaneously appear on multiple 401(k) menus, at least once as an affiliated fund and at least once as an unaffiliated fund. By comparing the

deletion probabilities of the same fund across plans managed by different trustees, our results are not contaminated by different fund characteristics or performance records.¹⁶

[Figure 1 about here.]

The figures show that affiliated funds are less likely to be deleted from a 401(k) plan than unaffiliated funds regardless of past performance. More importantly, the difference in deletion rates widens significantly for poorly-performing funds. For example, funds in the lowest performance decile in Panel A have a probability of deletion of 25.5% for unaffiliated funds and a probability of deletion of only 13.7% for affiliated funds. Indeed the deletion rate of affiliated funds in the lowest performance decile is lower than the deletion rates of affiliated funds in deciles two through four. This is surprising provided that Carhart (1997) documents performance persistence among poorly-performing funds. On the other hand, we find that in the top decile, affiliated funds are almost as likely to be deleted as unaffiliated funds.

Overall, the difference in deletion rates between affiliated and unaffiliated funds is statistically significant for the nine lowest performance deciles. In addition, the difference between affiliated and unaffiliated deletion probabilities in the lowest decile is statistically significantly higher than the corresponding differences in each of the other nine deciles. Panel B shows similar results for the subsample of funds that are simultaneously offered as both affiliated and unaffiliated funds. In this analysis the funds in each decile are identical across the affiliated and unaffiliated groups. Thus, our results are not driven by differences in fund characteristics.

Service providers have an incentive to protect their poorly-performing affiliated funds, as many of these funds are experiencing outflows from other investors. For example, we find that

investor money flows of affiliated funds from their *non-retirement* clients equal -3.5% in decile 1 and 22.8% in decile 10.¹⁷ Fund families, therefore, can reduce the volatility of fund flows by keeping those affiliated funds on the menu that experience poor prior performance. Reducing the volatility of money flows can be beneficial, as documented by Edelen (1999), Coval and Stafford (2007), and Chen, Goldstein, and Jiang (2010).

Finally, the deletion of an affiliated fund does not imply that the number of affiliated funds offered on the menu decreases. Although we do not observe where the assets of deleted funds are transferred, we find that plans often offer new affiliated funds when other affiliated funds are deleted. For example, if a plan deletes one or more affiliated funds, then there is a 95.7% probability that at least one new affiliated fund is added during the same year. On the other hand, if one or more unaffiliated funds are deleted, then there is only a 43.2% probability that at least one other fund is added from the deleted fund’s family.

These univariate results provide evidence that service providers favor their own funds when they adjust the investment menu. Favoritism is particularly pronounced for those funds that experience poor recent performance.

B Binary Choice Models of Fund Deletions

To extend our univariate results in Section A, we examine the performance sensitivity of fund deletions using the following logit model:¹⁸

$$Prob(DEL_{p,f,t} = 1) = \Lambda(AF_{p,f,t-1}\beta_{AF} + \mathbf{R}_{f,t-1}^T\beta_{\mathbf{R}} + AF_{p,f,t-1}\mathbf{R}_{f,t-1}^T\beta_{\mathbf{AF}\times\mathbf{R}} + \mathbf{Z}_{p,f,t-1}^T\beta_{\mathbf{Z}}), \quad (1)$$

where $DEL_{p,f,t}$ is an indicator variable that takes the value of one if mutual fund f is deleted from plan p during year t and zero otherwise, $AF_{p,f,t-1}$ is an indicator variable for whether the trustee of pension plan p is affiliated with the management company of mutual fund f at the end of year $t - 1$, $\mathbf{R}_{f,t-1}$ is a vector that captures piecewise-linear performance segments of fund f over the prior three years, and $\mathbf{Z}_{p,f,t-1}$ is a vector of lagged control variables including indicator variables for calendar years and investment styles. The function $\Lambda(z)$ in the logit model is defined as $\Lambda(z) = \exp(z)/(1 + \exp(z))$ and ranges between 0 and 1. Favoritism toward affiliated funds implies that, all else equal, affiliated funds are less likely to be delisted (i.e., $\beta_{AF} < 0$) and that deletions are less sensitive to prior performance for affiliated funds (i.e., $|\beta_{\mathbf{R}} + \beta_{\mathbf{AF} \times \mathbf{R}}| < |\beta_{\mathbf{R}}|$).

We use three different specifications for the prior performance measure $\mathbf{R}_{f,t-1}$. The first specification ('linear model') relates deletion rates to the performance percentile of funds. Performance percentiles $Perf$ are formed based on the performance of each fund among funds of the same style in the CRSP fund universe and range between zero and one. The second specification ('two-segment model') evaluates deletion sensitivities to prior performance separately for below and above median funds. $LowPerf$ and $HighPerf$ are defined as $LowPerf_{p,f,t-1} = \min(Perf_{p,f,t-1}, 0.5)$ and $HighPerf_{p,f,t-1} = \max(Perf_{p,f,t-1} - 0.5, 0)$. Finally, the third specification ('three-segment model') uses quintile-based performance segments following Sirri and Tufano (1998). The sensitivity of deletions to performance is estimated separately for the lowest performance quintile ($LowPerf_{p,f,t-1} = \min(Perf_{p,f,t-1}, 0.2)$), the middle three performance quintiles ($MidPerf_{p,f,t-1} = \min(\max(Perf_{p,f,t-1} - 0.2, 0), 0.6)$),

and the highest performance quintile ($HighPerf_{p,f,t-1} = \max(Perf_{p,f,t-1} - 0.8, 0)$).

To control for potential redundancies among menu options, which may lead to fund deletions, we add an explanatory variable $MaximumCorr$, which captures the highest pairwise correlation between the returns of each option and those of all other mutual fund investment choices on the menu. The other control variables in $\mathbf{Z}_{p,f,t-1}$ include the natural logarithm of plan assets invested in the fund, the number of options offered on the menu, the expense ratio of the fund, the turnover of the fund, the natural logarithm of the fund's size, fund age, the standard deviation of the fund's return, and unreported indicator variables for calendar years and for specific fund types (e.g., domestic equity, international equity, balanced, bond, target date, index, and money market funds).

Table III reports logit coefficient estimates for the various specifications. Consistent with Figure 1, we find that deletion probabilities differ significantly between affiliated and unaffiliated funds. In all specifications the coefficient estimates of our *Affiliated* dummy are significantly negative at the 1% level. We also find that the performance sensitivity of deletions is generally muted for affiliated funds. To interpret the coefficient estimates, we can compute the odds ratio for deletions between affiliated and unaffiliated funds. The first specification implies that the odds of being deleted for a median-performing affiliated fund are 63% of the corresponding odds for an unaffiliated median-performer. Furthermore, the difference in deletion odds between affiliated and unaffiliated funds widens substantially for poorly-performing funds: The deletion odds for an affiliated fund in the worst (best) performance percentile equal 47% (84%) of the deletion odds for a corresponding unaffiliated fund. These odds ratios

are statistically significantly different from each other and also statistically significantly lower than 100%.¹⁹

[Table III about here.]

An alternative way to illustrate the differential sensitivity of deletions to prior performance for affiliated and unaffiliated funds can be obtained by comparing the deletion odds of the worst- and the best-performing funds. For example, the odds of being deleted for a worst-performing affiliated fund ($Perf = 0$) are 2.89 times larger than that for a best-performing affiliated fund ($Perf = 1$). In contrast, the odds of being deleted differ by a factor of 5.16 between the worst- and the best-performing unaffiliated funds.²⁰ Thus, deletion rates are more sensitive to performance for unaffiliated than for affiliated funds. These differences in the performance sensitivities are also statistically significant, as captured by the interaction coefficients in Table III. The results from the two- and three-segment performance specifications are consistent with the linear specifications. The impact of performance on deletion probabilities is significantly lower for affiliated funds.

The additional control variables indicate that funds with returns that are more correlated with those of other options on the menu are more likely to be deleted. Thus, the incumbent ensemble of the funds on the menu matters in deletion decisions. Additionally, funds with large plan investments are less likely to be deleted and plans with more investment options are less likely to delete a specific fund. Plan providers are also more likely to delete funds with high expense ratios, funds with high turnover, and smaller funds.

Overall, our baseline results indicate that affiliated funds are significantly less likely to be

deleted from 401(k) plans than unaffiliated funds and that this bias is particularly pronounced for poorly-performing funds. As we discuss in Section A above, protecting poorly-performing affiliated funds may be especially important as keeping these funds on the menu dampens the outflow of capital triggered by poor performance and, as a result, mitigates distress.

C Subsample Analysis of Fund Deletions

To analyze whether the incentives for fund deletions differ across different types of plans and across time, Table IV shows the results of our logit model specified in equation (1) for various subsamples.

[Table IV about here.]

To test whether our results are affected by economies of scale in plan management, we re-estimate our model in columns 1 and 2 for below- and above-median sized plans, respectively. Sponsors with large 401(k) plans may have more negotiating power with service providers and may also monitor service providers more effectively. The results reveal that the odds of being deleted are significantly higher for unaffiliated funds across both groups of trustees. Moreover, while the coefficient estimates of the interaction between *LowPerf* and *Affiliated* are indeed less economically and statistically significant for large plans, the difference in the estimates is not statically significant, as indicated in the third column.

In the next three columns, we compare the results for the three largest trustees and for all other trustees. The three largest trustees in our sample each manage over 10% of all 401(k) mutual fund assets. Large service providers have more in-house investment options

and may have more bargaining power relative to small service providers. We find that the coefficient estimates on *Affiliated* are negative and statistically significant across both groups of trustees indicating that the odds of being deleted are significantly higher for unaffiliated funds. Additionally, the coefficients of the interaction between *LowPerf* and *Affiliated* are positive for both groups, but only statistically significant for smaller trustees.

The Pension Protection Act of 2006 (PPA) introduced comprehensive new legislation to protect U.S. retirement plan participants. Although the reforms mainly concerned defined benefit plans, the PPA also affected DC plans by allowing companies to offer objective investment advice to participants and by requiring plans to provide specific benefit statements to participants.²¹ Furthermore, several class action lawsuits were filed in the mid 2000s against large employers for breaches of fiduciary obligations with respect to their 401(k) accounts.²² To investigate whether these lawsuits and regulatory reforms affect our results, we divide our sample into two subperiods (1998 to 2006 and 2007 to 2009). The last three columns of Table IV indicate that the type of favoritism has changed over the time. Whereas service providers strongly favor their own funds across all performance groups in the first subsample, they favor only poorly-performing funds in the second subsample.²³

We provide additional robustness analyses on fund deletions in Table IA-V in the Internet Appendix. For example, we show that the results are qualitatively unaffected if we include indicator variables for individual trustees or for individual funds. Furthermore, the results are also robust if we focus only on plans with mutual fund trustees or if we delete target-date funds or plan-years in which a trustee change occurs.

D Univariate Analysis of Fund Additions

The previous sections provide evidence that trustees are substantially less likely to delete their own funds from the menus, and even more so when these funds are poorly-performing. In this section we examine whether similar biases exist for fund additions as well.

To investigate how a fund's propensity to be added to a menu depends on its affiliation with the trustee, we determine the addition frequency of each fund in the CRSP fund universe as an affiliated and unaffiliated menu choice, respectively. Consistent with our deletion frequency measures in Section A, we define the affiliated addition frequency of a fund as the number of affiliated plans to which the fund is added as a new investment option during the year divided by the total number of affiliated menus to which it could be added (i.e., the number of affiliated plans in which the fund is not already offered as an option at the end of the previous year). Unaffiliated addition frequencies are defined analogously.

Figure 2 displays average addition frequencies by affiliation and performance. Panel A summarizes the results using all existing mutual funds in the CRSP fund universe, whereas the average frequencies in Panel B are based on funds from only those families that act as trustees for at least one of our 401(k) plans during the year. Since addition rates differ substantially across affiliated and unaffiliated funds, we include separate axes for the affiliated and unaffiliated addition rates.

[Figure 2 about here.]

We find that the difference between the addition frequencies of affiliated and unaffiliated funds is large. For example, the average addition frequencies across the deciles are 1.33%

for affiliated funds and just 0.02% for unaffiliated funds. Though the difference between the groups is stark, it is difficult to assess the magnitude of favoritism for additions from these statistics alone. This is because when calculating these addition frequencies we implicitly assume that plan sponsors and trustees consider every fund in the CRSP universe when selecting new choices for their menus.²⁴ Therefore, it is more meaningful to focus instead on relative, rather than absolute, differences in the treatment of affiliated and unaffiliated funds on the menu. Importantly, for this reason, our main tests of favoritism concern comparing performance sensitivities rather than unconditional addition frequencies.

Figure 2 shows that while addition probabilities increase with performance for both groups, they increase disproportionately more for unaffiliated funds than for affiliated funds, indicating that unaffiliated additions are more sensitive to performance. An improvement in performance from the lowest to the highest decile increases the addition probability for unaffiliated funds approximately nine-fold from 0.005% to 0.044%. At the same time, an equivalent improvement in performance for affiliated funds results in only a three times larger addition rate (from 0.747% to 2.255%).

E Binary Choice Models of Fund Additions

In this section we extend the univariate results and investigate relative differences in the performance sensitivities of affiliated and unaffiliated fund additions by estimating logit models

that are analogous to those we use to analyze fund deletions in Sections B and C above:

$$Prob(ADD_{p,f,t} = 1) = \Lambda(AF_{p,f,t-1}\beta_{AF} + \mathbf{R}_{f,t-1}^T\beta_{\mathbf{R}} + AF_{p,f,t-1}\mathbf{R}_{f,t-1}^T\beta_{\mathbf{AF}\times\mathbf{R}} + \mathbf{Z}_{p,f,t-1}^T\beta_{\mathbf{Z}}), \quad (2)$$

where $ADD_{p,f,t}$ is one if fund f is added to plan p at time t and zero otherwise. We include the same controls in $\mathbf{Z}_{p,f,t-1}$ as in equation (1) with the exception that one of the variables – the natural logarithm of plan assets invested in the fund – is not defined for additions. As before, we estimate a linear, a two-segment, and a three-segment model. Since we take each fund in the CRSP fund universe at each time t and ask whether it is added to each existing plan p , the sample for estimating equation (2) includes over 60 million observations.

The logit framework is especially helpful for the analysis of additions as the addition rates of affiliated funds are orders-of-magnitude higher than those of unaffiliated funds, as discussed above. Due to the large difference in baseline probabilities, estimated marginal effects (which measure absolute effects) are not suitable for comparing the performance sensitivities of additions across affiliated and unaffiliated funds. In contrast, odds ratios provide more meaningful comparisons as these are ratios of scaled probabilities: by construction, scaling takes away the level effect and allows us to focus on the conditional results (relative effects).

Table V reports logit coefficient estimates for the linear performance model, our baseline two-segment, and the Sirri and Tufano (1998) three-segment specifications, respectively. Each model is estimated with and without the additional controls captured by $\mathbf{Z}_{p,f,t-1}$. Consistent with Figure 2 the results in the table indicate that affiliated funds are significantly more likely

to be added to 401(k) menus. In all specifications the coefficient estimates of our *Affiliated* dummy variable are positive and significant at the 1% level. In addition, performance sensitivities are significantly smaller for affiliated funds. For example, column 1 suggests that the addition odds for the best-performing affiliated funds are 3.4 times ($\exp(1.99 - 0.78)$) higher than the addition odds for the worst-performing affiliated funds, whereas the addition odds for the best-performing unaffiliated funds are 7.3 times ($\exp(1.99)$) higher than the addition odds for the worst-performing unaffiliated funds. Thus, unaffiliated funds do not just have statistically significantly lower addition rates, they also have addition rates that are statistically significantly more sensitive to performance.²⁵

[Table V about here.]

Table VI shows our estimates for the subsamples outlined in Section C. We find that the odds of being added to a 401(k) plan are significantly higher for affiliated funds for each subgroup. We also find that the performance sensitivity of affiliated funds is lower than that of unaffiliated funds among below-median performers, however not statistically significantly so for larger plans and after 2006.

Finally, it may be surprising that while affiliated funds have higher addition and lower deletion rates, we do not see a substantial increase in the representation of affiliated funds in 401(k) plans during our sample period. However, the proportion of affiliated funds will not increase if the growth rate of unaffiliated options exceeds that of affiliated options. Further, this latter condition is satisfied when the set of potential unaffiliated candidates is sufficiently larger than that of affiliated candidates, which is indeed the case in our sample: the set of

potential addition candidates contains on average 82 affiliated and 8,094 unaffiliated funds. Favoritism toward affiliated funds, therefore, coexists with secular changes in plan architecture including a proliferation of investment options from a more diverse set of fund providers.

[Table VI about here.]

Overall, our results for both deletion and addition decisions provide evidence that trustees treat their own affiliated funds differently than unaffiliated funds. Affiliated funds are more likely to be added and are less likely to be deleted from a plan. More importantly, fund additions and deletions are less sensitive to prior performance for affiliated than for unaffiliated funds.

IV Participant Flows

While the investment opportunity set of the plan is determined by the menu selected by the employer and the service providers, participants can freely allocate their contributions within the opportunity set. They could offset favoritism in their own portfolios by, for instance, not allocating capital to poorly-performing affiliated funds. In this section, we investigate whether menu favoritism has an impact on the overall allocation of plan assets by examining the sensitivity of participant flows to the performance of affiliated and unaffiliated funds.

Our primary definition of the growth rate of new money of fund f held in 401(k) plan p

at time t is based on the following measure of fund flows:

$$NMG1_{p,f,t} = \frac{V_{p,f,t} - V_{p,f,t-1}(1 + R_{f,t})}{V_{p,f,t-1}(1 + R_{f,t})}. \quad (3)$$

The numerator captures the dollar change in the value of participants' investments ($V_{p,f,t}$) in fund f in plan p in year t after adjusting for the appreciation of plan assets $R_{f,t}$ (fund return) during the year. The denominator is defined as the projected value of the lagged plan position in the fund without any new flow of money. If an investment option is deleted from a menu, then $NMG1$ equals -100%. We winsorize $NMG1$ at the 95% level.

Since equation (3) is not defined for fund additions, we adopt two alternative measures for the growth rate of new money. Our second measure ($NMG2$) normalizes fund flows by the sum of beginning- and end-of-period assets:

$$NMG2_{p,f,t} = \frac{V_{p,f,t} - V_{p,f,t-1}(1 + R_{f,t})}{V_{p,f,t} + V_{p,f,t-1}(1 + R_{f,t})}. \quad (4)$$

Under this definition, new money growth takes a value in the interval $[-1,1]$. In particular, it equals -100% for deletions, as before, and +100% for a fund that is newly added to the employee benefit plan. More gradual inflows and outflows (i.e., participant flows) into the fund are represented by intermediate values.

Finally, the denominator of our third measure ($NMG3$) is based on overall plan value at

$t - 1$ adjusted for fund returns. To remove outliers, we winsorize $NMG3$ at the 95% level:

$$NMG3_{p,f,t} = \frac{V_{p,f,t} - V_{p,f,t-1}(1 + R_{f,t})}{\sum_f V_{p,f,t-1}(1 + R_{f,t})}. \quad (5)$$

These three definitions of new money growth allow us to decompose fund flows to menu options into components that are primarily driven by plan providers (i.e., flows due to fund additions and deletions) and components that are primarily driven by plan participants (i.e., all changes which are not driven by fund additions and deletions).²⁶

To investigate the sensitivity of fund flows to prior performance, we estimate the following regression using the three alternative definitions of NMG :

$$\begin{aligned} NMG_{p,f,t} = & AF_{p,f,t-1}\beta_{AF} + \mathbf{R}_{f,t-1}^T\beta_{\mathbf{R}} + AF_{p,f,t-1}\mathbf{R}_{f,t-1}^T\beta_{\mathbf{AF}\times\mathbf{R}} \\ & + \mathbf{Z}_{p,f,t-1}^T\beta_{\mathbf{Z}} + \epsilon_{p,f,t}. \end{aligned} \quad (6)$$

Equation (6) is analogous to our two-segment specification in the previous sections with two exceptions. First, our new dependent variable is NMG , a continuous variable under all three definitions. Second, if participants use the same allocation rule each year, growth occurs mechanically due to the additional money contributed to the accounts over time. To capture this mechanical feature of flows, we add contemporaneous plan growth based on Form 5500 as an additional control variable.

The results are summarized in Table VII. The first three columns show estimates for our full sample of NMG values. The full sample includes observations that capture menu changes

as well as observations that reflect more gradual inflows and outflows by plan participants. The last three columns report estimates for participant flows based on a subsample that excludes *NMG* observations that reflect fund additions and deletions.

[Table VII about here.]

The results in columns 1–3 using the full sample are consistent with the results from Section III. Affiliated funds attract more new money than unaffiliated funds. We find that flows into various plan options increase with prior fund performance, consistent with Chevalier and Ellison (1997), Sirri and Tufano (1998), and Huang, Wei, and Yan (2007). The interaction effects indicate that flows are significantly less sensitive to poor performance for affiliated funds. For example, a ten percentage point increase in the past performance percentile of below-median funds increases flows by 5.5% for unaffiliated funds and by only 0.8% for affiliated funds in column 1. The additional controls indicate that the growth rates are larger for plans with higher growth rates, for funds that exhibit low return correlations with other menu options, for smaller options, for funds with lower expense ratios and turnovers, and for larger funds.

To investigate the importance of participant flows, we restrict our attention to the money flows of options that are not driven by deletions or additions in the last three columns of Table VII. We find that participant flows are generally higher for affiliated funds, although the coefficient estimates are smaller than the corresponding estimates in the first three columns of the table. Thus, the higher overall flows to affiliated funds in columns 1–3 are primarily driven by the decisions of plan sponsors and service providers.

The coefficients on the two performance ranking segments indicate that participants chase prior fund performance. Comparing the coefficients in columns 4–6 to those in columns 1–3 reveals that most of the inflows into above-median performers are due to plan participants, whereas most of the outflows out of below-median performers are due to decisions by sponsors and service providers. The interaction effects between the affiliation dummy and the two performance segments indicate that plan participants do not offset the biased decisions of plan sponsors and trustees: if anything, they are also somewhat less sensitive to the performance of poorly-performing affiliated funds. These results are consistent with previous studies documenting that DC pension participants are naive and inactive (Benartzi and Thaler, 2001; Madrian and Shea, 2001; Agnew, Balduzzi, and Sunden, 2003; Sialm, Starks, and Zhang, 2015).

Our results show that decisions of plan sponsors and service providers have a substantial impact on flows to mutual funds. Affiliated mutual funds can benefit by obtaining higher money flows and by avoiding large outflows from their poorly-performing funds.

V Future Performance

Our previous results provide evidence that 401(k) plans are less likely to delete affiliated funds from their menus and that deletions of affiliated funds are less sensitive to prior fund performance. We also document a similar behavior for fund additions. Finally, we show that participants do not direct flows away from the biased options offered by the trustee.

Still, favoritism toward affiliated funds may not hurt plan participants if the underperform-

ing affiliated funds exhibit superior subsequent performance. Indeed service providers may keep poor performers not because they are biased toward them, but rather, due to positive information they possess about the future returns of their own funds.

To investigate this hypothesis, we examine the performance of affiliated and unaffiliated funds that are kept in, deleted from, or added to the plans using monthly fund returns. We restrict our sample to domestic equity funds in these analyses, since it is difficult to compare performance across different asset classes. At the end of each calendar year, we form equal-weighted portfolios of affiliated and unaffiliated funds separately based on whether the funds are kept, deleted, or added (“No Changes,” “Deletions,” and “Additions”) during the year.²⁷ This creates six portfolios (“All Funds”). We then further subdivide these six groups based on past performance, using performance percentiles based on the prior three years. For example, “Affiliated Funds/Deletions/Lowest Decile” represents the portfolio of affiliated funds in the worst performance decile that are deleted from a menu. We rebalance our portfolios at the end of each calendar year and calculate the portfolios’ return for each of the next 12 months keeping the portfolio composition fixed.

Table VIII reports the abnormal returns of the various portfolios. Panels A, B, and C report the Carhart (1997) alphas, the Fama and French (1993) alphas, and the CAPM alphas, respectively. The future Carhart alpha for affiliated funds kept for at least two consecutive periods in the 401(k) plan is essentially zero basis point (bps) per month. Similarly, the corresponding alpha for unaffiliated funds is insignificantly different from zero at -6 bps per month. Consistent with the evidence on defined benefit plans provided by Goyal and Wahal

(2008), we do not find that added funds on average perform significantly better than deleted funds. However, we find that affiliated funds that are kept in the 401(k) plans by their sponsors despite their poor performance exhibit significantly negative Carhart and Fama-French alphas. For example, affiliated funds ranked in the lowest performance decile over the prior three years exhibit a Carhart alpha of -0.33% per month. This represents a risk- and style-adjusted underperformance of 3.96% per year. The performance difference between affiliated and unaffiliated funds ranked in the lowest performance decile of 0.25% per month is also statistically significant at the 5% level. On the other hand, the results are less pronounced using CAPM alphas, which do not adjust for style effects, but the difference in performance between poorly-performing affiliated and unaffiliated funds that are retained on the plans is similarly large.

[Table VIII about here.]

Our results in Table VIII confirm that the decision to retain poorly-performing affiliated funds is not driven by information about the future performance of these funds. Instead, consistent with Carhart (1997), poor performance persists, even after adjusting for momentum factors. Overall, those plan participants who invest in these affiliated funds would have obtained a higher risk-adjusted performance had they switched their retirement savings from underperforming affiliated funds to other funds.

VI Conclusion

While service providers of 401(k) plans are expected to act in the best interest of participants, they also have a competing incentive to attract and retain retirement contributions in their own proprietary funds. Despite the increasing role of 401(k) plans as a retirement vehicle, little is known about how provider incentives influence the set of investment choices offered in the plans. This is surprising as small inefficiencies in the selection of investment options, especially early in the participants' career, can have a significant impact on retirement savings outcomes.

Our paper takes a first step to investigate this question. We document significant favoritism in 401(k) menu decisions. We show that affiliated mutual funds are less likely to be removed from a 401(k) menu and that the sensitivity of fund deletions to prior performance is less pronounced for funds affiliated with the plan's service providers. Similarly, fund additions are also less sensitive to prior performance for affiliated than for unaffiliated funds.

Interestingly, mutual fund affiliation does not affect how participants allocate their contributions, suggesting that participants do not offset these biases. We also show that the reluctance to remove poorly-performing affiliated funds from the menu generates a significant subsequent negative abnormal return for participants investing in those funds.

In sum, our paper provides a first look at service providers in the 401(k) industry and their effect on plan design. Future research should explore and contrast additional costs and benefits of the various administrative arrangements of 401(k) plans.

References

- Agnew, Julie, Pierluigi Balduzzi, and Annika Sunden, 2003, Portfolio choice and trading in a large 401(k) plan, *American Economic Review* 93, 193–215.
- Benartzi, Shlomo, and Richard H. Thaler, 2001, Naive diversification strategies in defined contribution saving plans, *American Economic Review* 91, 79–98.
- Bergstresser, Daniel, John Chalmers, and Peter Tufano, 2009, Assessing the costs and benefits of brokers in the mutual fund industry, *Review of Financial Studies* 22, 4129–4156.
- Bhattacharya, Utpal, Jung Hoon Lee, and Veronika K. Pool, 2013, Conflicting family values in mutual fund families, *Journal of Finance* 68, 173–200.
- Brown, Jeffrey R., Nellie Liang, and Scott Weisbenner, 2007, Individual account investment options and portfolio choice: Behavioral lessons from 401(k) plans, *Journal of Public Economics* 91, 1992–2013.
- Carhart, Mark M., 1997, On the persistence of mutual fund performance, *Journal of Finance* 52, 57–82.
- Carroll, Gabriel D., James J. Choi, David Laibson, Brigitte C. Madrian, and Andrew Metrick, 2009, Optimal defaults and active decisions, *Quarterly Journal of Economics* 124, 1639–1674.
- Chalmers, John, and Jonathan Reuter, 2015, is conflicted investment advice better than no advice?, Working Paper.
- Chen, Qi, Itay Goldstein, and Wei Jiang, 2010, Payoff complementarities and financial fragility: Evidence from mutual fund outflows, *Journal of Financial Economics* 97, 239–262.
- Chevalier, Judith A., and Glenn D. Ellison, 1997, Risk taking in mutual funds as a response to incentives, *Journal of Political Economy* 105, 1167–1200.
- Choi, James J., David Laibson, Brigitte C. Madrian, and Andrew Metrick, 2002, Defined contribution pensions: Plan rules, participant decisions, and the path of least resistance, in James M. Poterba, ed., *Tax Policy and the Economy*, 67–113 (MIT Press, Cambridge, MA).
- Choi, James J., David Laibson, Brigitte C. Madrian, and Andrew Metrick, 2004, For better or for worse. Default effects and 401(k) savings behavior, in David A. Wise, ed., *Perspectives on the Economics of Aging*, 81–121 (University of Chicago Press, Chicago, IL).
- Christoffersen, Susan, Richard Evans, and David K Musto, 2013, What do consumers’ fund flows maximize? Evidence from their brokers’ incentives, *Journal of Finance* 68, 201–235.
- Cohen, Lauren, and Breno Schmidt, 2009, Attracting flows by attracting big clients, *Journal of Finance* 64, 2125–2151.
- Coval, Joshua, and Erik Stafford, 2007, Asset fire sales (and purchases) in equity markets, *Journal of Financial Economics* 86, 479–512.
- Davis, Gerald F., and E. Han Kim, 2007, Business ties and proxy voting by mutual funds, *Journal of Financial Economics* 85, 552–570.

- Del Guercio, Diane, and Jonathan Reuter, 2014, Mutual fund performance and the incentive to generate alpha, *Journal of Finance* 69, 1673–1704.
- Dvorak, Tomas, 2015, Do 401k plan advisors take their own advice?, *Journal of Pension Economics and Finance* 14, 55–75.
- Edelen, Roger M., 1999, Investor flows and the assessed performance of open-end fund managers, *Journal of Financial Economics* 53, 439–466.
- Elton, Edwin J., Martin J. Gruber, and Christopher R. Blake, 2006, The adequacy of investment choices offered by 401(k) plans, *Journal of Public Economics* 90, 1299–1314.
- Elton, Edwin J., Martin J. Gruber, and Christopher R. Blake, 2007, Participant reaction and the performance of funds offered by 401(k) plans, *Journal of Financial Intermediation* 16, 249–271.
- Fama, Eugene F., and Kenneth R. French, 1993, Common risk factors in the returns on stocks and bonds, *Journal of Financial Economics* 33, 3–56.
- Gaspar, Jose Miguel, Massimo Massa, and Pedro Matos, 2006, Favoritism in mutual fund families? Evidence on strategic cross-fund subsidization, *Journal of Finance* 61, 73–104.
- Goldreich, David, and Hanna Halaburda, 2013, When smaller plans are better: Variability in menu-setting ability, *Management Science* 59, 2518–2535.
- Goyal, Amit, and Sunil Wahal, 2008, The selection and termination of investment management firms by plan sponsors, *Journal of Finance* 63, 1805–1847.
- Huang, Jennifer, Kelsey D. Wei, and Hong Yan, 2007, Participation costs and the sensitivity of fund flows to past performance, *Journal of Finance* 62, 1273–1311.
- Huberman, Gur, and Wei Jiang, 2006, Offering versus choice in 401(k) plans: Equity exposure and number of funds, *Journal of Finance* 61, 763–801.
- Kuhnen, Camelia M., 2009, Business networks, corporate governance, and contracting in the mutual fund industry, *Journal of Finance* 64, 2185–2220.
- Madrian, Brigitte C., and Dennis F. Shea, 2001, The power of suggestion: Inertia in 401(k) participation and savings behavior, *Quarterly Journal of Economics* 116, 1149–1187.
- Mitchell, Olivia S., and Stephen Utkus, 2012, Target-date funds in 401(k) retirement plans, Working Paper.
- Muir, Dana M., 2013, Choice architecture and the locus of fiduciary obligation in defined contribution plans, *Iowa Law Review* 99, 1–55.
- Reuter, Jonathan, 2006, Are IPO allocations for sale? Evidence from mutual funds, *Journal of Finance* 61, 2289–2324.
- Ruiz-Zaiko, Linda, and Barbara Williams, 2007, Plan sponsors besieged by 401(k) fee lawsuits, Pensions & Benefits Management Bridgebay Financial.
- Sialm, Clemens, Laura T. Starks, and Hanjiang Zhang, 2015, Defined contribution pension plans: Sticky or discerning money?, *Journal of Finance* 70, 805–838.
- Sirri, Erik R., and Peter Tufano, 1998, Costly search and mutual fund flows, *Journal of Finance* 53, 1598–1622.

Tang, Ning, Olivia S. Mitchell, Gary R. Mottola, and Stephen P. Utkus, 2010, The efficiency of sponsor and participant portfolio choices in 401(k) plans, *Journal of Public Economics* 94, 1073–1085.

Notes

¹See the 2015 Investment Company Fact Book (http://www.ici.org/pdf/2015_factbook.pdf), p. 141.

²See the U.S. Government Accountability Office (2011) report on “Improved Regulation Could Better Protect Participants from Conflicts of Interest” (<http://www.gao.gov/assets/320/315363.pdf>).

³The structure of DC pension plans is analyzed additionally by Choi et al. (2002, 2004), Huberman and Jiang (2006), Elton, Gruber, and Blake (2006, 2007), Brown, Liang, and Weisbenner (2007), Carroll et al. (2009), Tang et al. (2010), Goldreich and Halaburda (2013), and Dvorak (2015).

⁴Additionally, Reuter (2006) shows that lead underwriters use allocations of underpriced IPOs to reward those institutions with which they have strong business relationships. Kuhnen (2009) finds that fund directors and advisory firms that manage the funds hire each other preferentially based on the intensity of their past interactions. Bhattacharya, Lee, and Pool (2013) find that affiliated funds of mutual funds cross-subsidize those funds in their complex that experience liquidity shortfalls.

⁵In this paper we use the term “service provider” to refer to those entities that provide various services to 401(k) plans. Over 90% of the mutual fund trustees in our sample are also recordkeepers of the same plan. A description of the services provided is available at: <http://www.ici.org/pdf/per19-04.pdf>.

⁶The U.S. Government Accountability Office (GAO) (2011) documents “revenue-sharing payments from hundreds of share classes of different investment funds that ranged from 5 to 125 basis points” (pages 16-17) (<http://www.gao.gov/assets/670/664391.pdf>).

⁷Bergstresser, Chalmers, and Tufano (2009), Christoffersen, Evans, and Musto (2013), Del Guercio and Reuter (2014), and Chalmers and Reuter (2015) discuss biases of advisers and brokers of mutual funds.

⁸The GAO (2013) report states that “the opportunity for service providers to sell participants their own

retail investment products and services, such as IRAs, may create an incentive for service providers to steer participants toward the purchase of such products and services even when they may not serve their participants' best interests" (page 22).

⁹See, www.ici.org/pdf/rpt_11_dc_401k_fee_study.pdf.

¹⁰ERISA rules are given in <http://www.law.cornell.edu/uscode>, which we cite following Muir (2013). The U.S. Department of Labor's Employee Benefits Services Administration website includes additional information on fiduciary obligations in DC plans (<http://www.dol.gov>).

¹¹See Ruiz-Zaiko and Williams (2007) on the effect of growing litigation uncertainty in the industry.

¹²When a company sponsors plans with identical menus, we retain only the largest plan in order to preserve the time series continuity required when defining deletions and additions.

¹³This is the unconditional average, which includes all plans regardless of trustee type. The average trustee share is 62.4% when we condition on plans that include at least one affiliated option.

¹⁴We include plan years in which a trustee change occurs in our sample and in the analyses reported in the paper. Our results are robust to excluding these plan years, as shown in Table IA-V in the Internet Appendix.

¹⁵Simultaneous deletions and additions are fairly common. In our sample, in 40.5% of the plan years the menu does not change, in 6.1% (17.1%) of the plan years we see fund exits (entries) but no entries (exits), and in the remaining 36.3% of the cases both entries and exits occur simultaneously.

¹⁶Table IA-I in the Internet Appendix tabulates the corresponding deletion frequencies for affiliated and unaffiliated funds, as well as tests the difference between them. In addition to the three-year performance evaluation horizon depicted in Figure 1, it also reports results for performance ranks based on prior one and five years.

¹⁷We compute investor money flows for DC and non-DC investors following Sialm, Starks, and Zhang

(2015) using information collected from surveys conducted by *Pensions & Investments*. Money flow by non-DC investors is computed as $[NonDCAssets_{f,t} - NonDCAssets_{f,t-1} \times (1 + R_{f,t})] / [NonDCAssets_{f,t-1} \times (1 + R_{f,t})]$, where $R_{f,t}$ is the return of fund f in year t and $NonDCAssets_{f,t}$ represents assets under management from the fund's non-DC clients. We winsorize these money flows at the 95% level.

¹⁸Our results on fund deletions are not qualitatively affected if we use a linear probability model instead of a logit model, as shown in the Internet Appendix.

¹⁹In the linear performance model, the odds of being deleted for a fund are $odds = p/(1-p) = \exp(\beta_{AF}AF + \beta_R Perf + \beta_{AF \times R} AF \times Perf + \mathbf{Z}_{\mathbf{p},f,t-1}^T \beta_{\mathbf{Z}})$, where p denotes the probability of deletion. The odds ratio between affiliated and unaffiliated funds with identical control variables \mathbf{Z} equals $OR = \exp(\beta_{AF} + \beta_R Perf + \beta_{AF \times R} Perf + \mathbf{Z}_{\mathbf{p},f,t-1}^T \beta_{\mathbf{Z}}) / \exp(\beta_R Perf + \mathbf{Z}_{\mathbf{p},f,t-1}^T \beta_{\mathbf{Z}}) = \exp(\beta_{AF} + \beta_{AF \times R} Perf)$. Thus, the odds ratio between affiliated and unaffiliated funds equals $\exp(\beta_{AF}) = \exp(-0.76) = 0.47$ for funds with $Perf = 0$, $\exp(\beta_{AF} + \beta_{AF \times R} \times 0.5) = \exp(-0.76 + 0.58 \times 0.5) = 0.63$ for funds with $Perf = 0.5$, and $\exp(\beta_{AF} + \beta_{AF \times R} \times 1) = \exp(-0.76 + 0.58) = 0.84$ for funds with $Perf = 1$. Figure IA-1 in the Internet Appendix summarizes the fitted deletion probabilities of the models at different performance levels. We calculate these predicted values by evaluating the probabilities at the means of the control variables.

²⁰The odds ratio between a worst-performing fund ($Perf = 0$) and a best-performing fund ($Perf = 1$) with identical control variables \mathbf{Z} equals $OR = \exp(\beta_{AF} + \mathbf{Z}_{\mathbf{p},f,t-1}^T \beta_{\mathbf{Z}}) / \exp(\beta_{AF} + \beta_R + \beta_{AF \times R} + \mathbf{Z}_{\mathbf{p},f,t-1}^T \beta_{\mathbf{Z}}) = 1 / \exp(\beta_R + \beta_{AF \times R}) = 1 / \exp(-1.64 + 0.58) = 2.89$ for affiliated funds and $OR = \exp(\mathbf{Z}_{\mathbf{p},f,t-1}^T \beta_{\mathbf{Z}}) / \exp(\beta_R + \mathbf{Z}_{\mathbf{p},f,t-1}^T \beta_{\mathbf{Z}}) = 1 / \exp(\beta_R) = 1 / \exp(-1.64) = 5.16$ for unaffiliated funds.

²¹Details on the PPA can be obtained from <http://www.dol.gov/ebsa/pensionreform.html>.

²²See Ruiz-Zaiko and Williams (2007) for additional information on the lawsuits.

²³The odds ratio for deletions between affiliated and unaffiliated funds is 48% (52%) during 1998 to 2006 (2007 to 2009) for the worst-performing funds ($LowPerf = 0$ and $HighPerf = 0$). The corresponding odds

ratios equal 54% in 1998 to 2006 and 91% in 2007 to 2009 for median-performing funds ($LowPerf = 0.5$ and $HighPerf = 0$). Finally, the odds ratios for deletions between affiliated and unaffiliated are 50% in 1998 to 2006 and 94% in 2007 to 2009 for the best-performing funds ($LowPerf = 0.5$ and $HighPerf = 0.5$).

²⁴The difference in addition frequencies is similarly stark when we limit our analysis to only those investment styles in the CRSP universe that appear on 401(k) menus in our sample.

²⁵Figure IA-2 in the Internet Appendix displays predicted probabilities from our logit model for fund additions based on Table V. We calculate these predicted probabilities by evaluating them at the means of the various control variables.

²⁶Plan sponsors and service providers may not only affect flows through addition and deletion decisions. For example, the selection of default options, the freezing of existing options, and the promotion of specific investments during online or face-to-face educational activities are additional actions that affect money flows. Unfortunately, we do not observe these decisions. However, despite our narrow definition of menu changes initiated by plan sponsors and service providers (based on flows due to additions and deletions), we find that plan sponsors and providers account for most of the variability of fund flows, as documented in Table VII. Sialm, Starks, and Zhang (2015) decompose the aggregate mutual fund flows in DC accounts into flows driven by menu changes and flows driven by participant changes.

²⁷To avoid any look-ahead biases, we do not include those plans in these analyses that have fiscal years ending before July of the calendar year.

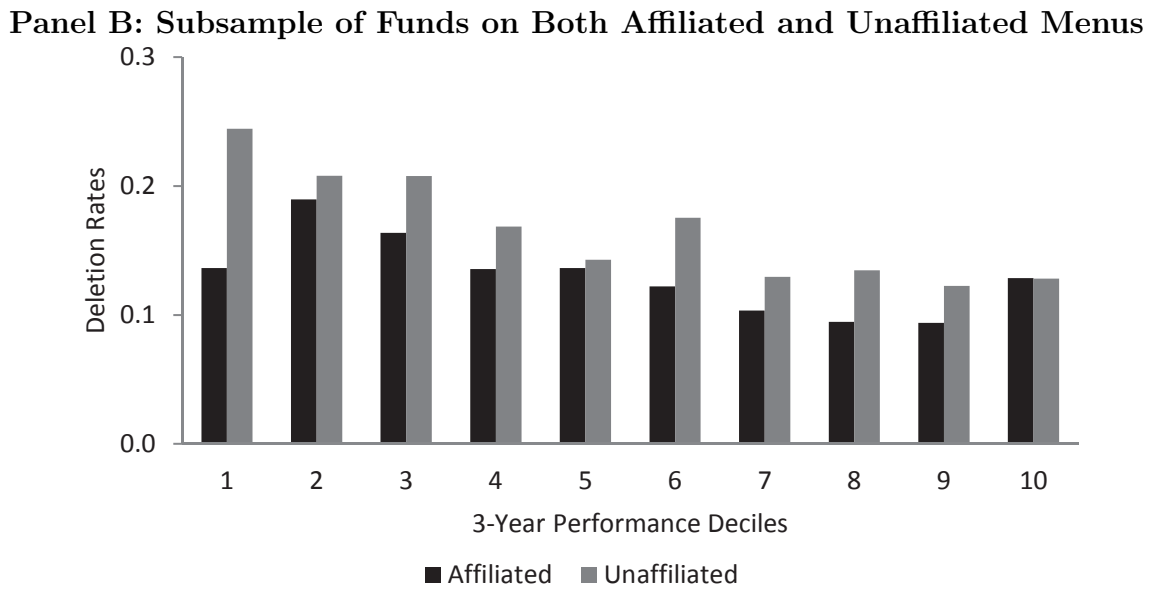
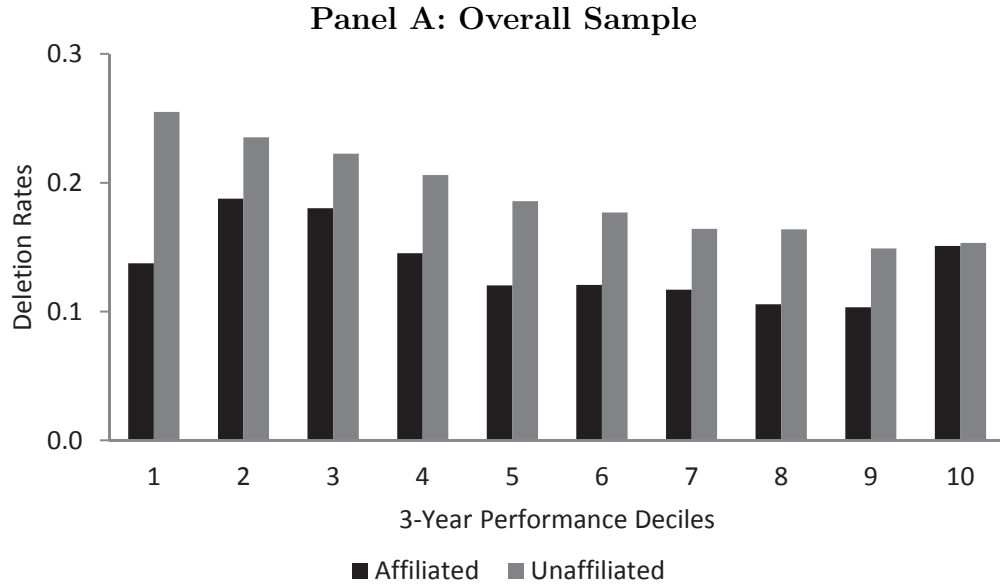
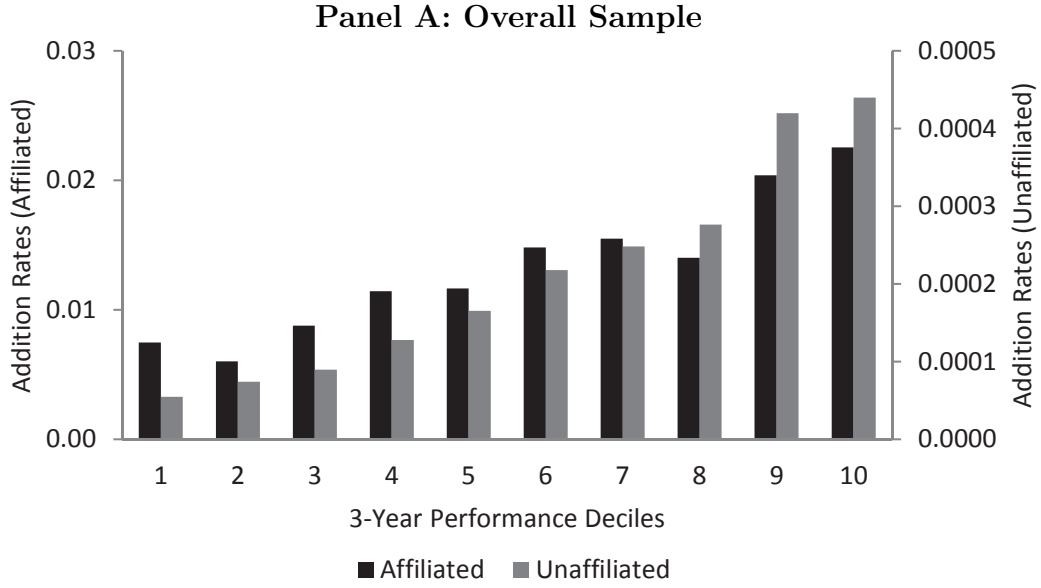


Figure 1: Fund Deletions by Affiliation.

The figure depicts mean annual fund deletion frequencies by trustee affiliation and performance deciles. Panel A includes the full sample. Panel B includes the subsample of funds that contemporaneously appear on multiple 401(k) menus, at least once as an affiliated fund and at least once as an unaffiliated fund. Every year, we calculate the ratio of the number of affiliated (unaffiliated) menus from which the fund is delisted during the year to the total number of affiliated (unaffiliated) menus associated with the fund. Performance deciles are created by grouping funds based on their percentile performance among funds of the same style in the CRSP fund universe over the prior three years. We then average across the funds' deletion frequencies by performance and affiliation. Table IA-I in the Internet Appendix tabulates the corresponding values and also shows the difference in the mean deletion rates.



Panel B: Subsample of Funds With Both Affiliated and Unaffiliated Menus

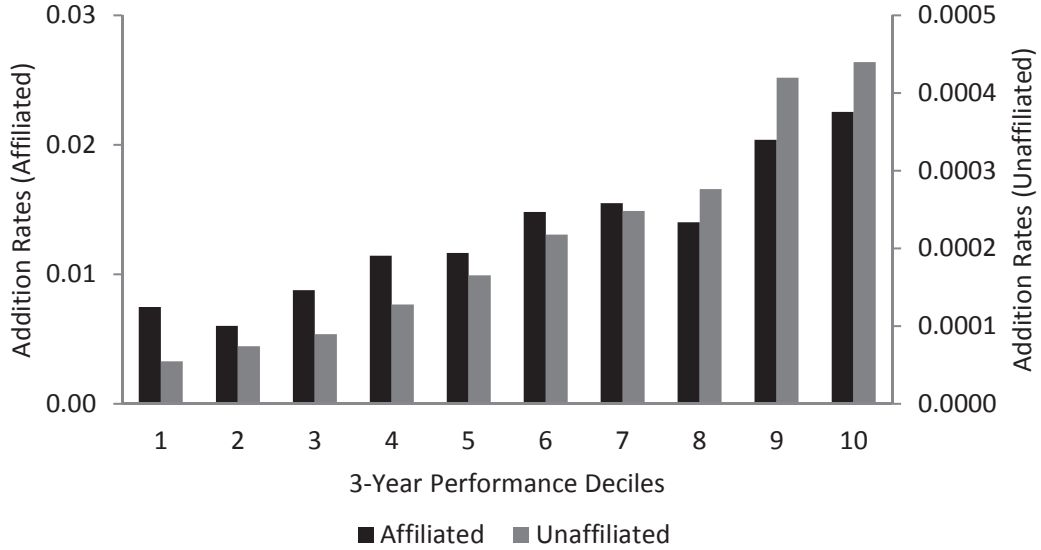


Figure 2: Fund Additions by Affiliation.

The figure depicts mean annual fund addition frequencies by affiliation and performance deciles. Affiliated probabilities are depicted relative to the axes on the left, while the corresponding axes for unaffiliated funds are on the right side of the figures. Panel A includes the full sample. Panel B includes only those funds that are offered by fund families that serve as trustees for at least one plan in our sample. For each fund in the CRSP mutual fund universe, every year we calculate the ratio of the number of affiliated (unaffiliated) menus to which the fund is added during the year to the total number of affiliated (unaffiliated) menus that do not yet include the fund as an option. Performance deciles are created by grouping funds based on their percentile performance among funds of the same style in the CRSP fund universe over the prior three years. We then average across the funds' addition frequencies by performance and affiliation. The corresponding values and differences in mean addition rates between affiliated and unaffiliated funds are tabulated in Table IA-VI in the Internet Appendix.

Table I: Sample Descriptive Statistics by Year.

The table provides descriptive statistics by year. Columns 1 and 2 report the number of plans and plan sponsors captured in our sample, respectively. Column 3 shows average plan size. In column 4 we report the percentage of plans in our sample that have mutual fund trustees. In columns 5-10, we provide information about the architecture of the average plan in the sample. This includes the number of mutual fund options offered in total, the number of affiliated options, trustee share calculated as the proportion of plan assets invested with affiliated funds (for all plans, not just those trusteeed by a mutual fund family), the proportion of plans with offerings from more than one mutual fund family, the average number of management companies that offer at least one investment option on the menu, and the Herfindahl index of the menu calculated based on the dollar share of each of these management companies.

Year	Number of Sponsors	Number of Plans	Average Plan Size (in \$M)	Plans with Mutual Fund Trustees (in %)	Number of Options	Number of Affiliated Options	Trustee Share (in %)	Plans with > 1 Family (in %)	Number of Families	Herfin- dahl Index
1998	618	713	286.26	60.31	7.01	2.38	34.01	65.92	2.96	0.67
1999	760	895	241.48	68.94	7.85	2.85	34.11	76.76	3.48	0.64
2000	829	1,004	295.43	73.21	9.29	3.53	35.68	81.18	4.00	0.59
2001	920	1,100	278.43	74.36	10.43	4.10	36.91	86.45	4.56	0.57
2002	1,012	1,230	250.27	76.59	11.50	4.60	37.26	89.51	5.01	0.54
2003	1,102	1,325	296.54	83.09	12.00	4.73	36.00	90.57	5.48	0.51
2004	1,106	1,314	327.38	83.33	13.19	5.18	33.85	92.54	5.89	0.48
2005	1,093	1,281	350.02	83.53	13.79	5.40	32.50	93.36	6.18	0.45
2006	1,034	1,225	401.53	78.12	14.57	5.81	31.56	94.12	6.29	0.44
2007	1,002	1,175	436.04	75.06	15.93	5.91	28.37	93.36	6.65	0.42
2008	970	1,126	322.47	75.40	17.20	6.49	28.99	93.16	7.08	0.42
2009	849	979	407.33	75.08	17.82	6.40	27.13	92.44	7.36	0.40
Mean	941	1,114	324.43	75.59	12.55	4.78	33.03	87.45	5.41	0.51

Table II: Mutual Fund Summary Statistics.

Panels A, B, and C of the table describe the funds that are kept in, deleted from, and added to a 401(k) menu in our sample, respectively. *Relative Option Size* is the average ratio of plan assets invested in the fund to total plan assets in each category (kept, deleted, added). *Total Option Size* is the proportion of affiliated (unaffiliated) assets that are kept, deleted, or added each year. *Option Size* is the dollar value of assets (in millions) in each option on the menu. The remaining variables are mutual fund level variables: fund age, fund size (in billions) as measured by total assets under management, the volatility of monthly fund returns, turnover, the expense ratio, and the funds' mean performance percentiles. Performance percentiles are calculated over the previous three years based on funds of the same style in the CRSP fund universe. The averages are reported for affiliated and unaffiliated funds separately. Standard errors for the differences are reported in parentheses and are clustered at the fund level. Significance levels for tests of the difference in means are denoted by *, **, ***, which correspond to 10%, 5%, and 1% levels, respectively.

	No Changes			Deletions			Additions		
	Aff. Funds	Unaff. Funds	Diff.	Aff. Funds	Unaff. Funds	Diff.	Aff. Funds	Unaff. Funds	Diff.
Option Size (in \$M)	13.47	8.92	4.54*** (1.45)	9.59	6.66	2.92*** (0.97)	5.13	4.93	0.20 (0.55)
Relative Option Size (in %)	7.60	8.56	-0.96* (0.51)	7.19	7.60	-0.41 (0.32)	4.57	6.26	-1.69*** (0.33)
Total Option Size (in %)	88.64	85.42	3.21*** (0.43)	11.35	14.57	-3.21*** (0.43)	14.35	20.74	-6.38*** (0.47)
Fund Age (in Years)	17.29	19.61	-2.32* (1.31)	17.54	18.19	-0.65 (0.79)	10.35	15.14	-4.79*** (0.94)
Fund Size (in \$B)	12.03	15.50	-3.47 (3.45)	7.01	8.30	-1.29 (1.39)	5.42	10.06	-4.64* (2.37)
Return Std.Dev. (in %)	3.38	3.98	-0.60*** (0.14)	3.48	4.08	-0.60*** (0.12)	3.23	3.98	-0.75*** (0.13)
Turnover (in %)	52.12	76.54	-24.42*** (7.12)	80.68	93.34	-12.66** (5.36)	53.23	80.65	-27.42*** (6.74)
Expense Ratio (in %)	0.57	0.94	-0.37*** (0.04)	0.80	1.06	-0.26*** (0.03)	0.60	0.95	-0.35*** (0.04)
Prior 3-Yr. Perf. (in %)	58.19	60.24	-2.05* (1.15)	51.37	51.29	0.08 (1.15)	63.91	67.49	-3.58*** (1.31)
Number of Obs.	52,239	82,550		4,285	14,189		7,816	21,872	

Table III: Logit Model of Fund Deletions.

The table reports the coefficient estimates for the following logit model: $Prob(DEL_{p,f,t} = 1) = \Lambda(AF_{p,f,t-1}\beta_{AF} + \mathbf{R}_{f,t-1}^T\beta_{\mathbf{R}} + AF_{p,f,t-1}\mathbf{R}_{f,t-1}^T\beta_{\mathbf{AF}\times\mathbf{R}} + \mathbf{Z}_{p,f,t-1}^T\beta_{\mathbf{Z}})$, where $DEL_{p,f,t}$ is an indicator variable that takes the value of one if mutual fund f is deleted from plan p during year t and zero otherwise, $AF_{p,f,t-1}$ is an indicator for whether the trustee of plan p is affiliated with the management company of fund f at the end of year $t-1$, and $\mathbf{R}_{f,t-1}$ is a vector that captures piecewise-linear performance segments of fund f . Performance percentiles $Perf$ are formed based on the performance of each fund among funds of the same style in the CRSP fund universe and range between zero and one. We include a linear performance specification, a two-segment specification where $LowPerf_{p,f,t-1} = \min(Perf_{p,f,t-1}, 0.5)$ and $HighPerf_{p,f,t-1} = \max(Perf_{p,f,t-1} - 0.5, 0)$, and a three-segment specification where $LowPerf_{p,f,t-1} = \min(Perf_{p,f,t-1}, 0.2)$, $MidPerf_{p,f,t-1} = \min(\max(Perf_{p,f,t-1} - 0.2, 0), 0.6)$, and $HighPerf_{p,f,t-1} = \max(Perf_{p,f,t-1} - 0.8, 0)$. The other lagged control variables in vector \mathbf{Z} include the maximum return correlation of the fund with existing menu options, the natural logarithm of option size, the number of options, the expense ratio, fund turnover, the natural logarithm of the fund's size, fund age, the standard deviation of the fund's return, and indicator variables for calendar years and investment styles. Standard errors are clustered at the fund level and are reported in parentheses. Significance levels are denoted by *, **, ***, which correspond to 10%, 5%, and 1% levels, respectively.

	Linear Model		Two-Segment Model		Three-Segment Model	
Affiliated	-0.76*** (0.07)	-0.62*** (0.07)	-0.71*** (0.08)	-0.75*** (0.09)	-0.70*** (0.12)	-0.82*** (0.14)
LowPerf			-2.26*** (0.11)	-1.82*** (0.11)	-2.39*** (0.35)	-2.06*** (0.39)
LowPerf×Affiliated			0.45** (0.20)	0.77*** (0.22)	0.40 (0.66)	1.48** (0.75)
Midperf	-1.64*** (0.06)	-1.11*** (0.07)			-1.82*** (0.07)	-1.34*** (0.08)
MidPerf×Affiliated	0.58*** (0.11)	0.32*** (0.11)			0.50*** (0.14)	0.32** (0.15)
HighPerf			-1.06*** (0.13)	-0.44*** (0.11)	0.56 (0.42)	1.72*** (0.37)
HighPerf×Affiliated			0.67*** (0.21)	-0.10 (0.22)	1.43* (0.78)	-0.62 (0.80)
Maximum Corr		0.08*** (0.00)		0.09*** (0.00)		0.09*** (0.00)
Log(Option Size)		-0.07*** (0.01)		-0.07*** (0.01)		-0.07*** (0.01)
No. of Options		-0.02*** (0.00)		-0.02*** (0.00)		-0.02*** (0.00)
Exp. Ratio		0.61*** (0.06)		0.59*** (0.06)		0.59*** (0.06)
Turnover		0.10*** (0.01)		0.10*** (0.01)		0.10*** (0.01)
Log(Fund Size)		-0.15*** (0.01)		-0.16*** (0.01)		-0.15*** (0.01)
Fund Age		0.01 (0.01)		0.01 (0.01)		0.01 (0.01)
Std. Dev.		-0.18 (1.06)		-0.82 (1.04)		-0.89 (1.01)
Observations	167,952	106,848	167,952	106,848	167,952	106,848
Pseudo R-squared	0.04	0.09	0.04	0.09	0.04	0.10

Table IV: Logit Model for Fund Deletions: Subsample Analysis.

The table reports the coefficient estimates for the following logit model: $Prob(DEL_{p,f,t} = 1) = \Lambda(AF_{p,f,t-1}\beta_{AF} + \mathbf{R}_{f,t-1}^T\beta_{\mathbf{R}} + AF_{p,f,t-1}\mathbf{R}_{f,t-1}^T\beta_{\mathbf{AF}\times\mathbf{R}} + \mathbf{Z}_{p,f,t-1}^T\beta_{\mathbf{Z}})$, where $DEL_{p,f,t}$ is an indicator variable that takes the value of one if mutual fund f is deleted from plan p during year t and zero otherwise, $AF_{p,f,t-1}$ is an indicator for whether the trustee of pension plan p is affiliated with the management company of fund f at the end of year $t - 1$, and $\mathbf{R}_{f,t-1}$ is a vector that captures piecewise-linear performance segments of fund f . Performance percentiles $Perf$ are formed based on the performance of each fund among funds of the same style in the CRSP fund universe and range between zero and one. We use a two-segment specification where $LowPerf_{p,f,t-1} = \min(Perf_{p,f,t-1}, 0.5)$ and $HighPerf_{p,f,t-1} = \max(Perf_{p,f,t-1} - 0.5, 0)$. The other lagged control variables in vector \mathbf{Z} include the maximum return correlation of the fund with existing menu options, the natural logarithm of option size, the number of options, the expense ratio, fund turnover, the natural logarithm of the fund's size, fund age, the standard deviation of the fund's return, and indicator variables for calendar years and investment styles. Columns 1 and 2 estimate our results for plans with below and above median asset size. We estimate the model by excluding the three largest trustees each year in the fourth column and for the three largest trustees each year in the fifth column. Finally, in columns 7 and 8, we divide our sample into the subperiods 1998 to 2006 and 2007 to 2009, respectively. The differences in the coefficients between the various subsamples are summarized in columns 3, 6, and 9. Standard errors are clustered at the fund level and are reported in parentheses. Significance levels are denoted by *, **, ***, which correspond to 10%, 5%, and 1% levels, respectively.

	Small Plans	Large Plans	Diff.	Small Trustees	Large Trustees	Diff.	1998- 2006	2007- 2009	Diff.
Affiliated	-0.94*** (0.13)	-0.66*** (0.12)	0.28 (0.18)	-0.83*** (0.11)	-0.71*** (0.19)	0.12 (0.21)	-0.73*** (0.11)	-0.65*** (0.15)	0.08 (0.19)
LowPerf	-1.90*** (0.15)	-1.99*** (0.19)	-0.09 (0.24)	-1.78*** (0.12)	-2.26*** (0.31)	-0.48 (0.33)	-1.72*** (0.14)	-2.05*** (0.19)	-0.33 (0.24)
LowPerf× Affiliated	1.10*** (0.34)	0.55* (0.32)	-0.55 (0.46)	1.16*** (0.28)	0.64 (0.44)	-0.52 (0.52)	0.22 (0.27)	1.12*** (0.36)	0.90** (0.45)
HighPerf	-0.62*** (0.15)	-0.31* (0.17)	0.32 (0.22)	-0.41*** (0.12)	-0.67** (0.28)	-0.26 (0.30)	0.04 (0.15)	-0.93*** (0.16)	-0.97*** (0.22)
HighPerf× Affiliated	-0.03 (0.36)	-0.22 (0.29)	-0.19 (0.47)	-0.75** (0.31)	0.57 (0.38)	1.33*** (0.49)	-0.13 (0.28)	0.05 (0.32)	0.17 (0.42)
Maximum Corr	0.08*** (0.00)	0.09*** (0.01)	0.01 (0.01)	0.07*** (0.00)	0.12*** (0.01)	0.05*** (0.01)	0.09*** (0.01)	0.08*** (0.01)	-0.01 (0.01)
Log(Option Size)	-0.02 (0.02)	-0.17*** (0.02)	-0.15*** (0.03)	-0.08*** (0.01)	-0.09*** (0.03)	-0.01 (0.03)	-0.08*** (0.02)	-0.07*** (0.02)	0.01 (0.02)
No. of Options	-0.01 (0.00)	-0.03*** (0.00)	-0.03*** (0.01)	-0.01*** (0.00)	-0.05*** (0.01)	-0.03*** (0.01)	-0.02*** (0.00)	-0.02*** (0.01)	0.01 (0.01)
Exp. Ratio	0.54*** (0.07)	0.69*** (0.09)	0.15 (0.12)	0.45*** (0.06)	1.33*** (0.12)	0.88*** (0.13)	0.55*** (0.07)	0.76*** (0.08)	0.21** (0.09)
Turnover	0.07*** (0.01)	0.16*** (0.02)	0.09*** (0.03)	0.08*** (0.01)	0.19*** (0.04)	0.11*** (0.04)	0.08*** (0.02)	0.11*** (0.03)	0.03 (0.03)
Log(Fund Size)	-0.18*** (0.01)	-0.12*** (0.02)	0.06*** (0.02)	-0.14*** (0.01)	-0.20*** (0.03)	-0.05* (0.03)	-0.13*** (0.01)	-0.18*** (0.02)	-0.05*** (0.02)
Fund Age	0.02* (0.01)	0.01 (0.01)	-0.01 (0.02)	0.01 (0.01)	0.03 (0.02)	0.02 (0.02)	0.02 (0.01)	0.01 (0.01)	-0.01 (0.02)
Std. Dev.	-1.44 (1.28)	-0.47 (1.57)	0.97 (2.02)	0.03 (1.12)	-7.19*** (2.03)	-7.22*** (2.33)	0.48 (1.01)	-9.45*** (1.78)	-9.93*** (1.98)
Observations	52,697	47,559		44,912	36,936		52,301	54,547	
Pseudo R-squared	0.12	0.08		0.07	0.17		0.10	0.10	

Table V: Logit Model of Fund Additions.

The table reports coefficient estimates for the following logit model: $Prob(ADD_{p,f,t} = 1) = \Lambda(AF_{p,f,t-1}\beta_{AF} + \mathbf{R}_{f,t-1}^T\beta_{\mathbf{R}} + AF_{p,f,t-1}\mathbf{R}_{f,t-1}^T\beta_{\mathbf{AF}\times\mathbf{R}} + \mathbf{Z}_{p,f,t-1}^T\beta_{\mathbf{Z}})$, where $ADD_{p,f,t}$ is an indicator variable that takes the value of one if mutual fund f is added to plan p during year t and zero otherwise, $AF_{p,f,t-1}$ is an indicator for whether the trustee of plan p is affiliated with the management company of fund f at the end of year $t - 1$, and $\mathbf{R}_{f,t-1}$ is a vector that captures piecewise-linear performance segments of fund f . Performance percentiles $Perf$ are formed based on the performance of each fund among funds of the same style in the CRSP fund universe and range between zero and one. We include a linear performance specification, a two-segment specification where $LowPerf_{p,f,t-1} = \min(Perf_{p,f,t-1}, 0.5)$ and $HighPerf_{p,f,t-1} = \max(Perf_{p,f,t-1} - 0.5, 0)$, and a three-segment specification where $LowPerf_{p,f,t-1} = \min(Perf_{p,f,t-1}, 0.2)$, $MidPerf_{p,f,t-1} = \min(\max(Perf_{p,f,t-1} - 0.2, 0), 0.6)$, and $HighPerf_{p,f,t-1} = \max(Perf_{p,f,t-1} - 0.8, 0)$. The other lagged control variables in vector \mathbf{Z} include the maximum return correlation of the fund with existing menu options, the number of options, the expense ratio, fund turnover, the natural logarithm of the fund's size, fund age, the standard deviation of the fund's return, and indicator variables for calendar years and investment styles. Standard errors are clustered at the fund level and are reported in parentheses. Significance levels are denoted by *, **, ***, which correspond to 10%, 5%, and 1% levels, respectively.

	Linear Model		Two-Segment Model		Three-Segment Model	
Affiliated	3.44*** (0.12)	2.61*** (0.16)	3.44*** (0.14)	2.75*** (0.19)	3.33*** (0.21)	2.82*** (0.23)
LowPerf			2.86*** (0.34)	1.11*** (0.29)	2.70*** (0.78)	-1.24 (0.77)
LowPerf×Affiliated			-0.75* (0.43)	-1.11** (0.49)	0.37 (1.33)	-1.71 (1.45)
Midperf	1.99*** (0.11)	1.88*** (0.11)			2.33*** (0.16)	1.90*** (0.16)
MidPerf×Affiliated	-0.78*** (0.18)	-0.68*** (0.22)			-1.16*** (0.24)	-0.82*** (0.30)
HighPerf			1.51*** (0.28)	2.29*** (0.24)	0.19 (0.58)	2.77*** (0.55)
HighPerf×Affiliated			-0.85** (0.41)	-0.41 (0.43)	0.43 (0.93)	0.54 (1.02)
Maximum Corr		0.79*** (0.18)		0.80*** (0.19)		0.81*** (0.19)
No. of Options		0.01*** (0.00)		0.01*** (0.00)		0.01*** (0.00)
Exp. Ratio		0.11 (0.08)		0.08 (0.08)		0.08 (0.08)
Turnover		0.00* (0.00)		0.00 (0.00)		0.00* (0.00)
Log(Fund Size)		0.71*** (0.04)		0.71*** (0.04)		0.71*** (0.04)
Fund Age		-0.11*** (0.04)		-0.10*** (0.04)		-0.10*** (0.04)
Std. Dev.		-3.16** (1.23)		-3.96*** (1.25)		-4.09*** (1.24)
Observations	63,234,618	51,062,968	63,234,618	51,062,968	51,062,968	63,234,618
Pseudo R-squared	0.09	0.16	0.09	0.16	0.09	0.16

Table VI: Logit Model for Fund Additions: Subsample Analysis.

The table reports coefficient estimates for the following logit model: $Prob(ADD_{p,f,t} = 1) = \Lambda(AF_{p,f,t-1}\beta_{AF} + \mathbf{R}_{f,t-1}^T\beta_{\mathbf{R}} + AF_{p,f,t-1}\mathbf{R}_{f,t-1}^T\beta_{\mathbf{AF}\times\mathbf{R}} + \mathbf{Z}_{p,f,t-1}^T\beta_{\mathbf{Z}})$, where $ADD_{p,f,t}$ is an indicator variable that takes the value of one if mutual fund f is added to plan p during year t and zero otherwise, $AF_{p,f,t-1}$ is an indicator for whether the trustee of plan p is affiliated with the management company of fund f at the end of year $t - 1$, and $\mathbf{R}_{f,t-1}$ is a vector that captures piecewise-linear performance segments of fund f . Performance percentiles $Perf$ are formed based on the performance of each fund among funds of the same style in the CRSP fund universe and range between zero and one. We use a two-segment specification where $LowPerf_{p,f,t-1} = \min(Perf_{p,f,t-1}, 0.5)$ and $HighPerf_{p,f,t-1} = \max(Perf_{p,f,t-1} - 0.5, 0)$. The other lagged control variables in vector \mathbf{Z} include the maximum return correlation of the fund with existing menu options, the number of options, the expense ratio, fund turnover, the natural logarithm of the fund's size, fund age, the standard deviation of the fund's return, and indicator variables for calendar years and investment styles. Columns 1 and 2 estimate our results for plans with below and above median asset size. We estimate the model by excluding the three largest trustees each year in the fourth column and for the three largest trustees each year in the fifth column. Finally, in columns 7 and 8, we divide our sample into the subperiods 1998 to 2006 and 2007 to 2009, respectively. The differences in the coefficients between the various subsamples are summarized in columns 3, 6, and 9. Standard errors are clustered at the fund level and are reported in parentheses. Significance levels are denoted by *, **, ***, which correspond to 10%, 5%, and 1% levels, respectively.

	Small Plans	Large Plans	Diff.	Small Trustees	Large Trustees	Diff.	1998- 2006	2007- 2009	Diff.
Affiliated	3.08*** (0.18)	2.56*** (0.23)	-0.52*** (0.20)	3.50*** (0.16)	2.71*** (0.29)	-0.79** (0.32)	2.91*** (0.22)	2.40*** (0.29)	-0.51 (0.33)
LowPerf	1.02*** (0.32)	1.35*** (0.33)	0.33 (0.24)	0.96*** (0.31)	1.82*** (0.41)	0.85** (0.40)	0.96*** (0.33)	1.53*** (0.39)	0.57 (0.40)
LowPerf× Affiliated	-1.60*** (0.50)	-0.77 (0.58)	0.83* (0.46)	-1.65*** (0.47)	-1.28* (0.68)	0.37 (0.79)	-1.15** (0.57)	-0.79 (0.81)	0.36 (0.91)
HighPerf	2.23*** (0.24)	2.27*** (0.26)	0.03 (0.15)	2.38*** (0.24)	1.93*** (0.33)	-0.45 (0.30)	2.46*** (0.30)	1.88*** (0.24)	-0.57* (0.30)
HighPerf× Affiliated	-0.42 (0.44)	-0.28 (0.47)	0.14 (0.30)	-0.30 (0.41)	0.17 (0.53)	0.47 (0.60)	-0.87* (0.48)	0.25 (0.60)	1.12* (0.66)
Maximum Corr	0.85*** (0.16)	0.75*** (0.24)	-0.10 (0.14)	0.89*** (0.17)	0.70** (0.34)	-0.19 (0.25)	0.54*** (0.17)	1.07*** (0.25)	0.53*** (0.19)
No. of Options	0.02*** (0.00)	0.01*** (0.00)	-0.01*** (0.00)	0.02*** (0.00)	0.00 (0.00)	-0.02*** (0.00)	0.02*** (0.00)	0.01** (0.00)	-0.01*** (0.00)
Exp. Ratio	0.25*** (0.07)	-0.13 (0.09)	-0.38*** (0.05)	0.21*** (0.07)	-0.41*** (0.16)	-0.62*** (0.14)	0.16* (0.08)	-0.07 (0.11)	-0.23** (0.11)
Turnover	0.00* (0.00)	0.00 (0.00)	-0.00 (0.00)	0.00** (0.00)	0.00 (0.00)	-0.00 (0.00)	0.04*** (0.01)	0.00 (0.00)	-0.04*** (0.01)
Log(Fund Size)	0.74*** (0.04)	0.69*** (0.04)	-0.05*** (0.02)	0.72*** (0.04)	0.72*** (0.05)	0.00 (0.03)	0.74*** (0.04)	0.68*** (0.04)	-0.05* (0.03)
Fund Age	-0.08** (0.03)	-0.13*** (0.04)	-0.05*** (0.02)	-0.08** (0.04)	-0.20*** (0.05)	-0.12*** (0.04)	-0.09** (0.04)	-0.12** (0.05)	-0.03 (0.04)
Std. Dev.	-3.98*** (1.28)	-3.85*** (1.43)	0.13 (1.03)	-3.02** (1.19)	-5.97*** (2.00)	-2.95* (1.75)	-5.67*** (1.36)	-2.31 (2.45)	3.37 (2.53)
Observations	23.5M	24.4M		36.2M	14.8M		30.5M	20.5M	
Pseudo R-squared	0.16	0.18		0.14	0.24		0.16	0.17	

Table VII: Fund Flow Regressions.

The table reports the coefficient estimates of the following OLS regression: $NMG_{p,f,t} = AF_{p,f,t-1}\beta_{AF} + \mathbf{R}_{f,t-1}^T\beta_{\mathbf{R}} + AF_{p,f,t-1}\mathbf{R}_{f,t-1}^T\beta_{\mathbf{AF}\times\mathbf{R}} + \mathbf{Z}_{p,f,t-1}^T\beta_{\mathbf{Z}} + \epsilon_{p,f,t}$, where the explanatory variables of the regression are analogous to those in Table III with the exception of *Plan Growth*, which is a new variable added in this table. Our first dependent variable (with corresponding results reported in columns 1 and 4 for all flows and participant flows, respectively) is new money growth defined as $NMG1_{p,f,t} = \frac{V_{p,f,t} - V_{p,f,t-1}(1+R_{f,t})}{V_{p,f,t-1}(1+R_{f,t})}$, where $V_{p,f,t}$ is the value of participants' investments in fund f in plan p in year t and $R_{f,t}$ is the fund's return during the year. We use two additional definitions for new money growth. $NMG2$ is new money growth defined as $NMG2_{p,f,t} = \frac{V_{p,f,t} - V_{p,f,t-1}(1+R_{f,t})}{V_{p,f,t} + V_{p,f,t-1}(1+R_{f,t})}$, with corresponding results reported in columns 2 and 5 for all flows and participant flows, respectively. Finally, $NMG3 = \frac{V_{p,f,t} - V_{p,f,t-1}(1+R_{f,t})}{\sum_f V_{p,f,t-1}(1+R_{f,t})}$ shares the numerator with the previous two definitions but replaces the denominator by lagged plan size adjusted for asset returns. Regression results using $NMG3$ as the dependent variable are reported in columns 3 and 6. Performance percentiles are calculated based on funds in the same style in the CRSP fund universe over the prior three years. The regressions include indicator variables for calendar years and investment styles. Standard errors are clustered at the fund level and are reported in parentheses. Significance levels are denoted by *, **, ***, which correspond to 10%, 5%, and 1% levels, respectively.

	All Fund Flows			Participant Flows Only		
	NMG1	NMG2	NMG3	NMG1	NMG2	NMG3
Affiliated	0.27*** (0.04)	0.20*** (0.02)	1.14*** (0.24)	0.08** (0.03)	0.03** (0.01)	0.06 (0.12)
LowPerf	0.55*** (0.07)	0.41*** (0.04)	3.77*** (0.51)	0.17*** (0.06)	0.08*** (0.02)	1.26*** (0.28)
LowPerf×Affiliated	-0.47*** (0.10)	-0.29*** (0.05)	-1.55** (0.61)	-0.14* (0.08)	-0.04 (0.03)	-0.60* (0.34)
HighPerf	0.35*** (0.05)	0.15*** (0.02)	0.94*** (0.33)	0.34*** (0.04)	0.11*** (0.02)	0.86*** (0.25)
HighPerf×Affiliated	0.08 (0.08)	-0.03 (0.04)	-0.85** (0.43)	0.03 (0.07)	-0.00 (0.02)	-0.13 (0.29)
Maximum Corr	-0.01*** (0.00)	-0.01*** (0.00)	-0.05*** (0.01)	0.00 (0.00)	0.00 (0.00)	-0.02*** (0.00)
Log(Option Size)	-0.08*** (0.00)	-0.07*** (0.00)	-0.32*** (0.01)	-0.11*** (0.00)	-0.04*** (0.00)	-0.08*** (0.01)
Plan Growth	0.83*** (0.03)	0.16*** (0.01)	4.90*** (0.25)	0.84*** (0.03)	0.35*** (0.01)	7.57*** (0.27)
No. of Options	-0.00* (0.00)	-0.00 (0.00)	-0.01*** (0.00)	-0.00*** (0.00)	-0.00*** (0.00)	-0.02*** (0.00)
Expense Ratio	-0.16*** (0.02)	-0.09*** (0.01)	-0.35*** (0.10)	-0.06*** (0.01)	-0.02*** (0.00)	-0.04 (0.05)
Turnover	-0.02*** (0.01)	-0.01*** (0.00)	-0.05*** (0.02)	0.00 (0.01)	0.00 (0.00)	-0.01 (0.02)
Log(Fund Size)	0.02*** (0.00)	0.02*** (0.00)	0.23*** (0.03)	0.00 (0.00)	0.00 (0.00)	0.09*** (0.02)
Fund Age	-0.01** (0.00)	-0.00 (0.00)	-0.02 (0.03)	-0.01*** (0.00)	-0.00*** (0.00)	-0.02 (0.02)
Std. Dev.	-0.06 (0.34)	-0.20 (0.18)	3.55** (1.48)	0.07 (0.29)	0.00 (0.10)	2.93** (1.15)
Observations	96,483	117,461	47 116,342	82,711	82,711	82,711
R-squared	0.16	0.52	0.14	0.25	0.22	0.11

Table VIII: Abnormal Returns of Affiliated and Unaffiliated Funds.

Panels A, B, and C of the table report the abnormal return $\alpha_{f,t}$ of fund portfolio f at time t using the Fama-French-Carhart four-factor model (FFM), the Fama and French (1993) model, and the CAPM model, respectively, over our complete sample period using monthly fund return data. At the end of each calendar year, we form equal-weighted portfolios of affiliated and unaffiliated domestic equity funds separately based on whether the funds were kept on, deleted from, or added to the 401(k) menu (“No Changes,” “Deletions,” and “Additions”) during the calendar year. This creates six portfolios. We then further subdivide these six groups based on past performance. In particular, “All Funds,” refers to the six portfolios and “Lowest Quintile,” (“Lowest Decile”) refers to a sub-portfolio in each group that contains only those funds that also rank in the lowest performance quintile (decile) relative to funds in their style in CRSP during the prior three years. The performance measures are reported in percent per month. Robust standard errors are reported in parentheses. Significance levels are denoted by *, **, ***, which correspond to 10%, 5%, and 1% levels, respectively.

Panel A: Carhart Alphas

	No Changes		Deletions		Additions	
	Affiliated Funds	Unaffiliated Funds	Affiliated Funds	Unaffiliated Funds	Affiliated Funds	Unaffiliated Funds
Lowest Decile	-0.33** (0.14)	-0.08 (0.14)	-0.28* (0.17)	-0.15 (0.17)	-0.01 (0.28)	0.12 (0.18)
Lowest Quintile	-0.20* (0.11)	-0.11 (0.10)	-0.19* (0.11)	-0.13 (0.12)	-0.11 (0.14)	-0.02 (0.11)
All Funds	-0.00 (0.04)	-0.06 (0.05)	-0.07 (0.05)	-0.09 (0.06)	-0.00 (0.05)	-0.06 (0.06)

Panel B: Fama-French Alphas

	No Changes		Deletions		Additions	
	Affiliated Funds	Unaffiliated Funds	Affiliated Funds	Unaffiliated Funds	Affiliated Funds	Unaffiliated Funds
Lowest Decile	-0.33** (0.14)	-0.08 (0.16)	-0.28 (0.17)	-0.15 (0.19)	-0.02 (0.27)	0.13 (0.19)
Lowest Quintile	-0.20* (0.12)	-0.10 (0.11)	-0.19* (0.11)	-0.13 (0.14)	-0.11 (0.14)	-0.02 (0.12)
All Funds	-0.00 (0.04)	-0.06 (0.05)	-0.07 (0.05)	-0.09 (0.06)	-0.00 (0.05)	-0.06 (0.06)

Panel C: CAPM Alphas

	No Changes		Deletions		Additions	
	Affiliated Funds	Unaffiliated Funds	Affiliated Funds	Unaffiliated Funds	Affiliated Funds	Unaffiliated Funds
Lowest Decile	-0.09 (0.17)	0.22 (0.26)	-0.12 (0.20)	0.14 (0.31)	0.06 (0.31)	0.39 (0.24)
Lowest Quintile	0.03 (0.18)	0.12 (0.18)	-0.12 (0.14)	0.07 (0.24)	0.08 (0.18)	0.23 (0.18)
All Funds	0.02 (0.04)	-0.01 (0.05)	-0.03 (0.05)	-0.02 (0.06)	0.02 (0.05)	-0.01 (0.08)

**Internet Appendix for
“It Pays to Set the Menu: Mutual Fund
Investment Options in 401(k) Plans”**

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This internet appendix provides supplemental analyses to the main tables and figures in ‘It Pays to Set the Menu: Mutual Fund Investment Options in 401(k) Plans.’

A Data

This section explains in more detail the data construction. We collect the investment options offered in 401(k) plans from Form 11-K filed with the U.S. Securities and Exchange Commission (SEC). All plans offering company stock as an investment option for plan participants are required to file this form with the SEC. The filing provides an overall description of the plan, identifies the trustee, all individual choices available to participants (the menu), and the accumulated value of assets invested in each of these vehicles at the end of the fiscal year.

We manually collect these data as disclosure is not standardized across plans and firms. We start by webcrawling the SEC’s website from 1998 to 2009 to identify all companies that report Form 11-K. We collect 26,624 links to 11-K filings but restrict this sample to companies covered by COMPUSTAT.¹ We eliminate filings that have been submitted to the SEC in duplicate and consolidate amendments with the corresponding original filings.

From these documents we collect all tables that describe the “Schedule of Assets” of the plan. In most cases, the table reports the complete set of investment options offered by the plan, including the employers’ own stock, other common stocks, mutual funds, separate accounts, or commingled trusts, as well as the current value of investments in these options at the end of the fiscal year. Occasionally, the table describes only those investment options that capture more than 5% of the plan’s assets or alternatively, only mutual fund investments. To overcome the incomplete and non-standardized disclosure of these tables, we supplement our Form 11-K information with plan level data from Form 5500. The resulting dataset has more than 302,000 observations, containing information at the firm-year-plan-fund level.

¹Our data collection initially included paper filings (not only pdfs of electronic documents). However, paper filings have been removed from the SEC’s website while our data collection was still in progress. We only partially incorporate these plan year observations.

To obtain information on the characteristics of the mutual funds included in DC plans, we match all funds listed on the menus to the CRSP Survivorship Bias-Free U.S. Mutual Fund database. To aid our matching task, we proceed in several steps. We start by filtering our menu options for non-mutual fund assets. These include, for instance, common stocks, bonds, insurance products, or guaranteed investment contracts. In approximately 15% of the cases, the SEC Form 11-K contains information on the number of shares of each asset held by the plan in addition to the market value of the position. This allows us to calculate the net asset value (NAV) of the position on the report date. When the NAV information is available, we match the menu choice to the CRSP mutual fund files by NAV and date. For the rest of the sample, we hand match the 11-K funds to the mutual fund database by name.

Since most plans do not identify the exact share class of the fund offered on the menu, we establish the link between our 401(k) sample and the CRSP Survivorship Bias-Free Mutual Fund database at the fund level, that is, we combine information on all available share classes of each fund in CRSP into fund-level variables. Accordingly, fund age is calculated as the age of the oldest share class, fund size is the sum of the total net assets of all share classes, and fund returns and expense ratios are calculated as the total net asset value weighted average returns and expense ratios of the share classes, respectively. We also classify each mutual fund in our sample as “balanced,” “bond,” “domestic equity,” “international equity,” or “other.” We create separate dummy variables for money market funds, target date funds, and index funds. We manually group funds into target date and index fund categories based on fund name.

Finally, we perform two additional data steps to complete our sample. First, we assign unique plan IDs to create time-series at the plan level. Form 11-K does not always disclose the plan number. Companies occasionally sponsor multiple plans for different subsidiaries, salaried and hourly employees, or unionized and non-unionized workers. In order to track the same plan over time, we collect the plan Employer Identification Number (EIN) and Plan Number (PN) by searching Form 5500 by plan name and assets. Once established, the link with Form 5500 allows us to collect additional information on total participants, active participants, employer and employee contributions, total assets, and whether the plan is collectively bargained or not.

We manually collect the trustee name (and any trustee change occurring during the year) from the plan description available in Form 11-K. We supplement and cross check this information with the name of the trustee disclosed in Form 5500.

B Menu Changes

This section provides additional robustness tests for fund deletions and additions.

B.1 Fund Deletions by Performance Deciles

Table IA-I summarizes mean annual deletion frequencies (as a %) by mutual fund affiliation. These deletion frequencies are analogous to those reported in Figure 1 in the paper, but the table also reports the results based on performance percentile ranks that are determined by prior one- and five-year performance evaluation horizons. Panel A includes the full sample. The number of observations in the individual performance deciles ranges between 407 and 867 for affiliated funds and 1,056 and 2,522 for unaffiliated funds. Panel B includes only funds that appear contemporaneously as affiliated and unaffiliated funds. Standard errors in these panels are clustered at the fund level. Panels C and D report identical difference test but use the Fama-MacBeth methodology to calculate the deletion frequencies and Newey-West standard errors using a lag length of 3.

B.2 Predicted Probabilities for Fund Deletions

Figure IA-1 displays average predicted probabilities from the various logit specifications for deletions corresponding to the six columns of Table III in the paper. The predicted probabilities for affiliated and unaffiliated funds are evaluated at different performance levels keeping the other control variables at their overall sample means. The results indicate that the sensitivity of deletions to prior performance is larger for unaffiliated funds.

B.3 Linear Probability Model of Fund Deletions

We estimate equation (1) in the main text using a logit model. We choose the logit specification in order to provide a parallel treatment between analyzing fund deletions and additions. For the latter, the logit setup represents the appropriate framework for interpreting the estimated effects because the baseline probability of adding an affiliated fund is orders-of-magnitude higher than that of adding an unaffiliated fund. Therefore, it is more meaningful to look at odds ratios rather than marginal effects to assess the effect of a determinant (i.e., performance) on the discrete outcome (i.e., adding a fund to the menu). In the context of fund deletions, it is also useful to look at the marginal effects of fund affiliation, however. The linear probability approach allows for a straightforward interpretation of the marginal effects of the piecewise linear terms and the interactions.

In Table IA-II we reproduce the results reported in Table 3 in the main text using the linear probability framework. Standard errors in the table are clustered at the fund level.

Consistent with Figure 1 and Table III in the main text, the table shows that affiliated funds – and especially poorly-performing affiliated funds – are significantly less likely to be deleted. For example, based on the results in column 2, affiliated funds are 10% less likely to be deleted than unaffiliated funds. Furthermore, a ten percentage point increase in the performance percentile for an unaffiliated fund decreases the probability of deletion by 1.7%, whereas the same performance increase for an affiliated fund decreases the probability of deletion by only 0.7%. Thus, the sensitivity of deletions to inferior fund performance is less than half of that of unaffiliated funds. The two-segment specification summarized in the fourth column of Table IA-II indicates that most of the performance sensitivity is driven by below-median funds. These coefficients are consistent with marginal effects calculated based on the methodology suggested by Ai and Norton (2003) for non-linear models.

To provide further evidence on the trustee’s incentive to support distressed funds, Table IA-III examines the role of non-DC money flows in more detail. We create an indicator variable that equals one if the fund experiences an outflow from its non-DC clients in the past year and zero otherwise, and an interaction term of this indicator variable with our *Affiliated*

dummy. Non-DC flows are calculated as $NonDCAssets_{f,t} - NonDCAssets_{f,t-1} \times (1 + R_{f,t})$, as described in footnote 17 of the main text. Unfortunately, the *Pensions & Investments* survey is only available for a relatively small subsample of the mutual fund universe. We, therefore, include an additional indicator variable in our model that takes the value of one if information on non-DC assets is missing and zero otherwise, and an interaction term between this missing flow variable and our *Affiliated* dummy. Panel A of the table reports the results of adding these two additional explanatory variables and the interaction terms to the models estimated in Table III in the main text, while Panel B shows the corresponding linear probability results.

In Table IA-IV we re-estimate the results for Table IV in the main text using the linear probability setup. The table indicates that our favoritism story holds for small and large trustees, small and large plans, and prior or after the PPA when using the linear probability estimation framework.

B.4 Robustness Tests for Fund Deletions

Table IA-V shows the results of our logit model specified in equation (1) in the main text using 1- and 5-year performance evaluation horizons and various sample restrictions. Panel A summarizes the coefficient estimates from a logit model, while Panel B contains the corresponding linear probability results. In columns 1 and 2, we show the results from using 1-year and 5-year prior performance horizons. In columns 3 and 4, we show that our results remain after controlling for indicator variables for individual trustees and funds, respectively. In column 5, we re-estimate our results using information only on those plans that are trusted by a mutual fund family. In column 6, we only include mutual fund trustees and require that they offer at least 10 funds in their fund family. The rationale behind excluding trustees with only a few funds in their product lineup is that these trustees could be large financial conglomerates or banks with a small mutual fund arm. In column 7 we exclude all plan year observations when a trustee change occurs, as in these plan years fund exits and entries are likely driven by the plan sponsor.

Finally, in columns 8-10 we restrict the sample of funds considered. In column 8 we exclude all target date funds since these funds are often used as default investment options. In column 9, we restrict our sample to equity funds, while in column 10 we only include actively managed funds.

B.5 Fund Additions by Performance Deciles

To investigate how a fund's propensity to be added to a menu depends on its affiliation, we determine the addition frequency of each fund in the CRSP fund universe as an affiliated and unaffiliated menu choice, respectively, as described in Section III.D in the paper. Table IA-VI summarizes mean annual addition frequencies (as a %) by mutual fund affiliation. These addition frequencies are analogous to those reported in Figure 2 in the paper, but the table also reports the results based on performance percentile ranks that are determined by prior one- and five-year performance evaluation horizons. Panel A includes the full sample, Panel B includes only those funds which are offered by fund families that serve as trustees for at least one plan in our sample. Standard errors in these panels are clustered at the fund level. Panels C and D report identical difference test but use the Fama-MacBeth methodology to calculate the addition frequencies and corresponding standard errors.

B.6 Predicted Probabilities for Fund Additions

Figure IA-2 displays average predicted probabilities from our logit model for additions tabulated in the six columns of Table V in the paper. The predicted probabilities are evaluated for affiliated and unaffiliated funds at different performance levels keeping the other control variables at their overall sample means. Since the addition rates are substantially larger for affiliated funds, the figures use separate axes to measure the addition probabilities for affiliated and unaffiliated funds.

B.7 Robustness Tests for Fund Additions

Table IA-VII shows the results of our logit model specified in equation (2) in the main text using various sample restrictions. In columns 1 and 2, we show the results from using 1-year and 5-year prior performance horizons. In column 3, we re-estimate our results using information only on those plans that are trusted by a mutual fund family. In column 4, we only include mutual fund trustees and require that they offer at least 10 funds in their fund family. The rationale behind excluding trustees with only a few funds in their product lineup is that these trustees could be large financial conglomerates or banks with a small mutual fund arm. In column 5 we exclude all plan year observations when a trustee change occurs, as in these plan years fund exits and entries are likely driven by the plan sponsor.

Finally, in columns 6-8 we restrict the sample of funds considered. In column 6 we exclude all target date funds since these funds are often used as default investment options. In column 7, we restrict our sample to equity funds, while in column 8 we only include actively managed funds. These results are consistent with the results in our baseline specification.

B.8 Newly Added Funds by Affiliation

This section provides some additional results on the determinants of fund additions. We investigate the characteristics of affiliated and unaffiliated funds based on our sample of newly added funds. Table II of the paper provides univariate evidence that newly listed affiliated funds exhibit lower past performance than unaffiliated funds in the same category. We confirm this finding in Figure IA-3. The figure describes the cumulative distribution of affiliated and unaffiliated fund additions separately. Fund performance is measured by the performance percentile of each fund in the universe of CRSP funds in the same style over the past three years. The results reveal that the proportion of unaffiliated funds with strong past performance is larger compared to that of affiliated funds, while affiliated funds are more likely to come to the menu with a mediocre performance record. We confirm that the distributions are statistically significantly different at the 1% level using the Kolmogorov-Smirnov test.

To further explore the difference in past performance across newly added affiliated and unaffiliated funds, we estimate the following logit model for fund addition type:

$$Prob(AF^{ADD}_{p,f,t} = 1) = \Lambda \left(\beta_{Perf} \times Perf_{p,f,t-1} + \mathbf{Z}_{\mathbf{p},\mathbf{f},\mathbf{t}-1}^T \beta_{\mathbf{Z}} \right), \quad (\text{IA-1})$$

where $AF^{ADD}_{p,f,t}$ takes the value of one if fund f added to plan p at time t is an affiliated fund, and zero otherwise. Since the sample used in this analysis includes only fund additions, it reflects the choice between selecting an affiliated fund over an unaffiliated fund. $Perf_{p,f,t-1}$ is the performance percentile of mutual fund f over the previous one, three, or five years based on the universe of CRSP funds in the same investment style and it enters the analysis as a linear term. Our additional controls include various fund characteristics and plan level variables, such as the number of menu options and plan size.

The results are reported in Table IA-VIII with standard errors clustered at the fund level. Consistent with menu favoritism, affiliated funds come to the menu with a significantly weaker track record even after controlling for other fund characteristics. This is shown by our $Perf_{p,f,t-1}$ coefficient estimates, which are significantly negative at the one percent level for each of our performance measures.

B.9 Representation of Affiliated Funds

It may be surprising that while affiliated funds have higher addition and lower deletion rates, we do not see a substantial increase in the representation of affiliated funds in 401(k) plans during our sample period. In this section, we discuss more formally how to reconcile this tension between the favoritism toward affiliated funds and the lack of a substantial increase in the representation of affiliated funds in DC menus.

The proportion of affiliated funds on a menu decreases as long as the growth rate of unaffiliated options g^U exceeds the growth rate of affiliated options g^A . The growth rates for

affiliated and unaffiliated funds on the menus are defined as follows:

$$g_t^A = \frac{A_t^A - D_t^A}{N_{t-1}^A}, \quad (\text{IA-2})$$

$$g_t^U = \frac{A_t^U - D_t^U}{N_{t-1}^U}, \quad (\text{IA-3})$$

where A measures the number of funds added, D the number of funds deleted, and N the number of funds included on a plan's menu. The number of additions A is the product of the addition rate a and the number of potential addition candidates that are not yet included on the menu ($T - N$). Furthermore, the number of deletions D is the product of the deletion rate d and the number of current investment options (N). Thus, the growth rates amount to:

$$g_t^A = \frac{A_t^A - D_t^A}{N_{t-1}^A} = \frac{a_t^A(T_{t-1}^A - N_{t-1}^A) - d_t^A N_{t-1}^A}{N_{t-1}^A} = a_t^A \left(\frac{T_{t-1}^A}{N_{t-1}^A} - 1 \right) - d_t^A, \quad (\text{IA-4})$$

$$g_t^U = \frac{A_t^U - D_t^U}{N_{t-1}^U} = \frac{a_t^U(T_{t-1}^U - N_{t-1}^U) - d_t^U N_{t-1}^U}{N_{t-1}^U} = a_t^U \left(\frac{T_{t-1}^U}{N_{t-1}^U} - 1 \right) - d_t^U. \quad (\text{IA-5})$$

The proportion of affiliated funds on a menu decreases as long as $g_t^A < g_t^U$. This inequality is satisfied as long as the proportion of potential addition candidates of unaffiliated funds relative to current unaffiliated funds (T_{t-1}^U/N_{t-1}^U) is sufficiently larger than the corresponding ratio for affiliated funds (T_{t-1}^A/N_{t-1}^A). This condition is satisfied in our sample since an average plan has around 82 affiliated and 8,094 unaffiliated funds that can potentially be added to the menu. On the other hand, 401(k) plans include on average 4.63 affiliated and 7.43 unaffiliated funds.²

We can illustrate the magnitude of the growth rates using the mean variables over our whole sample period:

$$g_t^A = a_t^A \left(\frac{T_{t-1}^A}{N_{t-1}^A} - 1 \right) - d_t^A = 0.00841 \left(\frac{82.0657}{4.6346} - 1 \right) - 0.0774 = 0.063, \quad (\text{IA-6})$$

²The average numbers of affiliated and unaffiliated funds differ from the average numbers in Table I because Table I also includes the values from 2009. The 2009 values are excluded in the calculations above since the formulas require the lagged number of affiliated and unaffiliated funds.

$$g_t^U = a_t^U \left(\frac{T_{t-1}^U}{N_{t-1}^U} - 1 \right) - d_t^U = 0.000217 \left(\frac{8093.57}{7.43} - 1 \right) - 0.1695 = 0.067. \quad (\text{IA-7})$$

Thus, the growth rate of unaffiliated funds is slightly larger than the growth rate of affiliated funds over our sample period, despite the fact that affiliated funds have a higher addition rate (0.84% vs. 0.02%) and a lower deletion rate (7.74% vs. 16.95%).³

C New Money Growth

Figure IA-4 provides histograms of the percentage flows into various plan options for affiliated and unaffiliated funds in the lowest performance decile over the previous three years.

D Future Performance

In Section V of the paper, we compute the abnormal return $\alpha_{f,t}$ of fund portfolio f at time t using the Fama-French-Carhart four-factor model (FFM) over our complete sample period using monthly fund return data from the CRSP Mutual Fund database:

$$\begin{aligned} R_{f,t} - R_{TB,t} &= \alpha_{f,t} + \beta_{f,t}^M (R_{M,t} - R_{TB,t}) + \beta_{f,t}^{SMB} (R_{S,t} - R_{B,t}) \\ &\quad + \beta_{f,t}^{HML} (R_{H,t} - R_{L,t}) + \beta_{f,t}^{UMD} (R_{U,t} - R_{D,t}) + \epsilon_{f,t}. \end{aligned} \quad (\text{IA-8})$$

The return of fund portfolio f during time period t is denoted by $R_{f,t}$. The index M corresponds to the market portfolio and the index TB to the risk-free Treasury bill rate. Portfolios of small and large stocks are denoted by S and B , respectively; portfolios of stocks with high and low ratios between their book values and their market values are denoted by H and L , respectively; and portfolios of stocks with relatively high and low returns during the previous year are denoted by U and D , respectively. We obtain monthly factor returns and the risk-free rate from Kenneth French's website.

³Equations (3) and (4) require menu-level information. Therefore, the numbers in parentheses are averages of addition and deletion rates computed at the menu-, rather than, at the fund-level.

In Section V of the paper, we form equal-weighted portfolios of affiliated and unaffiliated domestic equity funds separately at the end of each calendar year, as described in the section. Table VII in the paper reports the abnormal return (α) of these portfolios using the Fama-French-Carhart four-factor model (FFM), the Fama and French (1993) model, and the CAPM model, respectively, over our complete sample period using monthly fund return data. In Panels A, B, and C of Table IA-IX we augment these results by reporting the difference in the abnormal returns of the affiliated and unaffiliated fund portfolios in each category.

References

- Ai, Chunrong, and Edward C. Norton, 2003, Interaction terms in logit and probit models, *Economics Letters* 80, 123–129.
- Fama, Eugene F., and Kenneth R. French, 1993, Common risk factors in the returns on stocks and bonds, *Journal of Financial Economics* 33, 3–56.

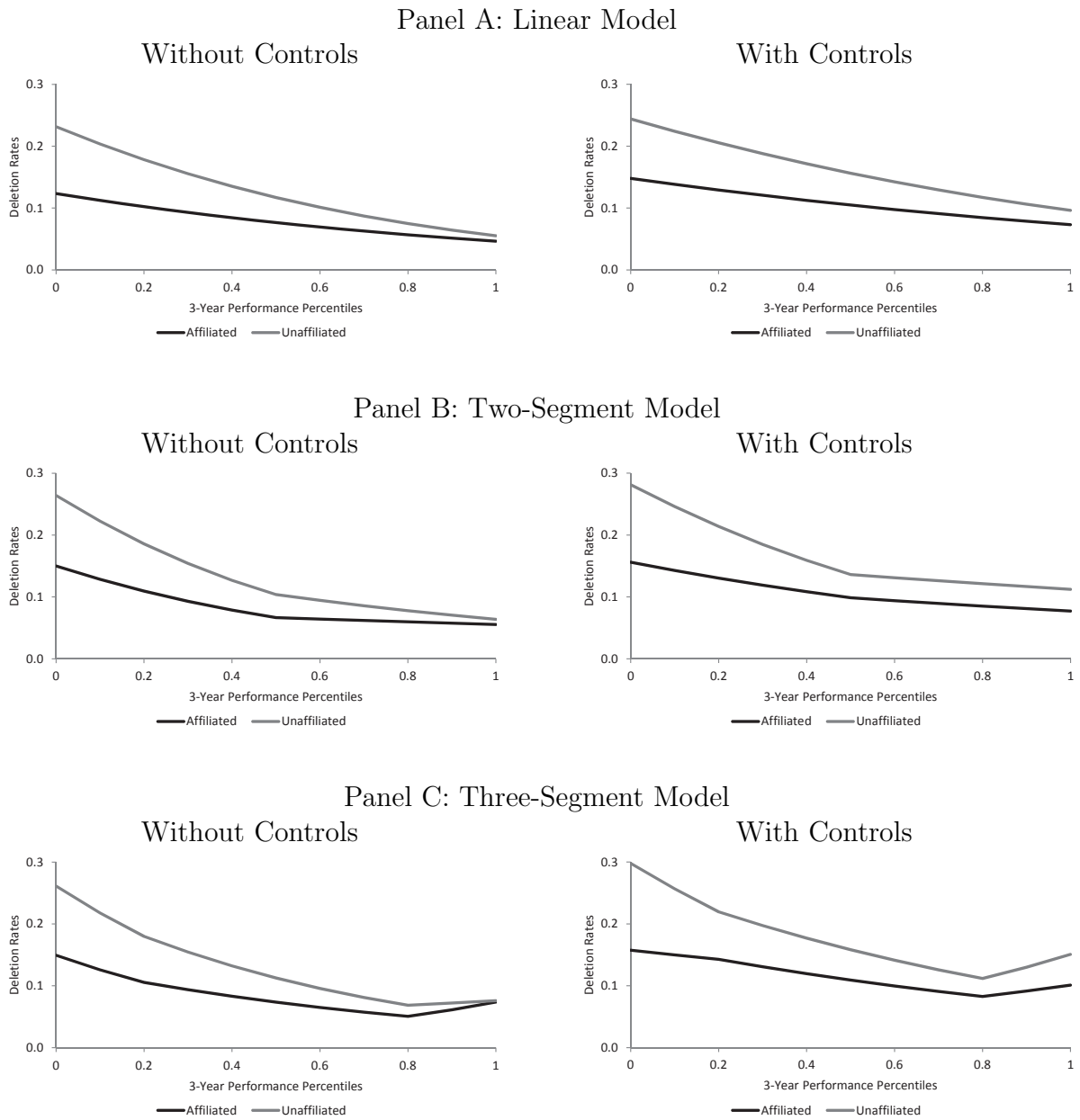


Figure IA-1: Predicted deletion probabilities by prior performance and fund affiliation. The figure displays predicted probabilities from our logit models for fund deletions by prior performance. We calculate these predicted probabilities by evaluating them at the means of the other control variables. Fitted probabilities are obtained from the logit models estimated in Table III in the paper.

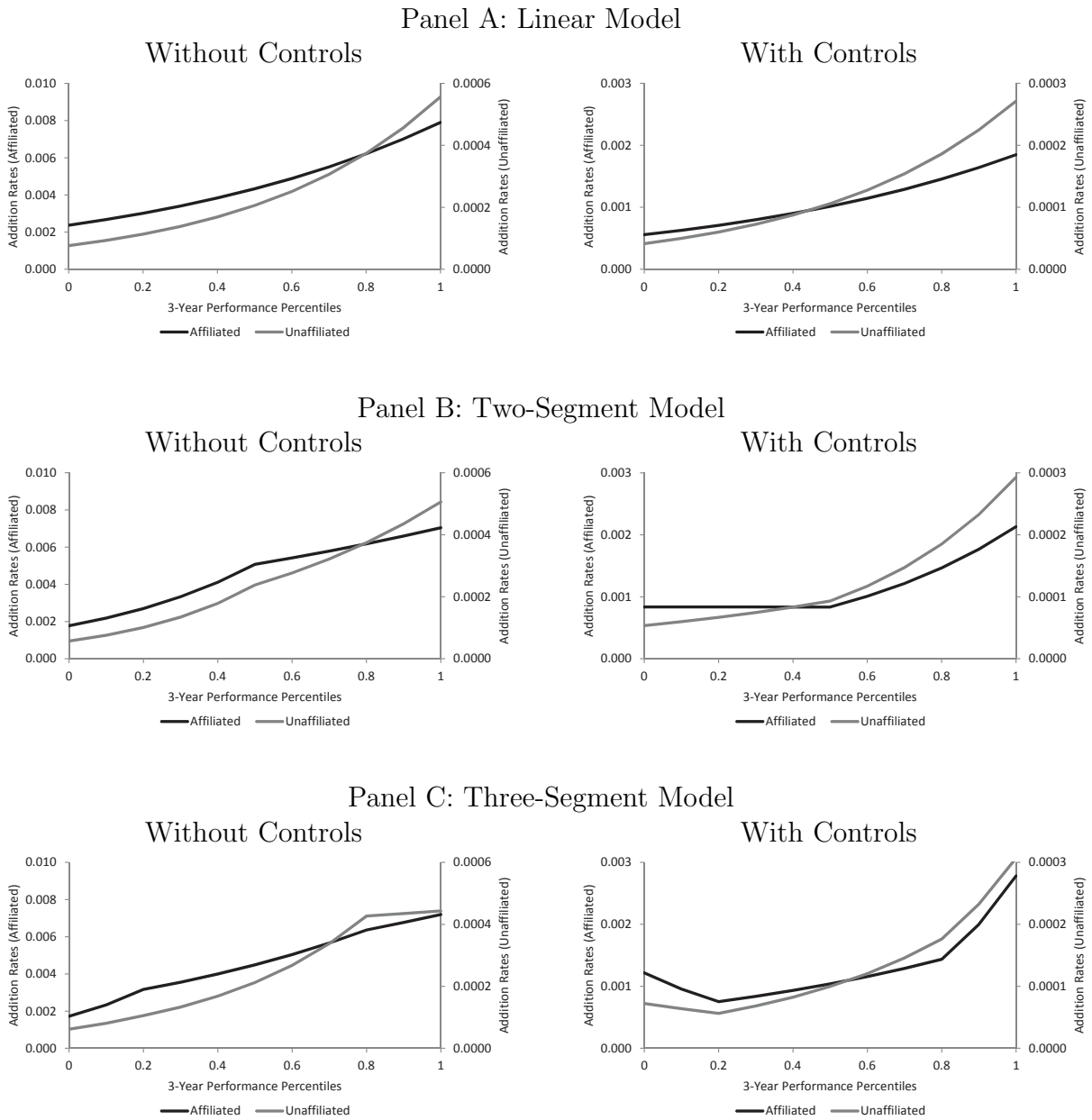


Figure IA-2: Predicted addition probabilities by prior performance and fund affiliation. The figure displays predicted probabilities from our logit models for fund additions by prior performance. We calculate these predicted probabilities by evaluating them at the means of the other control variables. Fitted probabilities are obtained from the logit models estimated in Table V in the paper. Affiliated probabilities are depicted relative to the axis on the left, while the corresponding axis for unaffiliated funds is on the right side of the figure.

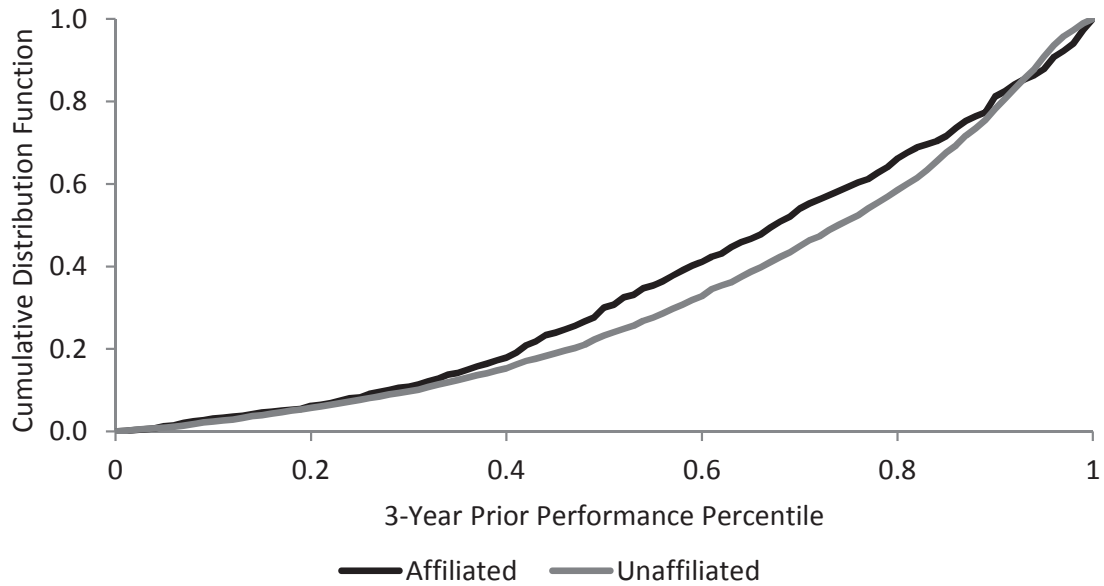


Figure IA-3: Cumulative distribution of mutual fund additions by performance and fund affiliation. The figure shows the cumulative distribution of the funds that are added to a 401(k) menu at some point during our sample period by performance decile and affiliation. The dark line shows the cumulative fraction of affiliated funds by performance deciles, while the grey line provides the corresponding values for unaffiliated funds. Performance deciles are created from percentile performance ranks. Fund performance is ranked relative to all other mutual funds in CRSP with the same style over the prior 36 months.

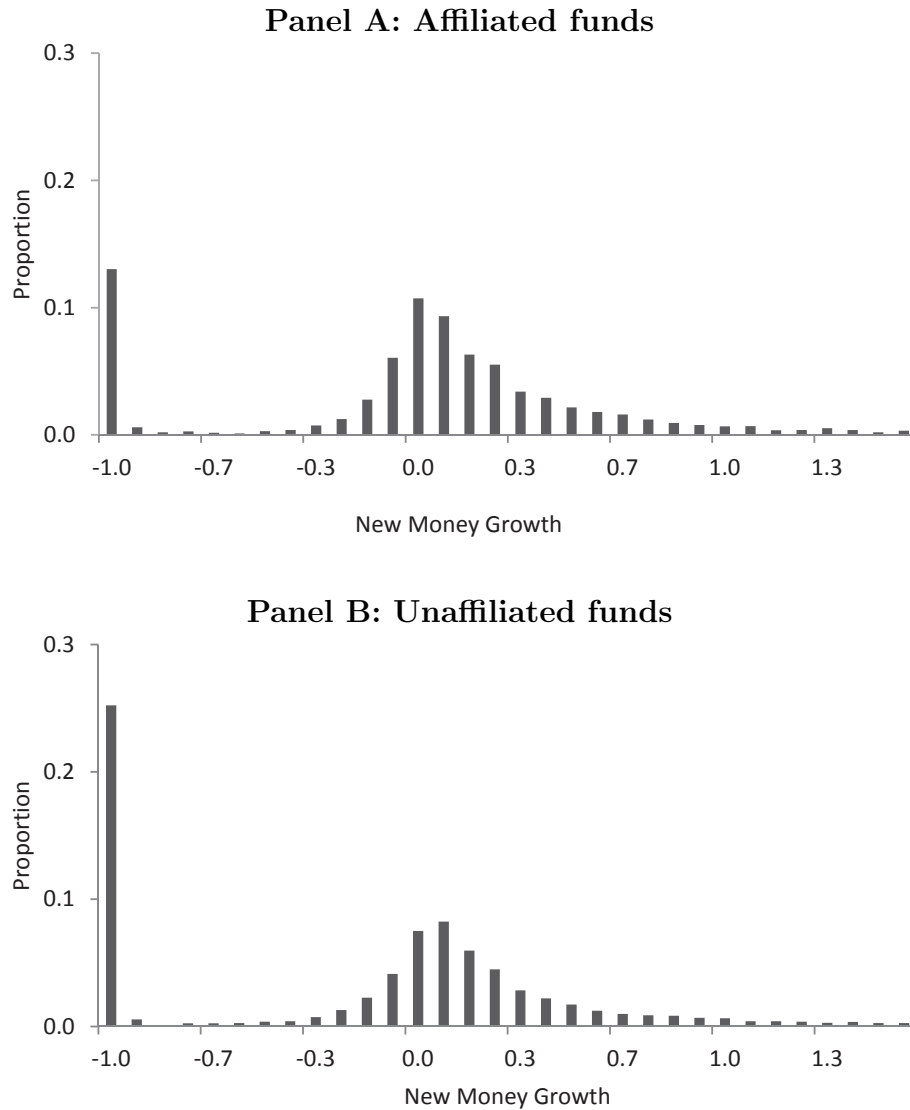


Figure IA-4: New money growth of poorly-performing affiliated and unaffiliated funds. The figure displays the distribution of fund flows to poorly-performing mutual funds on the menu by affiliation. Fund flows, or the growth rate of new money $NMG_{p,f,t}$ of fund f held in 401(k) plan p at time t is defined by $NMG_{p,f,t} = [V_{p,f,t} - V_{p,f,t-1}(1 + R_{f,t})] / [V_{p,f,t-1}(1 + R_{f,t})]$. The numerator captures the dollar change in the value of participants' investments ($V_{p,f,t}$) in fund f in plan p in year t after adjusting for price appreciation $R_{f,t}$ during the year. The denominator is defined as the projected value of the lagged plan position in the fund without any new flow of money. If an investment option is deleted from a plan menu, then NMG equals exactly -100%. In Panels A and B, the distributions describe fund flows to those affiliated and unaffiliated funds, respectively, that fall into the worst performance decile of the universe of mutual funds in the same style.

Table IA-I: Fund Deletions by Performance Deciles.

The table summarizes mean annual fund deletion frequencies (as a %) by trustee affiliation and performance deciles. Panels A and C include the full sample. Panels B and D include only those funds that appear contemporaneously on multiple 401(k) menus, at least once as an affiliated fund and at least once as an unaffiliated fund. Every year, we calculate the ratio of the number of affiliated (unaffiliated) menus from which the fund is delisted during the year to the total number of affiliated (unaffiliated) menus associated with the fund. Performance deciles are created by grouping funds based on their percentile performance among funds of the same style in the CRSP fund universe over the prior one, three, and five years. We then average across the funds' deletion frequencies by performance and affiliation. Significance levels for tests of the difference in means are denoted by *, **, ***, which correspond to 10%, 5%, and 1% levels, respectively. In Panels A and B standard errors are clustered at the fund level, while in Panels C and D, we report Fama-MacBeth coefficients and Newey-West standard errors using a lag length of 3.

Panel A: All Funds

Performance	1 Year			3 Years			5 Years		
	A	UA	A-UA	A	UA	A-UA	A	UA	A-UA
Decile	A	UA	A-UA	A	UA	A-UA	A	UA	A-UA
1	12.1	22.2	-10.0***	13.7	25.5	-11.8***	14.6	23.8	-9.2***
2	18.3	21.1	-2.9*	18.8	23.5	-4.7***	18.0	23.8	-5.8***
3	15.5	20.6	-5.1***	18.0	22.2	-4.2***	16.1	21.5	-5.4***
4	16.1	20.5	-4.4***	14.5	20.6	-6.1***	13.4	21.7	-8.3***
5	13.5	17.5	-4.0***	12.0	18.6	-6.5***	13.8	18.4	-4.6***
6	12.7	17.2	-4.5***	12.1	17.7	-5.6***	12.3	19.2	-6.9***
7	10.4	17.1	-6.6***	11.7	16.4	-4.7***	11.8	18.2	-6.4***
8	12.0	17.2	-5.3***	10.6	16.4	-5.8***	11.3	15.1	-3.8***
9	11.1	16.0	-4.9***	10.3	14.9	-4.6***	11.4	14.6	-3.3***
10	12.4	16.0	-3.6***	15.1	15.3	-0.2	13.8	15.8	-2.0
10-1	0.3	-6.2***	6.5***	1.3	-10.2***	11.5***	-0.8	-8.0***	7.2***

Panel B: Subsample of Funds on Both Affiliated and Unaffiliated Menus

Performance	1 Year			3 Years			5 Years		
	A	AU	A-UA	A	AU	A-UA	A	AU	A-UA
Decile	A	AU	A-UA	A	AU	A-UA	A	AU	A-UA
1	11.1	19.1	-7.9***	13.6	24.5	-10.8***	16.4	23.5	-7.2**
2	17.6	19.8	-2.2	19.0	20.8	-1.8	17.9	24.7	-6.8**
3	16.0	18.3	-2.4	16.4	20.8	-4.4**	14.7	19.1	-4.4**
4	15.5	18.1	-2.5	13.6	16.9	-3.3**	14.0	17.1	-3.1*
5	14.6	16.7	-2.2	13.6	14.3	-0.6	12.6	15.8	-3.2*
6	10.7	15.2	-4.5***	12.2	17.5	-5.3***	12.5	16.7	-4.2***
7	9.2	12.9	-3.7***	10.3	13.0	-2.6*	11.5	15.5	-3.9**
8	11.1	13.1	-2.0	9.5	13.5	-4.0***	10.1	13.0	-2.9**
9	10.5	13.8	-3.3**	9.4	12.3	-2.9**	9.9	10.8	-1.0
10	9.9	12.8	-2.9	12.9	12.8	0.0	12.5	12.9	-0.4
10-1	-1.2	-6.3***	5.1*	-0.8	-11.6***	10.9***	-3.9	-10.6***	6.7*

Panel C: All Funds, Fama-MacBeth Tests

Performance	1 Year			3 Years			5 Years		
	A	UA	A-UA	A	UA	A-UA	A	UA	A-UA
Decile	A	UA	A-UA	A	UA	A-UA	A	UA	A-UA
1	13.5	22.6	-9.1***	14.9	26.1	-11.2**	14.6	24.3	-9.6***
2	18.1	20.5	-2.4	18.3	23.0	-4.6**	16.6	22.7	-6.1***
3	15.6	20.4	-4.8**	18.3	21.5	-3.2*	15.6	20.9	-5.3***
4	16.4	20.3	-3.8*	14.6	20.2	-5.6***	14.1	21.6	-7.4***
5	13.4	17.2	-3.9***	12.6	17.9	-5.2***	14.2	18.0	-3.8**
6	12.3	17.0	-4.7***	11.8	17.4	-5.6***	12.1	18.9	-6.7***
7	10.2	16.1	-5.9***	11.4	15.9	-4.5***	11.6	17.6	-6.0***
8	12.0	16.9	-4.9***	10.0	15.9	-5.9***	10.6	14.8	-4.2***
9	10.9	15.8	-4.9***	10.0	14.8	-4.8***	10.9	14.3	-3.4**
10	11.9	16.0	-4.1**	14.4	15.4	-1.1	13.5	15.7	-2.2
10-1	-1.6	-6.6***	4.9**	-0.6	-10.7***	10.2***	-1.1	-8.6***	7.5***

Panel D: Subsample of Funds on Both Affiliated and Unaffiliated Menus, Fama-MacBeth Tests

Performance	1 Year			3 Years			5 Years		
	A	UA	A-UA	A	UA	A-UA	A	UA	A-UA
Decile	A	UA	A-UA	A	UA	A-UA	A	UA	A-UA
1	12.9	20.6	-7.6***	13.6	26.1	-12.5***	15.2	27.4	-12.2***
2	16.9	17.9	-1.0	17.9	20.0	-2.1	15.6	22.6	-6.9
3	16.1	17.0	-0.9	16.4	21.0	-4.7*	14.9	18.6	-3.6***
4	15.1	17.7	-2.6	13.8	16.9	-3.1	14.4	16.5	-2.1
5	14.4	17.0	-2.5	13.8	13.7	0.1	13.0	15.3	-2.3
6	10.2	15.0	-4.8**	12.2	17.4	-5.2**	12.4	17.0	-4.6*
7	9.1	12.6	-3.4**	10.3	13.1	-2.7**	11.3	14.9	-3.5
8	11.1	13.0	-1.9	9.0	13.2	-4.2**	9.3	13.3	-4.0***
9	10.4	14.1	-3.6	9.0	12.3	-3.3*	9.5	10.7	-1.2
10	9.7	13.5	-3.8**	12.1	13.7	-1.5	12.2	13.7	-1.5
10-1	-3.2*	-7.1*	3.9	-1.5	-12.4***	11.0**	-3.0	-13.7***	10.7**

Table IA-II: Linear Probability Model of Fund Deletions.

The table reports the coefficient estimates for the following linear probability model: $DEL_{p,f,t} = AF_{p,f,t-1}\beta_{AF} + \mathbf{R}_{f,t-1}^T\beta_{\mathbf{R}} + AF_{p,f,t-1}\mathbf{R}_{f,t-1}^T\beta_{\mathbf{AF}\times\mathbf{R}} + \mathbf{Z}_{p,f,t-1}^T\beta_{\mathbf{Z}} + \epsilon_{p,f,t}$, where $DEL_{p,f,t}$ is an indicator variable that takes the value of one if mutual fund f is deleted from plan p during year t and zero otherwise, $AF_{p,f,t-1}$ is an indicator for whether the trustee of pension plan p is affiliated with the management company of fund f at the end of year $t-1$, and $\mathbf{R}_{f,t-1}$ is a vector that captures piecewise-linear performance segments of fund f . Performance percentiles $Perf$ are formed based on the prior 3-year performance of each fund among funds of the same style in the CRSP fund universe and range between zero and one. We include a linear performance specification, a two-segment specification where $LowPerf_{p,f,t-1} = \min(Perf_{p,f,t-1}, 0.5)$ and $HighPerf_{p,f,t-1} = \max(Perf_{p,f,t-1} - 0.5, 0)$, and a three-segment specification where $LowPerf_{p,f,t-1} = \min(Perf_{p,f,t-1}, 0.2)$, $MidPerf_{p,f,t-1} = \min(\max(Perf_{p,f,t-1} - 0.2, 0), 0.6)$, and $HighPerf_{p,f,t-1} = \max(Perf_{p,f,t-1} - 0.8, 0)$. The other lagged control variables in vector \mathbf{Z} include the maximum return correlation of the fund with existing menu options, the natural logarithm of option size, the number of options, the expense ratio, fund turnover, the natural logarithm of the fund's size, fund age, the standard deviation of the fund's return, and indicator variables for calendar years and investment styles. Standard errors are clustered at the fund level and are reported in parentheses. Significance levels are denoted by *, **, ***, which correspond to 10%, 5%, and 1% levels, respectively.

	Linear Model		Two-Segment Model		Three-Segment Model	
Affiliated	-0.10*** (0.01)	-0.10*** (0.01)	-0.11*** (0.01)	-0.15*** (0.02)	-0.12*** (0.02)	-0.17*** (0.03)
LowPerf			-0.30*** (0.03)	-0.32*** (0.03)	-0.46*** (0.08)	-0.52*** (0.12)
LowPerf×Affiliated			0.16*** (0.03)	0.25*** (0.04)	0.25** (0.12)	0.47*** (0.18)
MidPerf	-0.17*** (0.01)	-0.17*** (0.01)			-0.19*** (0.01)	-0.19*** (0.02)
MidPerf×Affiliated	0.10*** (0.01)	0.10*** (0.02)			0.10*** (0.02)	0.11*** (0.02)
HighPerf			-0.08*** (0.02)	-0.05** (0.02)	0.09* (0.05)	0.21*** (0.07)
HighPerf*Affiliated			0.06** (0.02)	-0.01 (0.03)	0.06 (0.07)	-0.17* (0.09)
Maximum Corr		0.01*** (0.00)		0.01*** (0.00)		0.01*** (0.00)
Log(Option Size)		-0.01*** (0.00)		-0.01*** (0.00)		-0.01*** (0.00)
No. of Options		-0.00*** (0.00)		-0.00*** (0.00)		-0.00*** (0.00)
Expense Ratio		0.08*** (0.01)		0.08*** (0.01)		0.08*** (0.01)
Turnover		0.02*** (0.00)		0.02*** (0.00)		0.02*** (0.00)
Log(Fund Size)		-0.02*** (0.00)		-0.02*** (0.00)		-0.02*** (0.00)
Fund Age		0.00 (0.00)		0.00 (0.00)		0.00 (0.00)
Std. Dev.		-0.09 (0.15)		-0.18 (0.15)		-0.19 (0.14)
Observations	167,952	106,848	167,952	106,848	167,952	106,848
R-squared	0.03	0.08	0.03	0.08	0.03	0.08

Table IA-III: Fund Deletions: Fund Distress.

The table reports the coefficient estimates for the three models described in Table IA-II augmented by information on the capital flows of the fund's non-DC clients. In particular, we add the following additional explanatory variables. $NonDC\ Flow_{f,t-1} < 0$ is an indicator variable for whether the non-DC flows of the fund in year $t - 1$ are negative. $Missing\ NonDC\ Flow_{f,t-1}$ is an indicator that takes the value of one if information on the non-DC flows of the fund in year $t - 1$ is missing. We also interact these variables with our *Affiliated* dummy. The other lagged control variables Z include the maximum return correlation of the fund with existing menu options, the natural logarithm of option size, the number of options, the expense ratio, fund turnover, the natural logarithm of the fund's size, fund age, the standard deviation of the fund's return, and indicator variables for calendar years and investment styles. The logit and linear probability estimates are shown in Panels A and B, respectively. Standard errors - reported in parentheses - are clustered at the fund level. Significance levels are denoted by *, **, ***, which correspond to 10%, 5%, and 1% levels, respectively.

Panel A: Logit Model						
	Linear Model		Two-Segment Model		Three-Segment Model	
Affiliated	-0.65*** (0.08)	-0.58*** (0.09)	-0.64*** (0.09)	-0.71*** (0.10)	-0.64*** (0.13)	-0.78*** (0.15)
LowPerf			-2.02*** (0.11)	-1.69*** (0.12)	-2.19*** (0.34)	-1.97*** (0.39)
LowPerf×Affiliated			0.50** (0.20)	0.74*** (0.22)	0.62 (0.66)	1.49** (0.75)
Midperf	-1.48*** (0.06)	-0.99*** (0.06)			-1.64*** (0.07)	-1.21*** (0.08)
MidPerf×Affiliated	0.47*** (0.10)	0.26** (0.11)			0.43*** (0.14)	0.26* (0.15)
HighPerf			-0.97*** (0.12)	-0.34*** (0.11)	0.51 (0.41)	1.78*** (0.37)
HighPerf×Affiliated			0.43** (0.20)	-0.17 (0.21)	0.69 (0.76)	-0.74 (0.79)
NonDC Flow<0	0.49*** (0.03)	0.31*** (0.03)	0.49*** (0.03)	0.31*** (0.03)	0.49*** (0.03)	0.31*** (0.03)
NonDC Flow<0×Affiliated	-0.21*** (0.06)	-0.05 (0.07)	-0.21*** (0.06)	-0.06 (0.07)	-0.22*** (0.06)	-0.06 (0.07)
Missing NonDC Flow	0.39*** (0.04)	0.11*** (0.04)	0.38*** (0.04)	0.10** (0.04)	0.38*** (0.04)	0.10** (0.04)
Missing NonDC Flow×Affiliated	0.05 (0.07)	-0.03 (0.08)	0.04 (0.07)	-0.02 (0.08)	0.03 (0.07)	-0.03 (0.08)
Maximum Corr		0.08*** (0.00)		0.09*** (0.00)		0.09*** (0.00)
Log(Option Size)		-0.08*** (0.01)		-0.07*** (0.01)		-0.07*** (0.01)
No. of Options		-0.02*** (0.00)		-0.02*** (0.00)		-0.02*** (0.00)
Exp. Ratio		0.59*** (0.06)		0.57*** (0.06)		0.57*** (0.06)
Turnover		0.10*** (0.01)		0.10*** (0.01)		0.10*** (0.01)
Log(Fund Size)		-0.16*** (0.01)		-0.16*** (0.01)		-0.16*** (0.01)
Fund Age		0.01 (0.01)		0.01 (0.01)		0.01 (0.01)
Std. Dev.		-0.19 (1.07)		-0.79 (1.05)		-0.87 (1.03)
Observations	167,952	106,848	167,952	106,848	167,952	106,848
Pseudo R-squared	0.05	0.10	0.05	0.10	0.05	0.10

Panel B: Linear Probability Model

	Linear Model		Two-Segment Model		Three-Segment Model	
Affiliated	-0.07*** (0.01)	-0.08*** (0.01)	-0.10*** (0.01)	-0.12*** (0.02)	-0.10*** (0.02)	-0.14*** (0.03)
LowPerf			-0.28*** (0.03)	-0.30*** (0.03)	-0.44*** (0.08)	-0.51*** (0.11)
LowPerf×Affiliated			0.16*** (0.03)	0.22*** (0.04)	0.26** (0.12)	0.44** (0.18)
Midperf	-0.16*** (0.01)	-0.15*** (0.01)			-0.17*** (0.01)	-0.17*** (0.02)
MidPerf×Affiliated	0.09*** (0.01)	0.09*** (0.02)			0.09*** (0.02)	0.10*** (0.02)
HighPerf			-0.07*** (0.02)	-0.04* (0.02)	0.09* (0.05)	0.22*** (0.07)
HighPerf*Affiliated			0.04 (0.02)	-0.01 (0.03)	0.00 (0.06)	-0.14 (0.09)
Lag(NonDC Flow<0)	0.05*** (0.01)	0.04*** (0.01)	0.05*** (0.01)	0.04*** (0.01)	0.05*** (0.01)	0.04*** (0.01)
Lag(NonDC Flow<0)×Affiliated	-0.04*** (0.01)	-0.03*** (0.01)	-0.04*** (0.01)	-0.03*** (0.01)	-0.04*** (0.01)	-0.03*** (0.01)
Missing NonDC Flow	0.03*** (0.01)	0.02* (0.01)	0.03*** (0.01)	0.01* (0.01)	0.03*** (0.01)	0.01* (0.01)
Missing NonDC Flow×Affiliated	-0.01 (0.01)	-0.03*** (0.01)	-0.01 (0.01)	-0.03*** (0.01)	-0.01 (0.01)	-0.03*** (0.01)
Maximum Corr		0.01*** (0.00)		0.01*** (0.00)		0.01*** (0.00)
Log(Option Size)		-0.01*** (0.00)		-0.01*** (0.00)		-0.01*** (0.00)
No. of Options		-0.00*** (0.00)		-0.00*** (0.00)		-0.00*** (0.00)
Exp. Ratio		0.08*** (0.01)		0.07*** (0.01)		0.07*** (0.01)
Turnover		0.02*** (0.00)		0.02*** (0.00)		0.02*** (0.00)
Log(Fund Size)		-0.02*** (0.00)		-0.02*** (0.00)		-0.02*** (0.00)
Fund Age		-0.00 (0.00)		0.00 (0.00)		0.00 (0.00)
Std. Dev.		-0.09 (0.15)		-0.18 (0.15)		-0.19 (0.14)
Observations	167,952	106,848	167,952	106,848	167,952	106,848
R-squared	0.03	0.08	0.03	0.08	0.03	0.08

Table IA-IV: Linear Probability Model for Fund Deletions: Subsample Analysis.

The table reports the OLS coefficient estimates from a linear probability specification for our baseline two-segment piecewise linear model for fund deletions described in equation (1) in the paper for various subsamples of our data. Columns 1 and 2 estimate our results for plans with below and above median asset size. We estimate the model by excluding the three largest trustees each year in the fourth column and for the three largest trustees each year in the fifth column. Finally, in columns 7 and 8, we divide our sample into the subperiods 1998-2006 and 2007-2009, respectively. The differences in the coefficients between the various subsamples are summarized in columns 3, 6, and 9. The regressions include indicator variables for calendar years and investment styles. Standard errors in this table are clustered at the fund level and are reported in parentheses. Significance levels are denoted by *, **, ***, which correspond to 10%, 5%, and 1% levels, respectively.

	Small Plans		Large Plans		Small Trustees		Large Trustees		1998-2006		2007-2009		Diff.
		Diff.		Diff.		Diff.		Diff.		Diff.		Diff.	
Affiliated	-0.17*** (0.02)	0.03 (0.02)	-0.14*** (0.02)	0.03 (0.02)	-0.18*** (0.03)	-0.04 (0.04)	-0.14*** (0.02)	-0.18*** (0.03)	-0.16*** (0.02)	-0.13*** (0.03)	-0.13*** (0.03)	0.03 (0.03)	
LowPerf	-0.33*** (0.03)	-0.00 (0.04)	-0.33*** (0.04)	-0.00 (0.04)	-0.39*** (0.06)	-0.08 (0.06)	-0.31*** (0.03)	-0.39*** (0.06)	-0.33*** (0.04)	-0.31*** (0.05)	-0.31*** (0.05)	0.01 (0.06)	
LowPerf×Affiliated	0.28*** (0.05)	-0.04 (0.05)	0.23*** (0.05)	-0.04 (0.05)	0.31*** (0.08)	0.10 (0.09)	0.21*** (0.06)	0.31*** (0.08)	0.22*** (0.05)	0.25*** (0.06)	0.25*** (0.06)	0.03 (0.08)	
HighPerf	-0.07*** (0.02)	0.04 (0.02)	-0.03 (0.03)	0.04 (0.02)	-0.11*** (0.04)	-0.07* (0.04)	-0.04** (0.02)	-0.11*** (0.04)	0.02 (0.03)	-0.12*** (0.03)	-0.12*** (0.03)	-0.14*** (0.04)	
HighPerf×Affiliated	0.01 (0.03)	-0.02 (0.03)	-0.02 (0.03)	-0.02 (0.03)	0.06 (0.05)	0.09* (0.06)	-0.04 (0.04)	0.06 (0.05)	-0.02 (0.04)	0.02 (0.03)	0.02 (0.03)	0.04 (0.05)	
Maximum Corr	0.01*** (0.00)	-0.00 (0.00)	0.01*** (0.00)	-0.00 (0.00)	0.01*** (0.00)	0.00 (0.00)	0.01*** (0.00)	0.01*** (0.00)	0.01*** (0.00)	0.01*** (0.00)	0.01*** (0.00)	-0.00 (0.00)	
Log(Option Size)	-0.00 (0.00)	-0.02*** (0.00)	-0.02*** (0.00)	-0.02*** (0.00)	-0.01*** (0.00)	0.00** (0.00)	-0.01*** (0.00)	-0.01*** (0.00)	-0.01*** (0.00)	-0.01*** (0.00)	-0.01*** (0.00)	0.00** (0.00)	
No. of Options	-0.00*** (0.00)	-0.00*** (0.00)	-0.00*** (0.00)	-0.00*** (0.00)	-0.00*** (0.00)	-0.00*** (0.00)	-0.00*** (0.00)	-0.00*** (0.00)	-0.00*** (0.00)	-0.00*** (0.00)	-0.00*** (0.00)	0.00*** (0.00)	
Exp. Ratio	0.07*** (0.01)	0.02** (0.01)	0.09*** (0.01)	0.02** (0.01)	0.15*** (0.02)	0.09*** (0.02)	0.06*** (0.01)	0.15*** (0.02)	0.07*** (0.01)	0.09*** (0.01)	0.09*** (0.01)	0.02* (0.01)	
Turnover	0.01*** (0.00)	0.01*** (0.00)	0.03*** (0.00)	0.01*** (0.00)	0.03*** (0.01)	0.01* (0.01)	0.01*** (0.00)	0.03*** (0.01)	0.01*** (0.00)	0.02*** (0.01)	0.02*** (0.01)	0.01 (0.01)	
Log(Fund Size)	-0.02*** (0.00)	0.01*** (0.00)	-0.01*** (0.00)	0.01*** (0.00)	-0.02*** (0.00)	-0.00 (0.00)	-0.02*** (0.00)	-0.02*** (0.00)	-0.02*** (0.00)	-0.02*** (0.00)	-0.02*** (0.00)	-0.01* (0.00)	
Fund Age	0.00 (0.00)	-0.00 (0.00)	0.00 (0.00)	-0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	-0.00 (0.00)	
Std. Dev.	-0.25 (0.16)	0.15 (0.19)	-0.10 (0.19)	0.15 (0.19)	-0.83*** (0.24)	-0.82*** (0.24)	-0.01 (0.15)	-0.83*** (0.24)	0.05 (0.15)	-1.30*** (0.37)	-1.30*** (0.37)	-1.35*** (0.39)	
Observations	47,559	52,697	52,697	69,912	36,936	36,936	69,912	36,936	54,547	52,301	52,301	52,301	
R-squared	0.07	0.10	0.10	0.06	0.13	0.13	0.06	0.13	0.08	0.08	0.08	0.08	

Table IA-V: Fund Deletions: Additional Robustness Tests.

The table reports the coefficient estimates of our piecewise linear two-segment fund deletion model described in equation (1) in the paper for two alternative performance evaluation horizons and various subsamples. Panel A summarizes the coefficient estimates from the logit specification, while Panel B reports the coefficients of the linear probability model. In columns 1 and 2, we calculate the performance percentile rank of each fund based on previous one year and five year performance. In columns 3 and 4, we show that our results remain after controlling for indicator variables for individual trustees and funds, respectively. Column 5 only includes mutual fund trustees and column 6 only considers mutual fund trustees that have at least ten funds in their families. Column 7 re-estimates our results by excluding trustee changes. Column 8 excludes target date funds, column 9 excludes all non-equity funds, and column 10 reports results for actively managed funds. The regressions include indicator variables for calendar years and investment styles. Standard errors - reported in parentheses - are clustered at the fund level. Significance levels are denoted by *, **, ***, which correspond to 10%, 5%, and 1% levels, respectively.

	Panel A: Logit Model									
	1-Year Perf.	5-Year Perf.	Include Trustee Indicator Variables	Include Fund Indicator Variables	Only Fund Trustees	Fund Trustees With \geq 10 Funds	Exclude Trustee Changes	Exclude Target Funds	Only Equity Funds	Only Active Funds
Affiliated	-0.67*** (0.08)	-0.45*** (0.10)	-0.92*** (0.10)	-0.92*** (0.11)	-0.88*** (0.10)	-0.92*** (0.10)	-0.73*** (0.10)	-0.70*** (0.09)	-0.38*** (0.11)	-0.73*** (0.09)
LowPerf	-1.16*** (0.10)	-0.94*** (0.13)	-1.91*** (0.12)	-1.70*** (0.14)	-1.79*** (0.13)	-1.73*** (0.16)	-1.97*** (0.13)	-2.01*** (0.12)	-2.24*** (0.13)	-1.85*** (0.12)
LowPerf×Affiliated	0.75*** (0.21)	-0.24 (0.24)	0.86*** (0.22)	0.81*** (0.25)	0.81*** (0.24)	0.75*** (0.25)	0.88*** (0.24)	0.56** (0.22)	-0.07 (0.28)	0.89*** (0.22)
HighPerf	-0.14 (0.11)	-1.13*** (0.11)	-0.48*** (0.11)	-0.40*** (0.13)	-0.39*** (0.13)	-0.46*** (0.15)	-0.39*** (0.13)	-0.44*** (0.11)	-0.67*** (0.13)	-0.48*** (0.11)
HighPerf×Affiliated	-0.47** (0.22)	0.55** (0.22)	-0.03 (0.22)	0.35 (0.24)	-0.17 (0.23)	-0.16 (0.25)	-0.23 (0.24)	0.09 (0.22)	0.16 (0.36)	-0.30 (0.23)
Maximum Corr	0.09*** (0.00)	0.08*** (0.00)	0.09*** (0.00)	0.16*** (0.01)	0.09*** (0.01)	0.10*** (0.01)	0.08*** (0.01)	0.09*** (0.00)	0.11*** (0.01)	0.08*** (0.00)
Log(Option Size)	-0.07*** (0.01)	-0.08*** (0.01)	-0.08*** (0.01)	-0.08*** (0.01)	-0.08*** (0.01)	-0.09*** (0.02)	-0.07*** (0.01)	-0.08*** (0.01)	-0.10*** (0.01)	-0.08*** (0.01)
No. of Options	-0.02*** (0.00)	-0.02*** (0.00)	-0.02*** (0.00)	-0.03*** (0.01)	-0.02*** (0.00)	-0.02*** (0.00)	-0.02*** (0.00)	-0.02*** (0.00)	-0.02*** (0.00)	-0.02*** (0.00)
Exp. Ratio	0.62*** (0.06)	0.62*** (0.06)	0.68*** (0.05)	-0.30* (0.16)	0.61*** (0.07)	0.66*** (0.07)	0.56*** (0.06)	0.57*** (0.06)	0.41*** (0.06)	0.56*** (0.06)
Turnover	0.09*** (0.01)	0.10*** (0.01)	0.09*** (0.01)	0.05** (0.02)	0.09*** (0.02)	0.12*** (0.02)	0.10*** (0.02)	0.09*** (0.01)	0.14*** (0.03)	0.10*** (0.01)
Log(Fund Size)	-0.17*** (0.01)	-0.14*** (0.01)	-0.17*** (0.01)	-0.31*** (0.03)	-0.16*** (0.01)	-0.17*** (0.01)	-0.16*** (0.01)	-0.15*** (0.01)	-0.18*** (0.01)	-0.16*** (0.01)
Fund Age	0.02*** (0.01)	0.00 (0.01)	0.02*** (0.01)	0.12 (0.16)	0.01 (0.01)	0.02* (0.01)	0.01 (0.01)	0.01 (0.01)	-0.00 (0.01)	0.01* (0.01)
Std. Dev.	-3.15*** (1.04)	0.00 (0.98)	-1.80* (0.98)	-6.60*** (1.14)	-0.94 (1.18)	-1.63 (1.35)	0.43 (1.22)	0.13 (0.98)	2.98*** (0.94)	-0.02 (1.03)
Observations	106,848	106,848	100,133	103,523	86,761	72,879	96,168	92,235	56,588	95,809
Pseudo R-squared	0.09	0.09	0.12	0.17	0.11	0.12	0.10	0.08	0.09	0.09

Panel B: Linear Probability Model

	1-Year Perf.	5-Year Perf.	Include Trustee FE	Include Fund FE	Only Fund Trustees	Fund Trustees With \geq 10 Funds	Exclude Trustee Changes	Exclude Target Funds	Only Equity Funds	Only Active Funds
Affiliated	-0.11*** (0.01)	-0.11*** (0.02)	-0.17*** (0.02)	-0.15*** (0.01)	-0.17*** (0.02)	-0.18*** (0.02)	-0.14*** (0.02)	-0.14*** (0.02)	-0.10*** (0.02)	-0.15*** (0.02)
LowPerf	-0.18*** (0.03)	-0.20*** (0.04)	-0.32*** (0.03)	-0.28*** (0.02)	-0.33*** (0.04)	-0.32*** (0.04)	-0.31*** (0.03)	-0.37*** (0.03)	-0.40*** (0.04)	-0.32*** (0.03)
LowPerf×Affiliated	0.17*** (0.03)	0.10* (0.05)	0.23*** (0.04)	0.21*** (0.03)	0.27*** (0.05)	0.26*** (0.05)	0.25*** (0.04)	0.21*** (0.05)	0.10* (0.05)	0.26*** (0.04)
HighPerf	-0.02 (0.02)	-0.14*** (0.02)	-0.06*** (0.02)	-0.04*** (0.01)	-0.05* (0.03)	-0.06** (0.03)	-0.04* (0.02)	-0.04* (0.02)	-0.07*** (0.02)	-0.06** (0.02)
HighPerf×Affiliated	-0.04 (0.03)	0.10*** (0.03)	0.01 (0.03)	0.05*** (0.02)	-0.01 (0.03)	-0.01 (0.03)	-0.02 (0.03)	0.03 (0.03)	0.08* (0.04)	-0.03 (0.03)
Maximum Corr	0.01*** (0.00)	0.01*** (0.00)	0.01*** (0.00)	0.02*** (0.00)	0.01*** (0.00)	0.01*** (0.00)	0.01*** (0.00)	0.01*** (0.00)	0.01*** (0.00)	0.01*** (0.00)
Log(Option Size)	-0.01*** (0.00)	-0.01*** (0.00)	-0.01*** (0.00)	-0.01*** (0.00)	-0.01*** (0.00)	-0.01*** (0.00)	-0.01*** (0.00)	-0.01*** (0.00)	-0.01*** (0.00)	-0.01*** (0.00)
No. of Options	-0.00*** (0.00)	-0.00*** (0.00)	-0.00*** (0.00)	-0.00*** (0.00)	-0.00*** (0.00)	-0.00*** (0.00)	-0.00*** (0.00)	-0.00*** (0.00)	-0.00*** (0.00)	-0.00*** (0.00)
Exp. Ratio	0.08*** (0.01)	0.08*** (0.01)	0.09*** (0.01)	-0.04** (0.02)	0.08*** (0.01)	0.08*** (0.01)	0.07*** (0.01)	0.08*** (0.01)	0.05*** (0.01)	0.07*** (0.01)
Turnover	0.02*** (0.00)	0.02*** (0.00)	0.02*** (0.00)	0.01** (0.00)	0.02*** (0.00)	0.02*** (0.01)	0.02*** (0.00)	0.01*** (0.00)	0.02*** (0.01)	0.02*** (0.00)
Log(Fund Size)	-0.02*** (0.00)	-0.02*** (0.00)	-0.02*** (0.00)	-0.05*** (0.00)	-0.02*** (0.00)	-0.02*** (0.00)	-0.02*** (0.00)	-0.02*** (0.00)	-0.02*** (0.00)	-0.02*** (0.00)
Fund Age	0.00 (0.00)	-0.00 (0.00)	0.00 (0.00)	-0.01 (0.03)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	-0.00 (0.00)	0.00 (0.00)
Std. Dev.	-0.48*** (0.15)	-0.08 (0.15)	-0.27** (0.13)	-0.80*** (0.14)	-0.17 (0.15)	-0.24 (0.16)	-0.04 (0.15)	0.02 (0.14)	0.35** (0.18)	-0.09 (0.15)
Observations	106,848	106,848	101,190	106,848	86,761	72,879	96,168	92,235	56,588	95,809
R-squared	0.07	0.08	0.11	0.18	0.09	0.09	0.07	0.08	0.09	0.08

Table IA-VI: Fund Additions by Performance Deciles

The table summarizes mean annual fund addition frequencies (as a %) by affiliation and performance deciles. Panels A and C include the full sample. Panels B and D include only those funds which are offered by fund families that serve as trustees for at least one plan in our sample. Every year, we calculate the ratio of the number of affiliated (unaffiliated) menus to which the fund is added during the year to the total number of affiliated (unaffiliated) menus that do not yet include the fund as an option at the beginning of the year. Performance deciles are created by grouping funds based on their percentile performance among funds of the same style in the CRSP fund universe over the prior three years. We then average across the funds' addition frequencies by performance and affiliation. Significance levels for tests of the difference in means are based on standard errors that are clustered at the fund level in Panels A and B and are denoted by *, **, ***, which correspond to 10%, 5%, and 1% levels, respectively. In Panels C and D, we report Fama-MacBeth coefficients and Newey-West standard errors using a lag length of 3.

Panel A: All Funds

Performance Decile	1 Year			3 Years			5 Years		
	A	UA	A-UA	A	UA	A-UA	A	UA	A-UA
1	1.16	0.01	1.15***	0.75	0.01	0.74***	0.67	0.01	0.67***
2	0.77	0.01	0.76***	0.60	0.01	0.59***	0.51	0.01	0.51***
3	1.18	0.01	1.17***	0.88	0.01	0.87***	1.06	0.01	1.05***
4	1.27	0.02	1.26***	1.14	0.01	1.13***	0.84	0.01	0.82***
5	1.20	0.02	1.18***	1.17	0.02	1.15***	0.94	0.02	0.93***
6	1.33	0.02	1.30***	1.48	0.02	1.46***	1.24	0.02	1.22***
7	1.29	0.02	1.27***	1.55	0.02	1.53***	1.65	0.02	1.63***
8	1.46	0.03	1.43***	1.40	0.03	1.38***	1.72	0.03	1.69***
9	1.76	0.03	1.73***	2.04	0.04	2.00***	2.37	0.05	2.33***
10	1.84	0.04	1.81***	2.25	0.04	2.21***	2.30	0.04	2.25***
10-1	0.68**	0.03***	0.65**	1.51***	0.04***	1.47***	1.63***	0.04***	1.59***

Panel B: Subsample of Funds on Both Affiliated and Unaffiliated Menus

Performance Decile	1 Year			3 Years			5 Years		
	A	UA	A-UA	A	UA	A-UA	A	UA	A-UA
1	1.16	0.02	1.14***	0.75	0.01	0.74***	0.67	0.01	0.66***
2	0.77	0.01	0.76***	0.60	0.01	0.59***	0.51	0.01	0.51***
3	1.18	0.02	1.16***	0.88	0.01	0.86***	1.06	0.02	1.05***
4	1.27	0.03	1.25***	1.14	0.02	1.12***	0.84	0.02	0.81***
5	1.20	0.03	1.17***	1.17	0.03	1.13***	0.94	0.03	0.91***
6	1.33	0.04	1.29***	1.48	0.04	1.44***	1.24	0.03	1.21***
7	1.29	0.04	1.26***	1.55	0.04	1.51***	1.65	0.04	1.61***
8	1.46	0.04	1.41***	1.40	0.04	1.36***	1.72	0.04	1.68***
9	1.76	0.05	1.71***	2.04	0.06	1.98***	2.37	0.07	2.31***
10	1.84	0.05	1.80***	2.25	0.06	2.19***	2.30	0.06	2.23***
10-1	0.68**	0.03***	0.65**	1.51***	0.05***	1.46***	1.63***	0.06***	1.57***

Panel C: All Funds, Fama-MacBeth Tests

Performance	1 Year			3 Years			5 Years		
	A	UA	A-UA	A	UA	A-UA	A	UA	A-UA
Decile	A	UA	A-UA	A	UA	A-UA	A	UA	A-UA
1	1.01	0.01	1.00**	0.72	0.01	0.72**	0.65	0.01	0.65**
2	0.72	0.01	0.71***	0.54	0.01	0.54***	0.51	0.01	0.50***
3	1.18	0.01	1.17***	0.85	0.01	0.84***	1.04	0.01	1.02***
4	1.30	0.02	1.28***	1.12	0.01	1.11***	0.81	0.01	0.80***
5	1.18	0.02	1.16***	1.13	0.02	1.12***	0.91	0.02	0.90***
6	1.31	0.02	1.28***	1.46	0.02	1.43***	1.22	0.02	1.20***
7	1.27	0.02	1.24***	1.52	0.03	1.49***	1.60	0.03	1.57***
8	1.47	0.03	1.44***	1.39	0.03	1.36***	1.70	0.04	1.67***
9	1.75	0.04	1.71***	2.00	0.05	1.95***	2.35	0.05	2.30***
10	1.84	0.04	1.80***	2.19	0.05	2.14***	2.26	0.05	2.21***
10-1	0.84	0.03***	0.81	1.47*	0.04***	1.43*	1.61**	0.04***	1.56**

Panel D: Subsample of Funds on Both Affiliated and Unaffiliated Menus, Fama-MacBeth Tests

Performance	1 Year			3 Years			5 Years		
	A	UA	A-UA	A	UA	A-UA	A	UA	A-UA
Decile	A	UA	A-UA	A	UA	A-UA	A	UA	A-UA
1	1.01	0.02	0.99**	0.72	0.01	0.71**	0.65	0.01	0.64**
2	0.72	0.01	0.71***	0.54	0.01	0.53***	0.51	0.01	0.50***
3	1.18	0.02	1.16***	0.85	0.01	0.84***	1.04	0.02	1.02***
4	1.30	0.03	1.28***	1.12	0.02	1.10***	0.81	0.02	0.79***
5	1.18	0.03	1.15***	1.13	0.03	1.10***	0.91	0.03	0.88***
6	1.31	0.04	1.27***	1.46	0.04	1.42***	1.22	0.03	1.18***
7	1.27	0.04	1.23***	1.52	0.04	1.48***	1.60	0.04	1.56***
8	1.47	0.04	1.43***	1.39	0.04	1.35***	1.70	0.04	1.66***
9	1.75	0.05	1.70***	2.00	0.06	1.94***	2.35	0.07	2.29***
10	1.84	0.05	1.80***	2.19	0.06	2.13***	2.26	0.06	2.20***
10-1	0.84	0.03**	0.81	1.47*	0.05***	1.42*	1.61**	0.05***	1.55**

Table IA-VII: Fund Additions: Additional Robustness Tests.

The table reports the logit coefficient estimates of our piecewise linear two-segment fund addition model described in equation (2) in the paper for two alternative performance evaluation horizons and various subsamples. In columns 1 and 2, we calculate the performance percentile rank of each fund based on previous one year and five year performance. In column 3 we only include mutual fund trustees and in column 4, we only consider mutual fund trustees that have at least ten funds in their families. Column 5 re-estimates our results by excluding trustee changes. Column 6 excludes target date funds, column 7 excludes all non-equity funds, and column 8 reports results for actively managed funds. The logit models include indicator variables for calendar years and investment styles. Standard errors are clustered at the fund level and are reported in parentheses. Significance levels are denoted by *, **, ***, which correspond to 10%, 5%, and 1% levels, respectively.

	1-Year Perf.	5-Year Perf.	Only Fund Trustees	Fund Trustees With \geq 10 Funds	Exclude Trustee Changes	Exclude Target Funds	Only Equity Funds	Only Active Funds
Affiliated	2.40*** (0.17)	2.65*** (0.22)	2.88*** (0.19)	3.00*** (0.19)	2.91*** (0.20)	2.78*** (0.20)	2.44*** (0.26)	2.76*** (0.19)
LowPerf	0.97*** (0.22)	0.50* (0.30)	1.28*** (0.31)	1.31*** (0.31)	1.04*** (0.31)	1.70*** (0.32)	2.32*** (0.43)	1.02*** (0.31)
LowPerf×Affiliated	-0.32 (0.44)	-0.74 (0.54)	-1.31*** (0.50)	-1.44*** (0.50)	-0.94* (0.53)	-1.54*** (0.52)	-0.99 (0.69)	-1.13** (0.51)
HighPerf	1.41*** (0.20)	2.57*** (0.21)	2.26*** (0.25)	2.27*** (0.27)	2.31*** (0.25)	2.38*** (0.25)	2.49*** (0.32)	2.44*** (0.25)
HighPerf×Affiliated	-0.71* (0.39)	-0.75* (0.39)	-0.38 (0.43)	-0.35 (0.44)	-0.58 (0.46)	-0.93** (0.41)	-1.51*** (0.51)	-0.51 (0.45)
Maximum Corr	0.74*** (0.18)	0.72*** (0.18)	0.71*** (0.20)	0.74*** (0.22)	0.77*** (0.20)	0.52*** (0.17)	0.56*** (0.19)	0.76*** (0.20)
No. of Options	0.01*** (0.00)	0.01*** (0.00)	0.01*** (0.00)	0.01*** (0.00)	0.01*** (0.00)	0.02*** (0.00)	0.02*** (0.00)	0.01*** (0.00)
Exp. Ratio	0.10 (0.08)	0.05 (0.08)	0.07 (0.08)	0.06 (0.09)	0.12 (0.08)	0.29*** (0.08)	0.41*** (0.08)	0.13 (0.08)
Turnover	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.05*** (0.01)	0.03*** (0.01)	0.00* (0.00)
Log(Fund Size)	0.73*** (0.04)	0.70*** (0.04)	0.71*** (0.04)	0.72*** (0.04)	0.70*** (0.04)	0.74*** (0.04)	0.76*** (0.04)	0.74*** (0.04)
Fund Age	-0.13*** (0.04)	-0.09** (0.04)	-0.11*** (0.04)	-0.11*** (0.04)	-0.10*** (0.04)	-0.08** (0.03)	-0.06* (0.03)	-0.12*** (0.04)
Std. Dev.	0.71 (0.67)	-4.14*** (1.25)	-4.08*** (1.29)	-4.73*** (1.38)	-3.67*** (1.30)	-5.39*** (1.15)	-6.06*** (1.54)	-3.73*** (1.29)
Observations	51,062,968	51,062,968	41,718,951	34,267,381	45,213,976	50,167,798	25,046,361	47,609,055
Pseudo R-squared	0.16	0.16	0.17	0.19	0.17	0.14	0.14	0.17

Table IA-VIII: Logit Model for Affiliated Fund Additions.

The table reports the coefficient estimates of the logit model for affiliated fund additions: $Prob(AF_{p,f,t}^{ADD} = 1) = \Lambda(Perf_{f,t-1}\beta_{Perf} + \mathbf{Z}_{p,f,t-1}^T\beta_{\mathbf{Z}})$, where $AF_{p,f,t}^{ADD}$ is an indicator variable equal to one if mutual fund f added to the plan p during year t is affiliated with the management company acting as the plan's trustee and zero otherwise. $Perf_{f,t-1}$ is the performance percentile of mutual fund f over the previous one, three, or five years and is included as a percentage. The overall performance percentile of each fund depends on the performance of the fund relative to other funds in CRSP in the same style. The other lagged control variables \mathbf{Z} include the number of options, the expense ratio, fund turnover, the natural logarithm of the fund's size, fund age, the standard deviation of the fund's return (all measured during the previous year), and unreported indicator variables for calendar years and investment styles. Standard errors are clustered at the fund level and are reported in parentheses. Significance levels are denoted by *, **, ***, which correspond to 10%, 5%, and 1% levels, respectively.

	1 Year	3 Years	5 Years
Perf (1 YR)	-0.71*** (0.12)		
Perf (3 YR)		-0.77*** (0.15)	
Perf (5 YR)			-0.77*** (0.17)
No. of Options	0.01*** (0.00)	0.01*** (0.00)	0.01*** (0.00)
Log(Plan Assets)	0.09*** (0.01)	0.09*** (0.01)	0.09*** (0.01)
Exp. Ratio	-1.00*** (0.18)	-1.01*** (0.18)	-1.01*** (0.18)
Turnover	-0.09 (0.08)	-0.09 (0.08)	-0.09 (0.08)
Log(Fund Size)	-0.05 (0.04)	-0.04 (0.04)	-0.03 (0.05)
Fund Age	-0.13** (0.06)	-0.14** (0.06)	-0.15** (0.06)
Std. Dev.	-0.28*** (0.10)	-0.24** (0.10)	-0.24** (0.10)
Constant	-0.80 (0.67)	-0.70 (0.67)	-0.73 (0.67)
Observations	20,483	20,483	20,483
Pseudo R-squared	0.14	0.14	0.14

Table IA-IX: Differences in the Abnormal Returns of Affiliated and Unaffiliated Funds.

Panels A, B, and C of the table report the difference in abnormal returns (α) across the affiliated and unaffiliated portfolios using the Fama-French-Carhart four-factor model (FFM), the Fama and French (1993) model, and the CAPM model, respectively, over our complete sample period using monthly fund return data. At the end of each calendar year, we form equal-weighted portfolios of trustee and non-trustee domestic equity funds separately based on whether the funds were kept on, deleted from, or added to the 401(k) menu (“No Changes,” “Deletions,” and “Additions”) during the calendar year. This creates six portfolios. We then further subdivide these six groups based on past performance. In particular, “All Funds,” refers to the overall six portfolios and “Lowest Quintile,” (“Lowest Decile”) refers to a sub-portfolio in each group that contains only those funds that also rank in the lowest performance quintile (decile) relative to funds in their style in CRSP during the prior three years. The performance measures are reported in % per month. Robust standard errors are reported in parentheses. Significance levels are denoted by *, **, ***, which correspond to 10%, 5%, and 1% levels, respectively.

Panel A: Carhart Alpha Differences			
	No Changes	Deletions	Additions
Lowest Decile	-0.25** (0.12)	-0.13 (0.16)	-0.10 (0.22)
Lowest Quintile	-0.10 (0.07)	-0.06 (0.12)	-0.09 (0.13)
All Funds	0.06** (0.02)	0.02 (0.04)	0.06* (0.03)

Panel B: Fama-French Alpha Differences			
	No Changes	Deletions	Additions
Lowest Decile	-0.26** (0.13)	-0.13 (0.17)	-0.15 (0.23)
Lowest Quintile	-0.10 (0.07)	-0.06 (0.13)	-0.09 (0.14)
All Funds	0.06** (0.02)	0.02 (0.03)	0.06* (0.03)

Panel C: CAPM Alpha Differences			
	No Changes	Deletions	Additions
Lowest Decile	-0.32* (0.16)	-0.25 (0.21)	-0.37 (0.32)
Lowest Quintile	-0.09 (0.07)	-0.19 (0.18)	-0.15 (0.21)
All Funds	0.03 (0.03)	-0.01 (0.04)	0.02 (0.06)