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It Pays to Set the Menu: Mutual Fund Investment Options in 401(k) plans

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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 funds. Using a hand-collected dataset on retirement investment options, we show that poorly-performing funds are less likely to be removed from and more likely to be added to a 401(k) menu if they are affiliated with the plan trustee. 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 these trustee decisions are not information driven.

JEL Classification: G23, J23

Keywords: 401(k), pension plans, trustee, favoritism, mutual funds

1 Introduction

Employer-sponsored defined contribution (DC) accounts have gained significant importance around the world. In the United States, the value of 401(k) assets reached $4.2 trillion in 2013. The growth represents important business opportunities for mutual funds as they manage approximately half of the 401(k) investment pool.[1] Moreover, mutual fund families often play an active role in creating the menu of investment options as – in addition to asset management services – they also provide administrative services in these employee benefit plans.

Fund families involved in the plan's design often face conflicting incentives. While they have an incentive to include their own proprietary funds on the menu even when more suitable options are available from other fund families,[2] they are also pressured by plan sponsors to create menus that serve the interests of plan participants. 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 funds on the investment menu and subsequently reluctant to remove them. Additionally, they may also be less sensitive to the performance of their own funds in menu altering decisions as they have an incentive to support poorly-performing proprietary funds or, more generally, those that are experiencing significant cash outflows (Coval and Stafford, 2007).

[1] Federal Reserve Statistical Releases and Investment Company Institute (ICI).

[2] See the U.S. Government Accountability Office (2011) report on "Improved Regulation Could Better Protect Participants from Conflicts of Interest".

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 trusteed 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 an 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. Affiliated funds are more likely to be added and less likely to be removed from 401(k) plans. The biggest difference between how affiliated and unaffiliated funds are treated on the menu 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 past performance (among the universe of funds in the same style category over the prior 36 months), are approximately twice as likely to be deleted from those menus on which they are unaffiliated with the trustee than from those on which they are affiliated with the trustee. Protecting poorly-performing funds by keeping them on the menu helps mutual fund families to dampen the outflow of capital triggered by bad performance and, as a result, mitigates fund distress.

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 investigate 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 previous studies documenting that DC pension 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 biased behavior of mutual fund companies.

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 strong preference for these funds not because they are necessarily biased toward them, but rather, due to positive 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 they 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. Our 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 mutual fund families overinvest in the sponsoring company's stock. They also show that when other mutual funds sell the stock, trustee funds 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 mutual fund literature on favoritism within fund families. Gaspar, Massa, and Matos (2006) show that mutual fund families strategically transfer performance across member funds to favor those funds that are more likely to increase overall family profits. Reuter (2006) provides evidence that lead underwriters will use allocations of underpriced IPOs to reward those institutions with which they have strong business relationships.[4] Our paper provides evidence that mutual fund families favor their own affiliated funds when they act as service providers of 401(k) pension plans.

The rest of the paper is structured as follows. Section 2 provides information on the institutional, economic, and legal background of DC plans. Section 3 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 4–6 discuss our results. Section 7 concludes.

[3]Benartzi and Thaler (2001), Madrian and Shea (2001), Choi et al. (2002, 2004), Del Guercio and Tkac (2002), Duflo and Saez (2002), Agnew, Balduzzi, and Sunden (2003), Huberman and Jiang (2006), Elton, Gruber, and Blake (2006, 2007), Brown, Liang, and Weisbenner (2007), Goyal and Wahal (2008), Carroll et al. (2009), Tang et al. (2010), Balduzzi and Reuter (2012), Brown and Harlow (2012), Mitchell and Utkus (2012), Goldreich and Halaburda (2013), Christoffersen and Simutin (2014), and Sialm, Starks, and Zhang (2014) study the structure of pension plans and provide evidence that retirement savers are subject to behavioral biases and rarely adjust their portfolios.

[4]Several additional papers study favoritism within asset management companies. 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 funds in their complex that experience liquidity shortfalls.

2 Institutional Background

401(k) menus are jointly determined by the plan sponsor (i.e., employer) and the plan's service providers. In this paper we use the term "service provider" to refer to those entities that provide administrative services to 401(k) plans. These services include trustee services (i.e., providing the safe holding of the plan's assets in a trust), recordkeeping services (i.e., maintaining plan records, processing contributions and distributions, and issuing statements), participant education (i.e., online or face-to-face investment education), and compliance services (i.e., preparation of forms and legal services).[5] These various services are often bundled and provided by a single entity. For example, over 90% of the mutual fund trustees in our sample are also recordkeepers of the same plan. In addition to these administrative services, mutual fund families often also serve as investment managers by offering their own funds as investment options on the menu.

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 administrative fees collected from the various investment options offered on the menu (i.e., asset-based fees), from sponsors (i.e., per plan fees), or from participants (i.e., per participant fees). In practice, per plan and per participant fees are less common. Instead, 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 service providers will receive a fixed proportion of assets under management from the unaffiliated investment management companies (i.e., a portion of the expense ratio

[5] A description of the services provided is available at: http://www.ici.org/pdf/per19-04.pdf.

these companies collect from participants). For example, if the revenue sharing proportion is 20 basis points, then unaffiliated mutual funds will return 20 basis points of their expense ratio to the service providers.[6] Such revenue sharing arrangements increase the incentives of service providers to include unaffiliated investment options in the plan.

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 mutual fund options on the menu, as we document in this study. In addition, service providers obtain access to plan 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) plan assets to an affiliated Individual Retirement Account (IRA) after they retire or leave their jobs.[7]

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 plan participants.[8] 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 401(k) plan design. Thus, sponsors may have the opportunity to reduce their own costs of administering a plan by allowing mutual fund providers to favor their own proprietary investment options on the menus.

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[6]The 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).

[7]The 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).

[8]See, *www.ici.org/pdf/rpt_11_dc_401k_fee_study.pdf*.

There are some safeguards that mitigate conflicts of interest in 401(k) plans. In particular, sponsors face constraints 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 has the requirement 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 there have been numerous lawsuits filed against plan sponsors and service providers alleging excessive or hidden fees or improper monitoring of options.[9]

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.[10] For example, mutual fund providers are motivated for legal reasons to outsource funds from unaffiliated mutual funds families if their own fund offerings are limited or specialized, as ERISA mandates plans to offer a diversified menu of options, 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.

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[9]ERISA rules are cited following Muir (2012) and are available at http://www.law.cornell.edu/uscode/text/29/chapter-18/subchapter-I/subtitle-B/part-4.
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/ebsa/publications/fiduciaryresponsibility.html). A discussion of 401(k) lawsuits can be found in http://online.wsj.com/article/SB10001424052970204777904576651133452868572.html.

[10]See, for example Ruiz-Zaiko and Williams (2007) on the effect of growing litigation uncertainty in the industry.

3 Data and Summary Statistics

This section describes the sample selection process and provides summary statistics for our sample of 401(k) menus.

3.1 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 an overall description of the plan, identifies the trustee of the plan, 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. The resulting dataset has more than 302,000 observations, containing information at the firm-year-plan-option level.

To obtain information on the mutual funds included in DC plans, 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 by combining information on the share classes 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 (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 as "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).[11]

3.2 Sample description

Table 1 describes the composition of our final sample by year. Our data covers 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 is representative of the universe of plans offered by public companies filing Form 5500 with the Department of Labor in terms of plan size, number of participants, and industry composition.[13]

In our sample, average plan size is approximately $324 million (with a median of $61 million). In 2009, our plans cover $376 billion in retirement assets and 9 million total participants. The typical 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%).

[11]Following the PPA, the Department of Labor added a new fiduciary protection to ERISA for Qualified Default Investment Alternatives (QDIA), such as target-date funds, traditional balanced funds, and managed account advice services.

[12]When 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.

[13]Our sample covers 30-35% of the 401(k) assets sponsored by publicly listed companies that report Form 5500.

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 trusteed 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.

To summarize the growing popularity of open architecture, we report three 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.[14] Additionally, we report 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. Indeed, in 1998, 66.4% of mutual fund trusteed menus offered funds from more than one family, while the corresponding figure is 91.1% in 2009. The table also shows an increase in the number of funds offered in the average plan over time.

Table 2 describes the characteristics of mutual funds that have been kept on, deleted from, or added to the menu by trustee affiliation. Standard errors of the difference between the mean characteristics of affiliated and unaffiliated funds are two-way clustered at the plan and fund levels.[15]

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. Thus,

[14]The average trustee share appears at first glance to be relatively low. However, this figure includes all plans in our sample, regardless of trustee type. Overall, we find that 47.1% of plans do not include affiliated funds. Trustee share amounts to 62.4% if we condition on plans that include at least one affiliated fund option.

[15]We 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 A-6 in the Internet Appendix.

the unconditional probability for a fund deletion is around 12% per year. 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.[16]

Overall, funds that are deleted have the lowest average performance across the three groups, as measured by their percentile performance among funds of the same style in the CRSP fund universe using the past three-year returns. Added funds are younger and come with better performance records than those that are kept or deleted.

The table also shows that affiliated funds tend to have lower expense ratios, lower turnover, and lower standard deviations of monthly returns. 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 these 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 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.

[16]Simultaneous deletions and additions are the most common menu changes. 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.

4 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 401(k) menus by deleting some investment options and adding others. In this section, we study these menu altering decisions to test whether mutual funds affiliated with the plan's trustee are treated preferentially relative to funds from other mutual fund companies.

4.1 Univariate Relationship 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.

To make the comparison between the deletion frequencies of affiliated and unaffiliated funds more meaningful, we also 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.[17] Funds are then grouped into decile portfolios based on their prior performance.

Figure 1 reports the 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 average deletion rates for each fund in each year in affiliated and unaffiliated 401(k) plans. We then average the deletion rates within the performance deciles by year. Finally, we average the decile deletion rates across time. Panel A shows the results

[17] We use the following style categories: "balanced," "bond," "domestic equity," "international equity," or "other."

based on all funds in our sample. The numbers above the bars denote the differences between the affiliated and unaffiliated deletion frequencies.[18] In Panel B, we focus only on 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.

The figure shows that affiliated funds are less likely to be deleted from a 401(k) plan than unaffiliated funds regardless of past performance. For example, the average affiliated fund has a deletion rate of 13.7% across all performance deciles, whereas an unaffiliated fund has an average deletion rate of 19.1%.

Furthermore, we find that the difference in deletion rates widens significantly if we focus on 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 actually 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 A of Table A-1 in the Internet Appendix tabulates the deletion frequencies for affiliated and unaffiliated

[18]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. Significance levels for the differences in deletion rates are based on standard errors that are clustered at the fund level.

funds, as well as the difference between them. In addition to the 36 month performance evaluation horizon, it also reports results for performance ranks based on prior one and five years. Panel B shows similar results for the subsample of funds that are simultaneously offered as both affiliated and unaffiliated funds.[19] 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 from the funds' non-retirement clients equal -3.5% for affiliated funds in decile 1 and 22.8% for affiliated funds in decile 10.[20] Thus, fund families reduce the volatility of fund flows by keeping those affiliated funds on the menu that otherwise experience large outflows.

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 service providers often introduce 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 the plan will add at least one new affiliated fund during the same year. On the other hand, if a plan deletes one or more unaffiliated funds, then there is only a 43.2% probability that the plan will add at least one other fund from the deleted fund's family.

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[19] In both panels, standard errors are clustered at the fund level. For additional robustness, Panels C and D in Table A-1 report the corresponding deletion frequencies using the Fama-MacBeth methodology.

[20] We compute investor money flows for DC and non-DC investors following Sialm, Starks, and Zhang (2014) using information collected from surveys conducted by *Pensions & Investments*. Money flow (i.e., growth rate of new money (NMG)) by non-DC investors is computed as $NMG_{f,t}^{NON-DC} = [NonDCAssets_{f,t} - NonDCAssets_{f,t-1} \times (1 + R_{f,t})]/[NonDCAssets_{f,t-1} \times (1 + R_{f,t})]$, where $R_{f,t}$ corresponds to the return of fund f in year t. We winsorize these money flows at the 95% level.

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

4.2 Multivariate Relation of Fund Deletions

To extend our univariate results in Section 4.1, we examine the performance sensitivity of affiliated and unaffiliated fund deletions using the following linear probability model:

$$\begin{aligned} DEL_{p,f,t} &= \beta_0 + \beta_1 AF_{p,f,t-1} + \beta_2 LowPerf_{p,f,t-1} + \beta_3 HighPerf_{p,f,t-1} \\ &+ \beta_4 AF_{p,f,t-1} \times LowPerf_{p,f,t-1} + \beta_5 AF_{p,f,t-1} \times HighPerf_{p,f,t-1} \\ &+ Z'_{p,f,t-1}\gamma + \epsilon_{p,f,t}, \end{aligned} \tag{1}$$

where $DEL_{p,f,t}$ is an indicator variable that takes the value of one if mutual fund f has been 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 $t-1$, and $Z_{p,f,t-1}$ is a vector of relevant lagged control variables.

In our baseline model described in equation (1), we use two performance segments, evaluating 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 $HighPerf_{p,f,t-1} = max(Perf_{p,f,t-1} - 0.5, 0)$, where $Perf_{p,f,t-1}$ is the performance percentile of mutual fund f over the previous three years. Performance percentiles 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. In some specifications we constrain the sensitivity of deletions to depend linearly on performance. For robustness, we also estimate our model using quintile-based performance segments following Sirri and Tufano (1998) in the Internet Appendix.

To control for potential redundancies among menu options, which may lead to fund dele-

tions, we add an explanatory variable "$MaximumCorr$," which captures the highest pairwise correlation between each option and all other mutual fund investment choices on the menu. The other control variables in $Z_{p,f,t-1}$ 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 specific fund types (e.g., domestic equity, international equity, balanced, bond, target date, index, and money market funds) and year fixed effects. Favoritism toward affiliated funds implies that, all else equal, affiliated funds are less likely to be delisted (i.e., $\beta_1 < 0$) and that affiliated deletions are less sensitive to prior performance (i.e., $\beta_3 > 0$).

In the first two columns of Table 3 we report the coefficient estimates for the linear performance model and our baseline two-segment specification, respectively. We estimate equation (1) and the corresponding linear specification using a linear probability model, which allows for a straightforward interpretation of the piecewise linear terms and the corresponding interactions. The standard errors in the table are two-way clustered at the plan and fund levels.[21] Consistent with Figure 1 we find that affiliated funds – and especially poorly performing affiliated funds – are significantly less likely to be deleted. For example, based on the results in column 1, affiliated funds are 10.5% 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 1.67%, whereas the same performance increase for an affiliated fund decreases the probability of deletion by only 0.64%. Thus, the sensitivity of deletions to inferior fund performance is less than half of that of unaffiliated funds. The

[21] In Table A-2 of the Appendix we report the corresponding marginal effects using a probit specification. The interaction terms are calculated using the INTEFF command based on Ai and Norton (2003). Figures A-1–A-3 of the Appendix display the individual marginal effect estimates of the interaction terms for each observation of our sample along with the corresponding z-statistics. The findings in the table and the corresponding INTEFF graphs are qualitatively identical to those in Table 3.

two-segment specification summarized in the second column of Table 3 indicates that most of the performance sensitivity is driven by below-median funds.[22]

The additional control variables indicate that funds that are more correlated with 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 4.1 above, protecting poorly performing affiliated funds may be especially important as keeping these funds on the menu dampens the outflow of capital triggered by bad performance and, as a result, mitigates distress.

To provide further evidence on the trustee's incentive to support distressed funds, we now examine the role of non-DC money flows in more detail. In particular, 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 Fund' dummy. Non-DC flows are calculated as $NonDCAssets_{f,t} - NonDCAssets_{f,t-1} \times (1 + R_{f,t})$ based on footnote 20 above.

The last two columns of Table 3 report the results of adding these two additional explanatory variables to the models in columns 1 and 2. The coefficient estimates on '$NegNonDCFlow$' are positive and highly significant suggesting that plans are more likely to delete those unaffil-

[22]In a robustness test reported in Table A-3 in the Appendix, we compute two alternative ranking methods, where the percentile performance of a fund is either measured relative to the other investment options in a specific 401(k) plan or relative to the other funds offered by the fund's family. The results are consistent with those using performance rankings based on the CRSP fund universe. Additionally, Table A-4 in the Appendix estimates equation (1) for all three ranking methods using prior performance horizons of one and five years.

iated funds that are also shunned by outside investors. This implies that '$NegNonDCFlow$' captures some aspects of the fund's popularity among investors that are not captured by past performance or other fund characteristics. Interestingly, the interaction term is significantly negative indicating that affiliated funds receive support when they experience money outflows from their non-DC clients. Trustee support alleviates fund distress, which is costly for mutual funds.[23]

4.3 Subsample Analysis of Fund Deletions

To analyze whether the incentives for fund deletions differ across different types of plans and across time, Table 4 shows the results of our linear probability model specified in equation (1) for various subsamples.

In the first two 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.[24] Large service providers have more in-house investment options and may have more bargaining power relative to small fund families. Our favoritism results hold for both subsamples albeit a little weaker for smaller trustees.

To test whether our results are affected by economies of scale in plan management, we re-estimate our model in columns 3 and 4 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. Our results are remarkably consistent across the two subsamples.

The Pension Protection Act of 2006 (PPA) introduced comprehensive new legislation to

[23]Unfortunately, the *Pensions & Investments* survey is only available for a subsample of the mutual fund universe. Therefore, we do not include these variables in our baseline specification.

[24]The three largest trustees in terms of the dollar value of total plan assets in our sample are Vanguard, Fidelity, and State Street.

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.[25] 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.[26] To investigate whether these lawsuits and regulatory reforms affect our results, we divide our sample into two subperiods (1998-2006 and 2007-2009). Columns 5 and 6 of Table 4 indicate that our key results do not differ between the two subperiods. We find that affiliated funds exhibit a lower propensity to be deleted from 401(k) menus and that deletions for affiliated funds are less sensitive to prior fund performance for both subperiods.

Table A-6 in the Internet Appendix reports additional robustness analyses on fund deletions. For example, we show that the results are qualitatively unaffected if we include trustee fixed effects or fund fixed effects. Furthermore, the results are also robust if we focus only on plans with mutual fund trustees or if we delete target-date funds, index funds, or non-equity funds.

4.4 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

[25]The detailed regulations from the 2006 Pension Protection Act can be obtained from `http://www.dol.gov/ebsa/pensionreform.html`.

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

measures in Section 4.1, 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.

The difference between the average addition frequencies of affiliated and unaffiliated funds is large. For example, in the overall sample, the average addition frequency is 1.33% for affiliated funds and just 0.02% for unaffiliated funds. We report the average addition frequencies by affiliation and performance in Figure A-4 and Table A-7 in the Appendix.

While 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 addition frequencies implicitly assume that plan sponsors and trustees consider every fund in the CRSP universe when selecting new choices for their menus.[27] Therefore, instead of emphasizing the level effect, in what follows, we rescale affiliated and unaffiliated addition probabilities by dividing each series by its own mean. Rescaling allows us to highlight the conditional effects instead.

The scaled addition frequencies are depicted in Figure 2. As above, each year we sort funds into deciles according to their percentile performance among funds of the same style in the CRSP fund universe over the prior three years. Panel A summarizes the results using all existing mutual funds, 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. Thus, Panel B excludes funds that could not be added as trustee funds during the year. This restriction allows us to examine the rescaled addition frequency of the same fund to an affiliated or unaffiliated menu, respectively.

[27]The 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.

Figure 2 highlights several interesting results. First, for poorly performing funds, relative affiliated addition probabilities are higher than the corresponding unaffiliated probabilities. The difference is statistically significant in both panels. In the upper tail, the opposite is true: unaffiliated addition probabilities are significantly higher than affiliated probabilities. These results illustrate that the performance threshold unaffiliated funds have to meet to be included in the plan is significantly higher than that for affiliated funds. Moreover, 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 rescaled addition probability for unaffiliated funds approximately eight-fold from 0.29% to 2.31%. At the same time, an equivalent improvement in performance for affiliated funds results in only a three times larger value (from 0.55% to 1.67%).

To provide additional evidence on favoritism in fund addition decisions, we also perform regression analyses using these rescaled variables. These results are reported in Table 5. The findings indicate that unaffiliated addition probabilities are more sensitive to performance than affiliated addition probabilities, even after controlling for various fund characteristics.

Affiliated and unaffiliated addition probabilities also show very different sensitivities to fund distress and expense ratios. Distressed funds have a lower probability of being added to a menu as both affiliated and unaffiliated funds. More interestingly, the table shows that, consistent with our favoritism hypothesis, affiliated addition frequencies are significantly less sensitive to distress than are unaffiliated addition probabilities. Furthermore, addition rates are positively related to expense ratios for affiliated funds, whereas they are not significantly related to expense ratios for unaffiliated funds.

Finally, we complement these findings with two additional results tabulated in the Internet Appendix. In Table A-8 we estimate a linear probability model for which the dependent

variable takes the value of one if the added fund 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. Consistent with menu favoritism, we find that affiliated fund additions are associated with worse past performance even after controlling for other fund characteristics. A similar result is conveyed by Figure A-5 which reports the distribution of fund additions by performance decile and fund affiliation. The figure reveals 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.

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

5 Participant Flows

While the investment opportunity set of the plan is determined by the menu choices selected by the employer and the service providers, participants can freely allocate their contributions within the opportunity set. If participants anticipate biases, they can 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:

$$NMG1_{p,f,t} = \frac{V_{p,f,t} - V_{p,f,t-1}(1 + R_{f,t})}{V_{p,f,t-1}(1 + R_{f,t})}. \tag{2}$$

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 price appreciation of plan assets $R_{f,t}$ (i.e., 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 plan menu, then $NMG1$ equals exactly -100%. To remove outliers, we winsorize $NMG1$ at the 95% level.[28]

Since equation (2) 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 between beginning- and end-of-period assets:

$$NMG2_{p,f,t} = \frac{V_{p,f,t} - V_{p,f,t-1}(1 + R_{f,t})}{V_{p,f,t} + V_{p,f,t-1}(1 + R_{f,t})}. \tag{3}$$

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:

$$NMG3_{p,f,t} = \frac{V_{p,f,t} - V_{p,f,t-1}(1 + R_{f,t})}{\sum_f V_{p,f,t-1}(1 + R_{f,t})}. \tag{4}$$

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

[28]Figure A-6 in the Appendix depicts histograms of the percentage flows.

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).[29]

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

$$\begin{aligned} NMG_{p,f,t} &= \beta_0 + \beta_1 \times AF_{p,f,t-1} + \beta_2 \times LowPerf_{p,f,t-1} + \beta_3 \times HighPerf_{p,f,t-1} \\ &+ \beta_4 \times AF_{p,f,t-1} \times LowPerf_{p,f,t-1} + \beta_5 \times AF_{p,f,t-1} \times HighPerf_{p,f,t-1} \\ &+ Z'_{p,f,t-1}\gamma + \epsilon_{p,f,t}. \end{aligned} \tag{5}$$

Equation (5) is analogous to our two-segment baseline equation 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 as an additional control.[30]

The results are summarized in Table 6. The first three columns show the coefficient estimates for our full sample of NMG values. The full sample includes observations that capture fund deletion/addition as well as observations that reflect more gradual inflows and outflows by plan participants. The last three columns report coefficient estimates for participant flows only based on a subsample that excludes NMG observations that reflect fund additions and deletions.

The main results in columns 1–3 using the full sample are consistent with the deletion

[29]Plan sponsors and service providers may not only affect flows through addition and deletion decisions. For example, the selection of default investment options, the freezing of existing investment options to new money, and the promotion of specific investment options during on-line or face-to-face educational activities are additional actions by plan sponsors or service providers 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 (which are only based on flows due to additions and deletions), we find that plan sponsors and service providers account for most of the variability of fund flows, as documented in Table 6.

[30]We calculate plan growth using information from Form 5500 on total contributions, total expenses, and total assets.

results from Table 3. 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 overall flows are significantly less sensitive to poor performance for affiliated funds. For example, a ten percentage point increase in the past percentile performance of below-median funds increases flows over the next year by 5.54% for unaffiliated funds and by only 0.80% for affiliated funds. The additional control variables indicate that the growth rates are larger for funds that exhibit low correlations with existing menu options, for smaller investment options, for plans with higher growth rates, for funds with lower expense ratios and lower 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 6. 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 that have documented that DC pension participants are naive and inactive (Benartzi and Thaler,

2001; Madrian and Shea, 2001; Agnew, Balduzzi, and Sunden, 2003).

Our results indicate 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.

6 Future Performance

Our previous results indicate 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 underperforming 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 these funds.

To investigate this hypothesis, we now 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 were kept, deleted, or added ("No Changes," "Deletions,"and "Additions") during the calendar year.[31] This creates six portfolios. We then further subdivide these six groups based on past performance. In particular, "All Funds," refers to all funds in the original six portfolios, while "Lowest Decile" and "Lowest Quintile" refer to subportfolios in each group that

[31]To avoid any lookahead biases, we do not include those plans in these analyses that have fiscal years ending before July of the calendar year.

contain only those funds that also rank in the lowest performance deciles or quintiles. We use percentile performance rankings during the prior three years as in our baseline specification. For example, "Affiliated Funds/Deletions/Lowest Decile" represents the portfolio of afffiliated 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 7 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 0 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 a 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.

Our results in Table 7 confirm that the decision to retain poorly performing affiliated funds is not driven by private 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 may cross-subsidize other employees by shouldering a disproportionate share of the plan's costs and would have obtained a higher risk-adjusted performance had they switched their retirement savings from underperforming affiliated funds to other funds.

7 Conclusion

While mutual fund families serving as 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 investments 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 funds are less likely to be removed from the menu relative to unaffiliated funds, independent of their performance record. Moreover, the difference in deletion propensities between affiliated and unaffiliated funds is largest among the worst performing funds. We find similar results for mutual fund additions.

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. Since favoritism represents a form of implicit compensation for the plan's service providers, these performance results imply that favoritism causes an unequal distribution of plan costs across the plan's participants.

In sum, our paper provides a first look at the 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.

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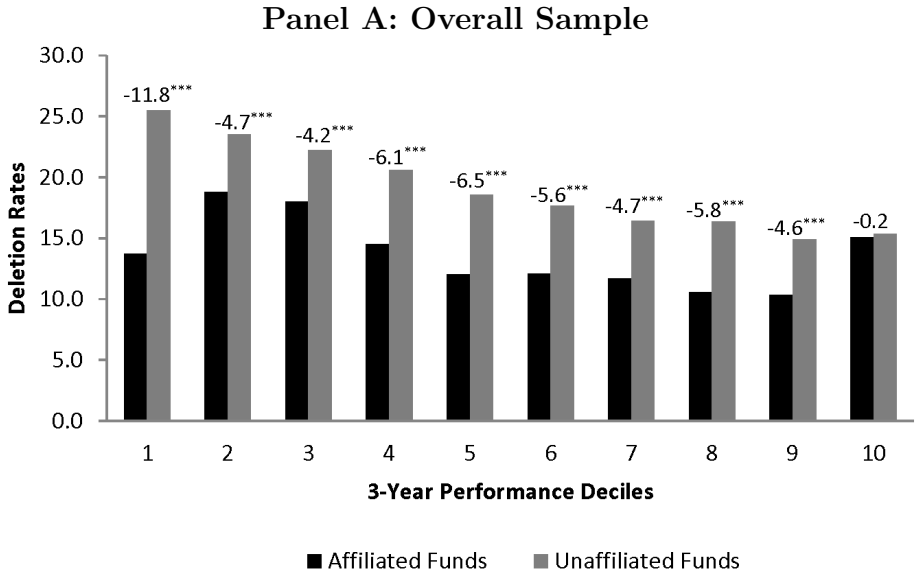

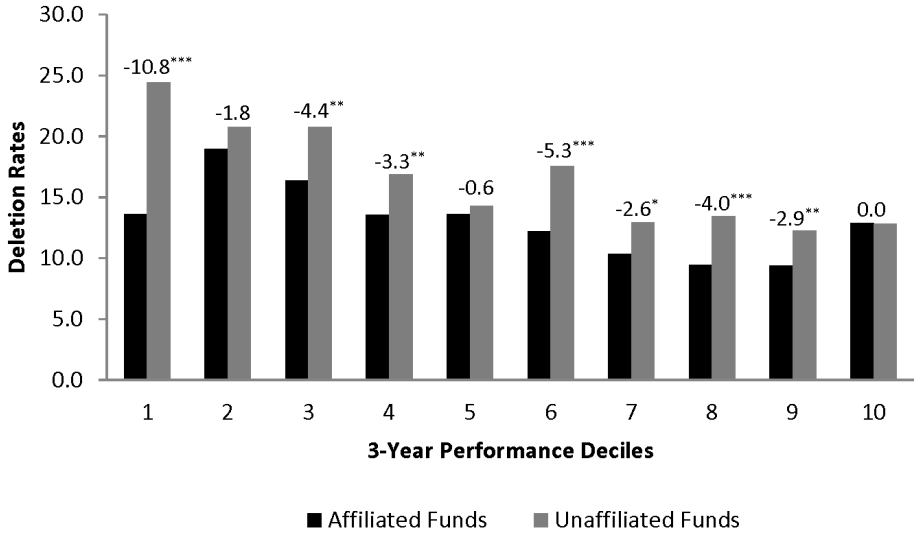

Figure 1: Fund Deletions by Affiliation. The figure depicts mean annual fund deletion frequencies by trustee affiliation and performance deciles. Panel A includes the full sample. Panel B includes the subsample of funds that appear contemporaneously on multiple 401(k) menus, at least once as an affiliated fund and at least once as an unffiliated 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. The numbers above the bars are differences in the mean deletion rates between affiliated and unaffiliated funds. The corresponding standard errors are clustered at the fund level with significance levels denoted by *, **, ***, which correspond to 10%, 5%, and 1% levels, respectively.

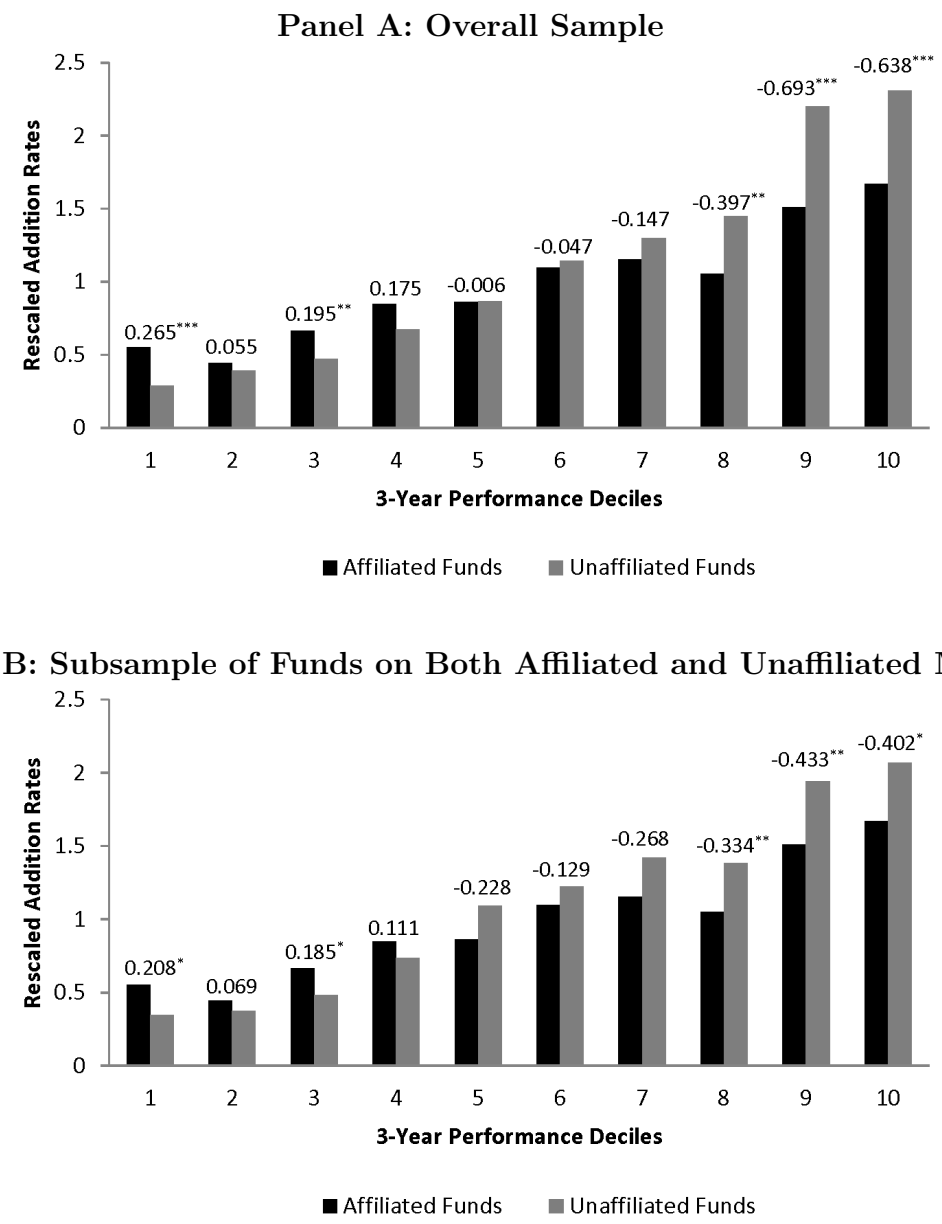

Figure 2: Rescaled Fund Additions by Affiliation. The figure depicts mean rescaled fund addition frequencies by trustee affiliation and performance deciles. Panel A includes the full sample. Panel B includes only those funds that are offered by fund families that serve as trustees for at least one plan in our sample. 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. These affiliated and unaffiliated addition rates are then rescaled by dividing the raw addition rates by the corresponding mean raw addition rates. We then average across the funds' rescaled addition frequencies by performance and affiliation. Performance deciles are created based on the fund's percentile performance among funds with the same style in the CRSP fund universe over the prior three years. The numbers above the bars are differences in the mean rescaled addition rates between affiliated and unaffiliated funds. The corresponding standard errors are clustered at the fund level with significance levels denoted by *, **, ***, which correspond to 10%, 5%, and 1% levels, respectively.

Table 1: 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 5-9, we provide information about the architecture of the plan. This includes the number of mutual fund options offered in total and the number of affiliated options, the trustee share calculated as the overall proportion of retirement assets invested with affiliated funds, 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 MF Trustees (in %)	Number of Options	Number of Affiliated Options	Trustee Share (in %)	Number of Mgmt. Companies	Herfindahl Index
1998	618	713	286.26	60.31	7.01	2.38	34.01	2.96	0.67
1999	760	895	241.48	68.94	7.85	2.85	34.11	3.48	0.64
2000	829	1,004	295.43	73.21	9.29	3.53	35.68	4.00	0.59
2001	920	1,100	278.42	74.36	10.43	4.10	36.91	4.56	0.57
2002	1,012	1,230	250.27	76.59	11.50	4.60	37.26	5.01	0.54
2003	1,102	1,325	296.54	83.09	12.00	4.73	36.00	5.48	0.51
2004	1,106	1,314	327.38	83.33	13.19	5.18	33.85	5.89	0.48
2005	1,093	1,281	350.02	83.53	13.79	5.40	32.50	6.18	0.45
2006	1,034	1,225	401.53	78.12	14.57	5.81	31.56	6.29	0.44
2007	1,002	1,175	436.04	75.06	15.93	5.91	28.37	6.65	0.42
2008	970	1,126	322.47	75.40	17.20	6.49	28.99	7.08	0.42
2009	849	979	407.33	75.08	17.82	6.40	27.13	7.36	0.40
Average	941	1,114	324.43	75.59	12.55	4.78	33.03	5.41	0.51

Table 2: 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 ratio of total assets invested in the average mutual fund option to plan assets, in each category (kept, deleted, added). *Total Option Size* is the ratio 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 ($Perf$) are calculated over the previous three years based on funds of the same style in the CRSP fund universe. With the exception of fund age and fund size, all values are expressed as percentages. The averages are reported for affiliated and unaffiliated funds separately. Standard errors are two-way clustered at the plan and fund levels. Significance levels for tests of the difference in means are denoted by *, **, ***, which correspond to 10%, 5%, and 1% levels, respectively.

Panel A: No Changes

Affiliated Fund	Number of Obs.	Relative Option Size (in %)	Total Option Size (in %)	Option Size (in $M)	Fund Age (in Years)	Fund Size (in $B)	Return Std. Dev. (in %)	Turnover (in %)	Expense Ratio (in %)	Prior 3-Yr. Performance (in %)
0	82,550	8.56	85.42	8.92	19.61	15.50	3.98	76.54	0.94	60.24
1	52,239	7.60	88.64	13.47	17.29	12.03	3.38	52.12	0.57	58.19
Diff	134,789	−0.96*	3.21***	4.54**	−2.32*	−3.47	−0.60***	−24.42***	−0.37***	−2.05*

Panel B: Deletions

Affiliated Fund	Number of Obs.	Relative Option Size (in %)	Total Option Size (in %)	Option Size (in $M)	Fund Age (in Years)	Fund Size (in $B)	Return Std. Dev. (in %)	Turnover (in %)	Expense Ratio (in %)	Prior 3-Yr. Performance (in %)
0	14,189	7.60	14.57	6.66	18.19	8.30	4.08	93.34	1.06	51.29
1	4,285	7.19	11.35	9.59	17.54	7.01	3.48	80.68	0.80	51.37
Diff	18,474	−0.41	−3.21***	2.92**	−0.65	−1.29	−0.60***	−12.66**	−0.26***	0.08

Panel C: Additions

Affiliated Fund	Number of Obs.	Relative Option Size (in %)	Total Option Size (in %)	Option Size (in $M)	Fund Age (in Years)	Fund Size (in $B)	Return Std. Dev. (in %)	Turnover (in %)	Expense Ratio (in %)	Prior 3-Yr. Performance (in %)
0	21,872	6.26	20.74	4.93	15.14	10.06	3.98	80.65	0.95	67.49
1	7,816	4.57	14.35	5.13	10.35	5.42	3.23	53.23	0.60	63.91
Diff	29,688	−1.69***	−6.38***	0.20	−4.79***	−4.64*	−0.75***	−27.42***	−0.35***	−3.58***

Table 3: Linear Probability Model of Fund Deletions.
The table reports the coefficient estimates for the following linear probability model: $DEL_{p,f,t} = \beta_0 + \beta_1 AF_{p,f,t-1} + \beta_2 Perf_{p,f,t-1} + \beta_3 AF_{p,f,t-1} \times Perf_{p,f,t-1} + \beta_4 NegNonDCFlow_{f,t-1} + \beta_5 AF_{p,f,t-1} \times NegNonDCFlow_{f,t-1} + Z'_{p,f,t-1}\gamma + \epsilon_{p,f,t}$ and for the following and 2-segment piecewise linear model $DEL_{p,f,t} = \beta_0 + \beta_1 AF_{p,f,t-1} + \beta_2 LowPerf_{p,f,t-1} + \beta_3 HighPerf_{p,f,t-1} + \beta_4 AF_{p,f,t-1} \times LowPerf_{p,f,t-1} + \beta_5 AF_{p,f,t-1} \times HighPerf_{p,f,t-1} + \beta_6 NegNonDCFlow_{f,t-1} + \beta_7 AF_{p,f,t-1} \times NegNonDCFlow_{f,t-1} + Z'_{p,f,t-1}\gamma + \epsilon_{p,f,t}$, 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 and $AF_{p,f,t-1}$ 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 $t-1$. $Perf_{p,f,t-1}$ is the percentile performance rank of fund f over the previous three years based on funds in the same style in the CRSP fund universe and $LowPerf$ and $HighPerf$ are defined as $LowPerf_{p,f,t-1} = min(Perf_{p,f,t-1}, 0.5)$ and $HighPerf_{p,f,t-1} = max(Perf_{p,f,t-1} - 0.5, 0)$. The variable $NegNonDCFlow_{f,t-1}$ is an indicator variable for whether the non-DC flows of the fund in year $t-1$ are negative. 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 fund style and year fixed effects. Standard errors are two-way clustered at the plan and fund levels and are reported in parentheses. Significance levels are denoted by *, **, ***, which correspond to 10%, 5%, and 1% levels, respectively.

	Linear	2-Segment	Linear	2-Segment
Affiliated Fund	−0.105***	−0.150***	−0.088***	−0.118***
	(0.014)	(0.019)	(0.019)	(0.027)
Perf	−0.167***		−0.165***	
	(0.014)		(0.019)	
Perf*Affiliated Fund	0.103***		0.092***	
	(0.018)		(0.025)	
LowPerf		−0.319***		−0.343***
		(0.034)		(0.044)
HighPerf		−0.051**		−0.021
		(0.023)		(0.031)
LowPerf*Affiliated Fund		0.249***		0.190***
		(0.045)		(0.059)
HighPerf*Affiliated Fund		−0.006		0.013
		(0.030)		(0.040)
Neg NonDC Flow			0.041***	0.041***
			(0.008)	(0.008)
Neg NonDC Flow*Affiliated Fund			−0.028***	−0.028***
			(0.010)	(0.010)
Maximum Corr	0.010***	0.010***	0.011***	0.011***
	(0.001)	(0.001)	(0.001)	(0.001)
Log(Option Size)	−0.009***	−0.009***	−0.007***	−0.007***
	(0.002)	(0.002)	(0.002)	(0.002)
No. of Options	−0.002***	−0.002***	−0.002***	−0.002***
	(0.000)	(0.000)	(0.000)	(0.000)
Expense Ratio	7.965***	7.626***	8.423***	7.600***
	(1.109)	(1.106)	(1.593)	(1.595)
Turnover	0.017***	0.017***	0.016***	0.016***
	(0.004)	(0.004)	(0.005)	(0.005)
Log(Fund Size)	−0.019***	−0.019***	−0.017***	−0.017***
	(0.002)	(0.002)	(0.003)	(0.003)
Fund Age	0.000	0.000	−0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Std. Dev.	−0.088	−0.179	−0.274	−0.373*
	(0.200)	(0.195)	(0.207)	(0.201)
Observations	106,848	106,848	65,855	65,855
R-squared	0.077	0.079	0.080	0.082

Table 4: Linear Probability Model for Fund Deletions: Subsample Analysis.
The table reports the coefficient estimates for our baseline 2-segment piecewise linear probability model for fund deletions described in Table 3 for various subsamples of our data. We estimate the model for the three largest trustees in the first column and exclude the three largest trustees each year in the second column. Columns 3 and 4 estimate our results for plans with below and above median asset size. Finally, in columns 5 and 6, we divide our sample into the subperiods 1998-2006 and 2007-2009, respectively. The regressions include fund style and year fixed effects. Standard errors in this table are two-way clustered at the plan and fund levels and are reported in parentheses. Significance levels are denoted by *, **, ***, which correspond to 10%, 5%, and 1% levels, respectively.

	Top 3 MF Trustees	Exclude Top 3 MF Trustees	Small Plans	Large Plans	Prior to 2007	After 2006
Affiliated Fund	−0.183***	−0.143***	−0.174***	−0.140***	−0.125***	−0.157***
	(0.038)	(0.024)	(0.024)	(0.023)	(0.029)	(0.025)
LowPerf	−0.385***	−0.308***	−0.330***	−0.331***	−0.311***	−0.325***
	(0.069)	(0.033)	(0.037)	(0.044)	(0.051)	(0.040)
HighPerf	−0.113**	−0.043*	−0.072***	−0.034	−0.116***	0.021
	(0.046)	(0.023)	(0.024)	(0.030)	(0.030)	(0.031)
LowPerf*Affiliated Fund	0.310***	0.212***	0.279***	0.232***	0.246***	0.215***
	(0.084)	(0.060)	(0.055)	(0.054)	(0.065)	(0.058)
HighPerf*Affiliated Fund	0.058	−0.037	0.006	−0.015	0.021	−0.021
	(0.052)	(0.040)	(0.036)	(0.037)	(0.038)	(0.040)
Maximum Corr	0.012***	0.010***	0.010***	0.010***	0.010***	0.011***
	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Log(Option Size)	−0.007**	−0.010***	−0.002	−0.021***	−0.008***	−0.010***
	(0.003)	(0.002)	(0.002)	(0.004)	(0.002)	(0.002)
No. of Options	−0.004***	−0.002***	−0.001	−0.003***	−0.002***	−0.002***
	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.000)
Expense Ratio	15.129***	6.174***	6.824***	8.810***	9.416***	7.023***
	(2.272)	(1.177)	(1.197)	(1.494)	(1.570)	(1.223)
Turnover	0.028***	0.014***	0.012***	0.025***	0.019***	0.014***
	(0.009)	(0.004)	(0.004)	(0.005)	(0.006)	(0.005)
Log(Fund Size)	−0.024***	−0.019***	−0.022***	−0.013***	−0.022***	−0.016***
	(0.004)	(0.002)	(0.002)	(0.003)	(0.003)	(0.002)
Fund Age	0.000	0.000	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Std. Dev.	−0.830***	−0.014	−0.253	−0.103	−1.298***	0.047
	(0.270)	(0.214)	(0.205)	(0.282)	(0.390)	(0.203)
Observations	36,936	69,912	47,387	52,869	52,301	54,547
R-squared	0.129	0.061	0.068	0.100	0.085	0.078

Table 5: Affiliated and Unaffiliated Fund Additions.

The table reports the coefficient estimates of the following model for rescaled affiliated and unaffiliated addition frequencies: $ADDRATE^{i}_{f,t} = \beta_0 + \beta_1 Perf_{f,t-1} + \beta_2 NegNonDCFlow_{f,t-1} + Z'_{f,t-1}\gamma + \epsilon_{f,t}$, where we estimate the model separately for affiliated and unaffiliated addition rates (i.e., $i \in \mathcal{A}, \mathcal{UA}$). The affiliated addition rate of fund f at time t, is defined 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. $ADDRATE^{A}_{f,t}$ and $ADDRATE^{UA}_{f,t}$ represent rescaled addition frequencies of fund f at time t which we obtain by dividing our affiliated and unaffiliated addition rates, respectively, by their corresponding means. Finally, addition frequencies are calculated for all funds in the CRSP universe that belong to those families that serve as trustees at least to one of the plans in our sample. $Perf_{f,t-1}$ is the percentile performance rank of fund f over the previous three years based on funds in the same style in CRSP. In columns 4–6 and 10–12, we replace $Perf_{f,t-1}$ by a 2-segment piecewise linear specification in which $LowPerf$ and $HighPerf$ are defined as $LowPerf_{p,f,t-1} = min(Perf_{p,f,t-1}, 0.5)$ and $HighPerf_{p,f,t-1} = max(Perf_{p,f,t-1} - 0.5, 0)$. The variable $NegNonDCFlow_{f,t-1}$ is an indicator variable for whether the non-DC flows of the fund in year $t-1$ are negative. The other lagged control variables Z include, fund expense ratio, fund turnover, the natural logarithm of the fund's size, fund age, the standard deviation of the fund's return, and fund style and year fixed effects. 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.

	Linear			2-Segment			Linear			2-Segment		
	A	UA	Diff	A	UA	Diff	A	UA	Diff	A	UA	Diff
Perf	0.804***	1.819***	−1.016***				1.102**	2.906***	−1.804**			
	(0.173)	(0.229)	(0.257)				(0.487)	(0.869)	(0.877)			
LowPerf				0.768**	0.898	−0.130				1.338	5.017	−3.680
				(0.370)	(0.621)	(0.671)				(1.044)	(3.585)	(3.619)
HighPerf				0.837**	2.655***	−1.819**				0.893	1.035	−0.142
				(0.392)	(0.767)	(0.785)				(0.982)	(4.013)	(3.956)
Neg NonDC Flow							−0.787***	−4.344***	3.556***	−0.787***	−4.342***	3.555***
							(0.271)	(1.136)	(1.109)	(0.271)	(1.133)	(1.106)
Expense Ratio	27.392**	−26.628	54.020**	27.353**	−27.642	54.995**	81.478**	−116.502	197.980**	82.063**	−111.260	193.323**
	(13.201)	(23.537)	(23.264)	(13.238)	(23.346)	(23.100)	(36.744)	(101.212)	(98.679)	(36.669)	(95.276)	(93.038)
Turnover	−0.090***	−0.043	−0.047	−0.090***	−0.050	−0.040	−0.224***	0.096	−0.320**	−0.225***	0.085	−0.310**
	(0.033)	(0.047)	(0.053)	(0.033)	(0.045)	(0.052)	(0.083)	(0.146)	(0.147)	(0.083)	(0.145)	(0.146)
Log(Fund Size)	0.288***	1.382***	−1.094***	0.288***	1.385***	−1.097***	0.220**	3.071***	−2.852***	0.220**	3.071***	−2.851***
	(0.035)	(0.177)	(0.173)	(0.035)	(0.176)	(0.172)	(0.090)	(0.661)	(0.649)	(0.090)	(0.660)	(0.648)
Fund Age	−0.006	−0.000	−0.006	−0.006	0.000	−0.007	0.020	−0.021	0.040	0.020	−0.021	0.041
	(0.008)	(0.025)	(0.024)	(0.008)	(0.024)	(0.024)	(0.015)	(0.041)	(0.041)	(0.015)	(0.040)	(0.041)
Std. Dev.	0.265***	0.430**	−0.165	0.263***	0.375**	−0.112	0.129	0.994**	−0.865*	0.142	1.110**	−0.969*
	(0.094)	(0.184)	(0.167)	(0.092)	(0.180)	(0.162)	(0.183)	(0.503)	(0.501)	(0.179)	(0.516)	(0.514)
Observations	19,714	19,714	19,714	19,714	19,714	19,714	4,005	4,005	4,005	4,005	4,005	4,005
R-squared	0.046	0.121	0.051	0.046	0.121	0.051	0.066	0.144	0.106	0.066	0.145	0.106

Table 6: Fund Flow Regressions.
The table reports the coefficient estimates of the following linear regression: $NMG_{p,f,t} = \beta_0 + \beta_1 AF_{p,f,t-1} + \beta_2 LowPerf_{p,f,t-1} + \beta_3 HighPerf_{p,f,t-1} + \beta_4 AF_{p,f,t-1} \times LowPerf_{p,f,t-1} + \beta_5 AF_{p,f,t-1} \times HighPerf_{p,f,t-1} + Z'_{p,f,t-1}\gamma + \epsilon_{p,f,t}$, where the explanatory variables of the regression are analogous to those in Table 3 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, $NMG3$ 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 fund style and year fixed effects. Standard errors in this table are two-way clustered at the plan and fund levels 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 Fund	0.270***	0.200***	1.141***	0.076**	0.026**	0.057
	(0.042)	(0.024)	(0.256)	(0.035)	(0.012)	(0.133)
LowPerf	0.554***	0.408***	3.769***	0.169***	0.077***	1.258***
	(0.074)	(0.045)	(0.517)	(0.059)	(0.021)	(0.283)
HighPerf	0.352***	0.146***	0.937***	0.343***	0.113***	0.855***
	(0.052)	(0.025)	(0.340)	(0.046)	(0.016)	(0.254)
LowPerf*Affiliated Fund	−0.474***	−0.286***	−1.545**	−0.143*	−0.044	−0.601*
	(0.102)	(0.057)	(0.630)	(0.085)	(0.030)	(0.354)
HighPerf*Affiliated Fund	0.082	−0.033	−0.848*	0.026	−0.003	−0.131
	(0.087)	(0.039)	(0.444)	(0.078)	(0.026)	(0.297)
Maximum Corr	−0.012***	−0.010***	−0.051***	0.001	0.000	−0.020***
	(0.002)	(0.001)	(0.009)	(0.001)	(0.000)	(0.005)
Log(Option Size)	−0.083***	−0.068***	−0.324***	−0.113***	−0.037***	−0.082***
	(0.005)	(0.001)	(0.011)	(0.004)	(0.001)	(0.011)
Plan Growth	0.830***	0.161***	4.903***	0.836***	0.355***	7.569***
	(0.070)	(0.037)	(0.359)	(0.066)	(0.025)	(0.384)
No. of Options	−0.001	−0.000	−0.014***	−0.004***	−0.002***	−0.021***
	(0.001)	(0.001)	(0.004)	(0.001)	(0.000)	(0.003)
Expense Ratio	−15.765***	−8.794***	−34.893***	−6.392***	−2.093***	−4.392
	(2.315)	(1.146)	(10.850)	(1.770)	(0.606)	(6.228)
Turnover	−0.023***	−0.013***	−0.054**	0.001	0.001	−0.010
	(0.008)	(0.004)	(0.021)	(0.006)	(0.002)	(0.017)
Log(Fund Size)	0.024***	0.024***	0.233***	0.001	0.002	0.088***
	(0.005)	(0.003)	(0.029)	(0.005)	(0.002)	(0.017)
Fund Age	−0.001**	−0.000	−0.002	−0.001***	−0.000***	−0.002
	(0.000)	(0.000)	(0.003)	(0.000)	(0.000)	(0.002)
Std. Dev.	−0.058	−0.197	3.546**	0.069	0.001	2.928**
	(0.457)	(0.257)	(1.540)	(0.333)	(0.118)	(1.235)
Observations	96,483	117,461	116,342	82,711	82,711	82,711
R-squared	0.159	0.515	0.138	0.250	0.221	0.108

Table 7: 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 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 Alphas

	No Changes		Deletions		Additions	
	Affiliated Funds	Unaffiliated Funds	Affiliated Funds	Unaffiliated Funds	Affiliated Funds	Unaffiliated Funds
Lowest Decile	-0.33^{**}	-0.08	-0.28^{*}	-0.15	-0.01	0.12
	(0.14)	(0.14)	(0.17)	(0.17)	(0.28)	(0.18)
Lowest Quintile	-0.20^{*}	-0.11	-0.19^{*}	-0.13	-0.11	-0.02
	(0.11)	(0.10)	(0.11)	(0.12)	(0.14)	(0.11)
All Funds	-0.00	-0.06	-0.07	-0.09	-0.00	-0.06
	(0.04)	(0.05)	(0.05)	(0.06)	(0.05)	(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^{**}	-0.08	-0.28	-0.15	-0.02	0.13
	(0.14)	(0.16)	(0.17)	(0.19)	(0.27)	(0.19)
Lowest Quintile	-0.20^{*}	-0.10	-0.19^{*}	-0.13	-0.11	-0.02
	(0.12)	(0.11)	(0.11)	(0.14)	(0.14)	(0.12)
All Funds	-0.00	-0.06	-0.07	-0.09	-0.00	-0.06
	(0.04)	(0.05)	(0.05)	(0.06)	(0.05)	(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	0.22	-0.12	0.14	0.06	0.39
	(0.17)	(0.26)	(0.20)	(0.31)	(0.31)	(0.24)
Lowest Quintile	0.03	0.12	-0.12	0.07	0.08	0.23
	(0.18)	(0.18)	(0.14)	(0.24)	(0.18)	(0.18)
All Funds	0.02	-0.01	-0.03	-0.02	0.02	-0.01
	(0.04)	(0.05)	(0.05)	(0.06)	(0.05)	(0.08)

Internet Appendix to

"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.'

1 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

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

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.

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.

2 Menu Changes

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

2.1 Fund Deletions by Performance Deciles

Table A-1 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 also report 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 funds that appear contemporaneously as affiliated and unaffiliated funds. Standard errors in these panels are clustered at the fund level. Panes C and D report identical difference test but use the Fama-MacBeth methodology to calculate the deletion frequencies and corresponding standard errors.

2.2 Probit Model for Fund Deletions

For robustness, we re-estimate the linear probability models in Table 3 in the paper using a probit specification. Table A-2 reports the estimated marginal effects for the linear and 2-segment models of fund deletions. The interaction effects and the corresponding standard errors on the interaction variables between the affiliation dummy and the performance percentiles are estimated based on Ai and Norton (2003). The interaction effect is defined as the change in the predicted probability of a deletion for a change in both fund performance and fund affiliation. Figures A-1–A-3 depict the corresponding graphs.

2.3 Alternative Performance Rankings

In the paper we rank mutual funds based on their prior performance relative to the universe of CRSP funds in the same style. We refer to this global ranking as "Overall Ranking" in this appendix. For robustness we also compute two alternative ranking methods, where the performance percentile of a fund is either measured relative to the other investment options in a specific 401(k) plan ("Plan Ranking") or relative to the other funds offered by the fund's family ("Family Ranking"). The overall ranking method captures the performance of a fund relative to the universe of available mutual funds in the U.S., which could be viewed as the most comprehensive metric. When a fund underperforms compared to the other investment choices included in the plan or the other options in the fund family, the plan may be pressured to remove the fund from the menu as underperformance in this setting is perhaps more transparent.

Table A-3 summarizes the coefficient estimates when $Perf_{p,f,t-1}$ is defined using the alternative ranking methodologies based on fund performance in the previous 36 months. The results are qualitatively and quantitatively similar to the base-case results reported in Table

3 in the paper. Thus, our findings are not affected by whether we benchmark mutual funds relative to the universe of mutual funds or relative to other funds included in the same 401(k) plan or other funds offered by the same fund family.

2.4 Robustness for Other Performance Ranking Horizons

In Table A-4 we re-estimate our baseline 2-segment model for fund deletions using prior one and five year fund performance to create performance rankings. The table summarizes the results for all three alternative ranking methodologies introduced above (i.e., overall, plan, and family rankings).

2.5 Sensitivity to Extreme Performance

To analyze in more depth the sensitivity of deletions to extreme performance, we estimate a specification using three piecewise linear segments instead of the two segments from equation (1) in the paper. The performance segments are 1) the lowest performance quintile, 2) the highest performance quintile, and 3) the three middle performance quintiles, which are pulled together to represent a single performance segment. Following Sirri and Tufano (1998), the performance in the lowest quintile is given by $LowPerfQ_{p,f,t-1} = min(Perf_{p,f,t-1}, 0.2)$, the performance in the three middle quintiles is given by $MidPerfQ_{p,f,t-1} = min(Perf_{p,f,t-1} - LowPerfQ_{p,f,t-1}, 0.6)$, and the performance in the highest quintile is given by $HighPerfQ_{p,f,t-1} = (Perf_{p,f,t-1} - LowPerfQ_{p,f,t-1} - MidPerfQ_{p,f,t-1})$.

Table A-5 reports the estimates for the three piecewise linear segments using our alternative ranking methods, based on the three year performance ranking horizon. Consistent with the base-case specification from Table 3 in the paper, we find that deletions are less sensitive to poor and intermediate performance for affiliated funds. Interestingly, in our overall ranking

model, we find that the probability of deleting unaffiliated funds that rank in the highest performance quintile actually increases with the performance percentile.

2.6 Fund Deletions, Robustness Tests

Table A-6 shows the results of our linear probability model specified in equation (1) using various sample restrictions. In columns 1 and 2, we show that our results remain after controlling for trustee and fund fixed effects, respectively. In column 3 we use the Fama-MacBeth methodology to compute our coefficient estimates and corresponding standard errors. In column 4, we re-estimate our results using information only on those plans that are trusteed by a mutual fund family. In column 5, 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 6 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 7-9 we restrict the sample of funds considered. In column 7 we exclude all target date funds since these funds are often used as default investment options. In column 8, we restrict our sample to equity funds, while in column 9 we only include actively managed funds. These results are very consistent with the results in our baseline specification.

2.7 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 CRSP as an affiliated and unaffiliated menu choice, respectively, as described in Section 4.4 in the paper. While Figure 2 in the paper displays

rescaled addition rates, we tabulate raw addition rates in Figure A-4 in this document. The corresponding average raw addition frequencies by affiliation and performance are summarized in Table A-7, which also extends the results for the one and five year performance evaluation horizons. Panel A includes the full sample, Panel B includes only those funds that belong to families that provide trustee services for at least one plan in our sample. Standard errors in these panels are clustered at the fund level. Panes C and D report identical difference test but use the Fama-MacBeth methodology to calculate the addition frequencies and corresponding standard errors.

2.8 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 2 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 A-5. The figure describes the distribution of affiliated and unaffiliated fund additions separately, by performance deciles. 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.

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

$$AF^{ADD}{}_{p,f,t} = \beta_0 + \beta_1 \times Perf_{p,f,t-1} + Z'_{p,f,t-1}\gamma + \epsilon_{p,f,t}, \tag{1}$$

where the dependent variable 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 overall rankings 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 A-8 with standard errors two-way clustered at the plan and fund levels. Consistent with menu favoritism, affiliated fund additions are associated with worse past performance even after controlling for other fund characteristics. This is represented by our $Perf_{p,f,t-1}$ coefficient estimates, which are significantly negative at the one percent level for each of our performance measures.

3 New Money Growth

Figure A-6 provides histograms of the percentage flows into various plan options for affiliated and unaffiliated funds in the lowest performance quintile over the previous three years.

4 Future Performance

In Section 6 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:

$$R_{f,t} - R_{TB,t} \;=\; \alpha_{f,t} + \beta^{M}_{f,t}(R_{M,t} - R_{TB,t}) + \beta^{SMB}_{f,t}(R_{S,t} - R_{B,t})$$

$$+\beta_{f,t}^{HML}(R_{H,t} - R_{L,t}) + \beta_{f,t}^{UMD}(R_{U,t} - R_{D,t}) + \epsilon_{f,t}. \quad (2)$$

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.

4.1 Future Performance

In Section 6 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 7 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 A-9 we augment these results by reporting the difference in the abnormal returns of the affiliated and unaffiliated fund portfolios in each category.

References

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Fama, E. F. and K. R. French (1993). Common risk factors in the returns on stocks and bonds. *Journal of Financial Economics 33*(1), 3–56.

Sirri, E. R. and P. Tufano (1998). Costly search and mutual fund flows. *Journal of Finance 53*(5), 1598–1622.

Table A-1: 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		
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

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

Performance	1 Year			3 Years			5 Years		
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

Panel C: All Funds, Fama-MacBeth Tests

Performance	1 Year			3 Years			5 Years		
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

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

Performance	1 Year			3 Years			5 Years		
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

Table A-2: Probit Model for Fund Deletions.
Columns 1 and 2 report estimated marginal effects for the linear performance probit model for fund deletions: $Pr(DEL_{p,f,t} = 1|X) = \Phi(\beta_0 + \beta_1 AF_{p,f,t-1} + \beta_2 Perf_{p,f,t-1} + \beta_3 AF_{p,f,t-1} \times Perf_{p,f,t-1} + \beta_4 NegNonDCFlow_{f,t-1} + \beta_5 AF_{p,f,t-1} \times NegNonDCFlow_{f,t-1} + Z'_{p,f,t-1}\gamma + \epsilon_{p,f,t})$, while columns 3 and 4 tabulate corresponding marginal effects for the 2-segment probit model: $Pr(DEL_{p,f,t} = 1|X) = \Phi(\beta_0 + \beta_1 AF_{p,f,t-1} + \beta_2 LowPerf_{p,f,t-1} + \beta_3 HighPerf_{p,f,t-1} + \beta_4 AF_{p,f,t-1} \times LowPerf_{p,f,t-1} + \beta_5 AF_{p,f,t-1} \times HighPerf_{p,f,t-1} + \beta_6 NegNonDCFlow_{f,t-1} + \beta_7 AF_{p,f,t-1} \times NegNonDCFlow_{f,t-1} + Z'_{p,f,t-1}\gamma)$, where $DEL_{p,f,t}$ is an indicator that takes the value of one if fund f is deleted from plan p in year t and zero otherwise and $AF_{p,f,t-1}$ is an indicator for whether the trustee of plan p is affiliated with the family of fund f at the end of year $t-1$. $Perf_{p,f,t-1}$ is the percentile performance rank of f over the prior three years based on funds in the same style in the CRSP fund universe and $LowPerf$ and $HighPerf$ are defined as $LowPerf_{p,f,t-1} = min(Perf_{p,f,t-1}, 0.5)$ and $HighPerf_{p,f,t-1} = max(Perf_{p,f,t-1} - 0.5, 0)$. $NegNonDCFlow_{f,t-1}$ is an indicator for whether the non-DC flows of the fund in year $t-1$ are negative. The other lagged control variables Z include the maximum return correlation of the fund with other menu options, the logarithm of option size, the number of options, the expense ratio, fund turnover, the logarithm of the fund's size, fund age, the standard deviation of the fund's return, and fund style and year fixed effects. The marginal effects for the interaction terms are computed using the INTEFF command based on Ai and Norton (2003). Standard errors are clustered at the plan level and are in parentheses. Significance levels are denoted by *, **, ***, corresponding to 10%, 5%, and 1% levels, respectively.

	Linear		2-Segment	
Affiliated Fund	−0.069***	−0.059***	−0.085***	−0.061***
	(0.007)	(0.009)	(0.009)	(0.011)
Perf	−0.128***	−0.119***		
	(0.007)	(0.008)		
Perf*Affiliated Fund	0.042***	0.028**		
	(0.012)	(0.013)		
LowPerf			−0.215***	−0.109***
			(0.013)	(0.014)
HighPerf			−0.051***	−0.029**
			(0.012)	(0.014)
LowPerf*Affiliated Fund			0.102***	0.064**
			(0.024)	(0.028)
HighPerf*Affiliated Fund			−0.010	−0.037
			(0.023)	(0.026)
Neg NonDC Flow		0.032***		0.044***
		(0.004)		(0.004)
Neg NonDC Flow*Affiliated Fund		−0.009		−0.012*
		(0.006)		(0.006)
Maximum Corr	0.009***	0.010***	0.010***	0.011***
	(0.001)	(0.001)	(0.001)	(0.001)
Log(Option Size)	−0.008***	−0.007***	−0.008***	−0.007***
	(0.001)	(0.001)	(0.001)	(0.001)
No. of Options	−0.002***	−0.002***	−0.002***	−0.002***
	(0.000)	(0.000)	(0.000)	(0.000)
Exp. Ratio	6.972***	7.143***	6.735***	7.384***
	(0.624)	(0.657)	(0.628)	(0.656)
Turnover	0.012***	0.011***	0.012***	0.010***
	(0.002)	(0.002)	(0.002)	(0.002)
Log(Fund Size)	−0.018***	−0.016***	−0.018***	−0.018***
	(0.001)	(0.001)	(0.001)	(0.001)
Fund Age	0.000	−0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Std. Dev.	−0.074	−0.232**	−0.145	−0.554***
	(0.117)	(0.109)	(0.115)	(0.106)
Observations	106,848	65,855	106,848	65,855
R-squared	0.0939	0.0996	0.0948	0.0950

Table A-3: Linear Probability Model for Fund Deletions: Alternative Rankings.
The table reports the coefficient estimates for the linear and piecewise linear 2-segment fund deletion models estimated in Table 3 in the paper for two alternative performance rankings. Under "plan ranking" we calculate the performance percentile rank of each fund on the menu relative to the other investment options in the 401(k) plan. Under "family ranking", performance percentile ranks are calculated relative to the other funds in the fund's family. In both cases, we use fund performance in the prior 36 months to compute performance ranks and include fund style and year fixed effects. Standard errors are two-way clustered at the plan and fund levels and are reported in parentheses. Significance levels are denoted by *, **, ***, which correspond to 10%, 5%, and 1% levels, respectively.

	Plan Ranking		Family Ranking	
	Linear	2-Segment	Linear	2-Segment
Affiliated Fund	−0.085***	−0.102***	−0.072***	−0.093***
	(0.013)	(0.015)	(0.013)	(0.018)
Perf	−0.142***		−0.089***	
	(0.017)		(0.015)	
LowPerf		−0.262***		−0.160***
		(0.023)		(0.029)
HighPerf		−0.015		−0.029
		(0.022)		(0.025)
Perf*Affiliated Fund	0.086***		0.055***	
	(0.020)		(0.019)	
LowPerf*Affiliated Fund		0.144***		0.122***
		(0.033)		(0.043)
HighPerf*Affiliated Fund		0.032		−0.003
		(0.032)		(0.037)
Maximum Corr	0.010***	0.011***	0.011***	0.011***
	(0.001)	(0.001)	(0.001)	(0.001)
Log(Option Size)	−0.009***	−0.009***	−0.009***	−0.009***
	(0.002)	(0.002)	(0.002)	(0.002)
No. of Options	−0.002***	−0.002***	−0.002***	−0.002***
	(0.000)	(0.000)	(0.000)	(0.000)
Exp. Ratio	8.570***	8.558***	8.574***	8.469***
	(1.098)	(1.100)	(1.110)	(1.111)
Turnover	0.016***	0.016***	0.017***	0.017***
	(0.004)	(0.004)	(0.004)	(0.004)
Log(Fund Size)	−0.019***	−0.019***	−0.021***	−0.021***
	(0.002)	(0.002)	(0.002)	(0.002)
Fund Age	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Std. Dev.	−0.213	−0.300	−0.287	−0.319
	(0.203)	(0.202)	(0.194)	(0.197)
Observations	107,355	107,355	107,175	107,175
R-squared	0.075	0.077	0.070	0.071

Table A-4: Linear Probability Model for Fund Deletions: Different Horizons.
The table reports the OLS coefficient estimates of our baseline piecewise linear 2-segment fund deletion model described in equation (1) in the paper for two alternative performance evaluation horizons. In columns 1,3, and 5 we calculate the performance percentile rank of each fund over the previous one year based on either overall rankings (column 1), plan rankings (column 3), or fund family rankings (column 5). In columns 2,4, and 6 we report corresponding results for the three ranking methods using the fund's performance in the previous five years to calculate percentile ranks. The regressions include fund style and year fixed effects. Standard errors are two-way clustered at the plan and fund levels and are reported in parentheses. Significance levels are denoted by *, **, ***, which correspond to 10%, 5%, and 1% levels, respectively.

	Overall Ranking		Plan Ranking		Family Ranking	
	1 Year	5 Years	1 Year	5 Years	1 Year	5 Years
Affiliated Fund	−0.108***	−0.107***	−0.088***	−0.103***	−0.075***	−0.090***
	(0.016)	(0.023)	(0.014)	(0.016)	(0.014)	(0.018)
LowPerf	−0.183***	−0.197***	−0.183***	−0.160***	−0.100***	−0.134***
	(0.030)	(0.037)	(0.019)	(0.021)	(0.025)	(0.033)
HighPerf	−0.017	−0.142***	0.025	−0.165***	−0.013	−0.066**
	(0.024)	(0.024)	(0.021)	(0.019)	(0.025)	(0.026)
LowPerf*Affiliated Fund	0.171***	0.099*	0.119***	0.089***	0.071**	0.109**
	(0.037)	(0.055)	(0.033)	(0.026)	(0.034)	(0.046)
HighPerf*Affiliated Fund	−0.036	0.099***	−0.002	0.107***	0.033	0.006
	(0.032)	(0.034)	(0.031)	(0.026)	(0.034)	(0.039)
Maximum Corr	0.011***	0.010***	0.011***	0.010***	0.011***	0.011***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Log(Option Size)	−0.009***	−0.009***	−0.009***	−0.009***	−0.009***	−0.009***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
No. of Options	−0.002***	−0.002***	−0.002***	−0.002***	−0.002***	−0.002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Exp. Ratio	8.132***	8.073***	8.806***	8.232***	8.593***	8.668***
	(1.117)	(1.143)	(1.114)	(1.139)	(1.120)	(1.111)
Turnover	0.017***	0.018***	0.016***	0.018***	0.017***	0.017***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Log(Fund Size)	−0.021***	−0.018***	−0.021***	−0.017***	−0.021***	−0.020***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Fund Age	0.000	−0.000	0.000	−0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Std. Dev.	−0.478**	−0.078	−0.568***	−0.042	−0.451**	−0.177
	(0.198)	(0.194)	(0.201)	(0.196)	(0.206)	(0.195)
Observations	106,848	106,848	107,355	107,355	107,175	107,175
R-squared	0.072	0.075	0.071	0.075	0.069	0.071

Table A-5: Linear Probability Model for Fund Deletions: Alternative Functional Forms.
The table reports the coefficient estimates of the model for fund deletions described in equation (1) but replaces our baseline 2-segment model with a 3-segment piecewise linear specification. In the 3-segment specification the performance segments are 1) the lowest performance quintile, 2) the highest performance quintile, and 3) the three middle performance quintiles, which are pulled together to represent a single performance segment. Following Sirri and Tufano (1998), the performance in the lowest quintile is given by $LowPerfQ_{p,f,t-1} = min(Perf_{p,f,t-1}, 0.2)$, the performance in the three middle quintiles is given by $MidPerfQ_{p,f,t-1} = min(Perf_{p,f,t-1} - LowPerfQ_{p,f,t-1}, 0.6)$, and the performance in the highest quintile is given by $HighPerfQ_{p,f,t-1} = (Perf_{p,f,t-1} - LowPerfQ_{p,f,t-1} - MidPerfQ_{p,f,t-1})$, where $Perf_{p,f,t-1}$ is the performance percentile of mutual fund f over the previous three years based on either overall rankings (column 1), 401(k) plan rankings (column 2), or fund family rankings (column 3). The regressions include fund style and year fixed effects. Standard errors in this table are two-way clustered at the plan and fund levels and are reported in parentheses. Significance levels are denoted by *, **, ***, which correspond to 10%, 5%, and 1% levels, respectively.

	Performance Ranking		
	Overall	Plan	Family
Affiliated Fund	−0.172***	−0.124***	−0.116***
	(0.035)	(0.025)	(0.030)
LowPerfQ	−0.521***	−0.699***	−0.449***
	(0.122)	(0.089)	(0.109)
MidPerfQ	−0.187***	−0.105***	−0.065***
	(0.018)	(0.015)	(0.020)
HighPerfQ	0.207***	0.107	−0.044
	(0.074)	(0.088)	(0.074)
LowPerfQ*Affiliated Fund	0.468**	0.318**	0.320*
	(0.188)	(0.129)	(0.164)
MidPerfQ*Affiliated Fund	0.110***	0.068***	0.031
	(0.025)	(0.020)	(0.026)
HighPerfQ*Affiliated Fund	−0.167	0.049	0.098
	(0.102)	(0.121)	(0.121)
Maximum Corr	0.010***	0.011***	0.011***
	(0.001)	(0.001)	(0.001)
Log(Option Size)	−0.009***	−0.009***	−0.009***
	(0.002)	(0.002)	(0.002)
No. of Options	−0.002***	−0.002***	−0.002***
	(0.000)	(0.000)	(0.000)
Exp. Ratio	7.607***	8.593***	8.417***
	(1.094)	(1.098)	(1.109)
Turnover	0.018***	0.015***	0.017***
	(0.004)	(0.004)	(0.004)
Log(Fund Size)	−0.019***	−0.019***	−0.021***
	(0.002)	(0.002)	(0.002)
Fund Age	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)
Std. Dev.	−0.186	−0.332	−0.322
	(0.191)	(0.203)	(0.198)
Observations	106,848	107,355	107,175
R-squared	0.079	0.078	0.071

Table A-6: Linear Probability Model for Fund Deletions: Robustness Tests.
The table reports the coefficient estimates for our baseline 2-segment fund deletion model described in equation (1) in the paper for various subsamples of our data. In columns 1 and 2, we show that our results remain after controlling for trustee and fund fixed effects, respectively. In column 3 we use the Fama-MacBeth methodology to compute our coefficient estimates and Newey-West standard errors with a lag length of 3. Columns 4 and 5 only include mutual fund trustees or mutual fund trustees that have at least ten funds in their families. Column 6 reestimates our results by excluding trustee changes. Column 7 excludes target date funds, column 8 excludes all non-equity funds, and column 9 reports results for actively managed funds. The regressions include fund style and year fixed effects. Standard errors in this table are two-way clustered at the plan and fund levels and are reported in parentheses. Significance levels are denoted by *, **, ***, which correspond to 10%, 5%, and 1% levels, respectively.

	Include Trustee FE	Include Fund FE	Fama MacBeth	Only MF Trustees	MF Trustees With at Least 10 Funds	Exclude Trustees Changes	Exclude Target Date Funds	Only Equity Funds	Only Active Funds
Affiliated Fund	−0.166***	−0.149***	−0.110***	−0.172***	−0.179***	−0.139***	−0.143***	−0.126***	−0.139***
	(0.018)	(0.014)	(0.019)	(0.021)	(0.022)	(0.019)	(0.021)	(0.024)	(0.022)
LowPef	−0.315***	−0.277***	−0.272***	−0.325***	−0.317***	−0.313***	−0.370***	−0.397***	−0.372***
	(0.033)	(0.021)	(0.066)	(0.039)	(0.043)	(0.035)	(0.034)	(0.036)	(0.034)
HighPerf	−0.058***	−0.038***	−0.071*	−0.049*	−0.061**	−0.038	−0.043*	−0.065***	−0.049*
	(0.022)	(0.014)	(0.034)	(0.027)	(0.031)	(0.024)	(0.024)	(0.024)	(0.025)
LowPerf*Affiliated Fund	0.233***	0.209***	0.128**	0.268***	0.261***	0.248***	0.206***	0.166***	0.209***
	(0.043)	(0.029)	(0.053)	(0.049)	(0.052)	(0.044)	(0.048)	(0.055)	(0.050)
HighRank*Affiliated Fund	0.008	0.051***	0.014	−0.011	−0.006	−0.021	0.030	0.041	0.008
	(0.029)	(0.019)	(0.012)	(0.034)	(0.038)	(0.030)	(0.034)	(0.037)	(0.037)
Maximum Corr	0.011***	0.018***	0.014***	0.011***	0.011***	0.009***	0.011***	0.014***	0.011***
	(0.001)	(0.001)	(0.003)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Log(Option Size)	−0.010***	−0.008***	−0.009***	−0.010***	−0.010***	−0.007***	−0.010***	−0.011***	−0.011***
	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
No. of Options	−0.003***	−0.003***	−0.003***	−0.002***	−0.002***	−0.002***	−0.002***	−0.002***	−0.002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Exp. Ratio	8.868***	−4.357**	7.575***	7.947***	8.132***	6.560***	7.906***	6.429***	7.422***
	(1.040)	(2.187)	(0.829)	(1.259)	(1.299)	(1.075)	(1.223)	(1.193)	(1.234)
Turnover	0.015***	0.006**	0.012**	0.017***	0.020***	0.017***	0.014***	0.024***	0.014***
	(0.004)	(0.003)	(0.004)	(0.004)	(0.005)	(0.004)	(0.004)	(0.007)	(0.004)
Log(Fund Size)	−0.021***	−0.049***	−0.019***	−0.018***	−0.020***	−0.018***	−0.019***	−0.021***	−0.020***
	(0.002)	(0.004)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)
Fund Age	0.000	−0.001	0.000	0.000	0.000	0.000	0.000	−0.000	0.000
	(0.000)	(0.003)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Std. Dev.	−0.272**	−0.799***	−0.039	−0.171	−0.236	−0.043	0.023	0.227	0.111
	(0.135)	(0.144)	(0.264)	(0.213)	(0.227)	(0.209)	(0.188)	(0.216)	(0.195)
Observations	101,190	106,848	106,777	86,761	72,879	96,168	92,235	71,055	81,227
R-squared	0.110	0.183	0.088	0.087	0.093	0.074	0.075	0.091	0.073

Table A-7: Fund Additions by Performance Deciles (unscaled)

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	1 Year			3 Years			5 Years		
Decile	A	UA	A-UA	A	UA	A-UA	A	UA	A-UA
1	1.160	0.009	1.150***	0.747	0.005	0.742***	0.671	0.005	0.666***
2	0.770	0.010	0.760***	0.602	0.007	0.594***	0.513	0.006	0.507***
3	1.178	0.013	1.165***	0.879	0.009	0.870***	1.064	0.010	1.054***
4	1.274	0.016	1.258***	1.144	0.013	1.131***	0.835	0.012	0.823***
5	1.203	0.020	1.183***	1.165	0.017	1.149***	0.941	0.016	0.925***
6	1.327	0.023	1.304***	1.481	0.022	1.459***	1.242	0.018	1.224***
7	1.294	0.022	1.272***	1.550	0.025	1.525***	1.648	0.023	1.625***
8	1.455	0.027	1.428***	1.402	0.028	1.375***	1.721	0.031	1.689***
9	1.762	0.034	1.728***	2.039	0.042	1.997***	2.374	0.045	2.329***
10	1.843	0.038	1.805***	2.255	0.044	2.211***	2.297	0.045	2.252***

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

Performance	1 Year			3 Years			5 Years		
Decile	A	UA	A-UA	A	UA	A-UA	A	UA	A-UA
1	1.160	0.018	1.141***	0.747	0.010	0.737***	0.671	0.010	0.661***
2	0.770	0.014	0.756***	0.602	0.011	0.590***	0.513	0.008	0.505***
3	1.178	0.021	1.157***	0.879	0.014	0.864***	1.064	0.017	1.047***
4	1.274	0.026	1.248***	1.144	0.022	1.122***	0.835	0.022	0.813***
5	1.203	0.033	1.170***	1.165	0.033	1.133***	0.941	0.031	0.910***
6	1.327	0.037	1.290***	1.481	0.037	1.444***	1.242	0.034	1.208***
7	1.294	0.037	1.258***	1.550	0.043	1.507***	1.648	0.037	1.611***
8	1.455	0.045	1.410***	1.402	0.042	1.361***	1.721	0.043	1.677***
9	1.762	0.052	1.710***	2.039	0.058	1.980***	2.374	0.068	2.306***
10	1.843	0.048	1.795***	2.255	0.062	2.193***	2.297	0.065	2.232***

Panel C: All Funds, Fama-MacBeth Tests

Performance	1 Year			3 Years			5 Years		
Decile	A	UA	A-UA	A	UA	A-UA	A	UA	A-UA
1	1.007	0.010	0.998**	0.723	0.006	0.717**	0.653	0.006	0.648**
2	0.721	0.011	0.710***	0.545	0.008	0.537***	0.510	0.006	0.504***
3	1.184	0.015	1.169***	0.853	0.010	0.843***	1.035	0.011	1.024***
4	1.303	0.019	1.284***	1.124	0.015	1.109***	0.812	0.013	0.799***
5	1.177	0.022	1.155***	1.134	0.019	1.115***	0.914	0.018	0.896***
6	1.307	0.025	1.282***	1.459	0.025	1.434***	1.217	0.021	1.196***
7	1.269	0.025	1.244***	1.520	0.027	1.492***	1.600	0.025	1.574***
8	1.469	0.030	1.439***	1.387	0.031	1.356***	1.704	0.035	1.669***
9	1.749	0.039	1.711***	2.001	0.047	1.954***	2.354	0.051	2.303***
10	1.843	0.043	1.800***	2.193	0.049	2.143***	2.259	0.050	2.209***

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

Performance	1 Year			3 Years			5 Years		
Decile	A	UA	A-UA	A	UA	A-UA	A	UA	A-UA
1	1.007	0.016	0.992**	0.723	0.009	0.713**	0.653	0.009	0.644**
2	0.721	0.014	0.708***	0.545	0.011	0.534***	0.510	0.008	0.503***
3	1.184	0.022	1.162***	0.853	0.015	0.839***	1.035	0.017	1.018***
4	1.303	0.027	1.276***	1.124	0.022	1.102***	0.812	0.022	0.790***
5	1.177	0.032	1.145***	1.134	0.033	1.101***	0.914	0.032	0.882***
6	1.307	0.037	1.270***	1.459	0.037	1.421***	1.217	0.033	1.184***
7	1.269	0.036	1.233***	1.520	0.042	1.477***	1.600	0.037	1.562***
8	1.469	0.044	1.425***	1.387	0.042	1.345***	1.704	0.043	1.661***
9	1.749	0.053	1.697***	2.001	0.059	1.943***	2.354	0.068	2.286***
10	1.843	0.048	1.795***	2.193	0.059	2.133***	2.259	0.063	2.196***

Table A-8: Linear Probability Model for Affiliated Fund Additions.
The table reports the coefficient estimates of the following model for affiliated fund additions: ${AF^{ADD}}_{p,f,t} = \beta_0 + \beta_1 \times Perf_{p,f,t-1} + Z'_{p,f,t-1}\gamma + \epsilon_{p,f,t}$, where ${AF^{ADD}}_{p,f,t-1}$ 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. $Perf_{p,f,t-1}$ 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 rank 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 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 specific fund styles, and year and trustee fixed effects. Standard errors are two-way clustered at plan and fund levels 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)	−0.140***		
	(0.026)		
Perf (3 YR)		−0.201***	
		(0.036)	
Perf (5 YR)			−0.228***
			(0.041)
No. of Options	−0.001	−0.001*	−0.001*
	(0.000)	(0.000)	(0.000)
Log(Plan Assets)	−0.017***	−0.017***	−0.016***
	(0.003)	(0.003)	(0.003)
Exp. Ratio	−0.134***	−0.131***	−0.127***
	(0.023)	(0.022)	(0.022)
Turnover	−0.001	−0.002	−0.002
	(0.010)	(0.010)	(0.010)
Log(Fund Size)	−0.007	−0.005	−0.001
	(0.007)	(0.007)	(0.007)
Fund Age	−0.002***	−0.002***	−0.002***
	(0.001)	(0.001)	(0.001)
Std. Dev.	0.014	0.041	0.044
	(0.033)	(0.032)	(0.032)
Observations	20,925	20,925	20,925
R-squared	0.723	0.725	0.726

Table A-9: 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^{**}	-0.13	-0.10
	(0.12)	(0.16)	(0.22)
Lowest Quintile	-0.10	-0.06	-0.09
	(0.07)	(0.12)	(0.13)
All Funds	0.06^{**}	0.02	0.06^{*}
	(0.02)	(0.04)	(0.03)

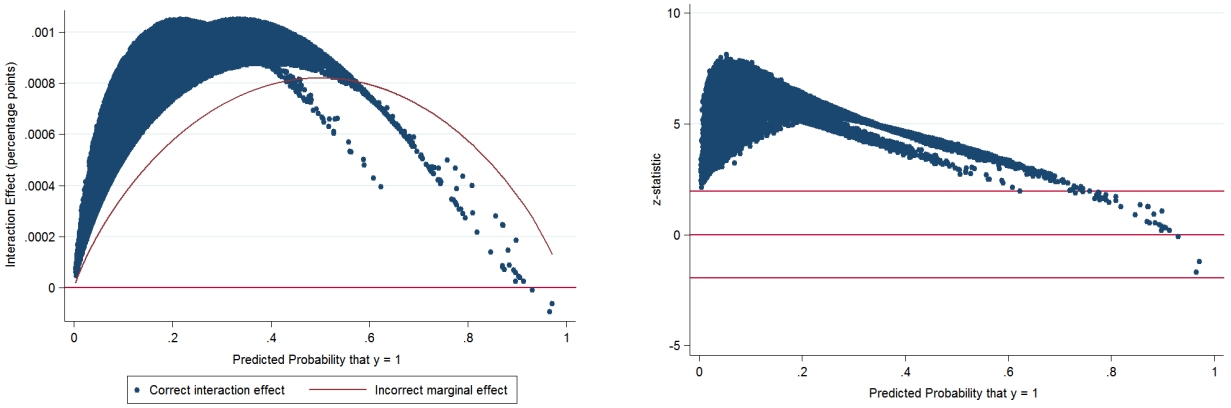
Panel B: Fama-French Alpha Differences

	No Changes	Deletions	Additions
Lowest Decile	-0.26^{**}	-0.13	-0.15
	(0.13)	(0.17)	(0.23)
Lowest Quintile	-0.10	-0.06	-0.09
	(0.07)	(0.13)	(0.14)
All Funds	0.06^{**}	0.02	0.06^{*}
	(0.02)	(0.03)	(0.03)

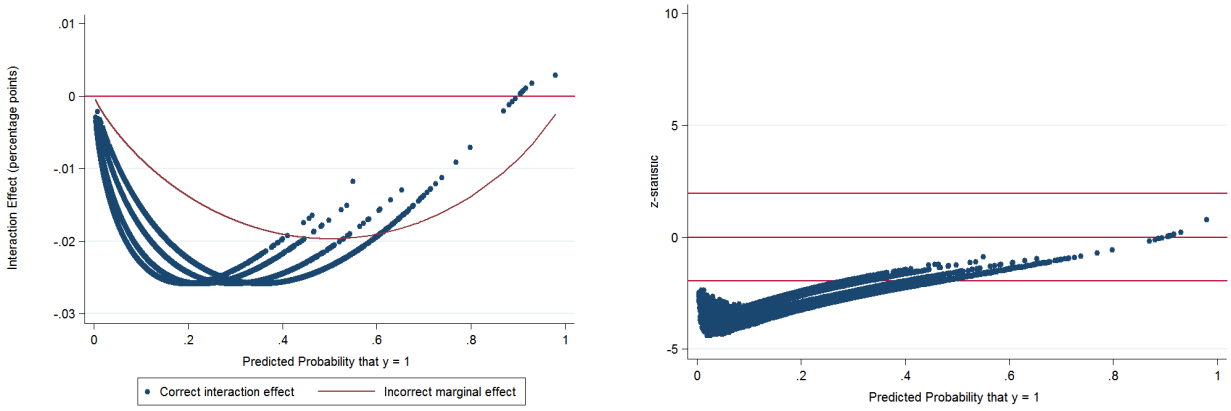
Panel C: CAPM Alpha Differences

	No Changes	Deletions	Additions
Lowest Decile	-0.32^{*}	-0.25	-0.37
	(0.16)	(0.21)	(0.32)
Lowest Quintile	-0.09	-0.19	-0.15
	(0.07)	(0.18)	(0.21)
All Funds	0.03	-0.01	0.02
	(0.03)	(0.04)	(0.06)

Panel A: Interaction Effects for Linear Performance (Table A-2, column 1)



Panel B: Interaction Effects for Linear Performance (Table A-2, column 2)



Panel C: Interaction Effects for Negative Non-DC flows (Table A-2, column 2)

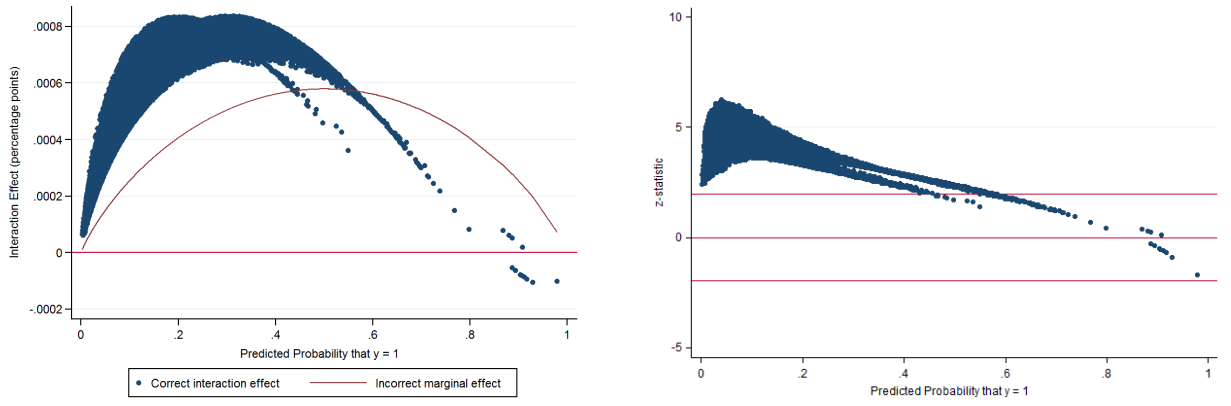
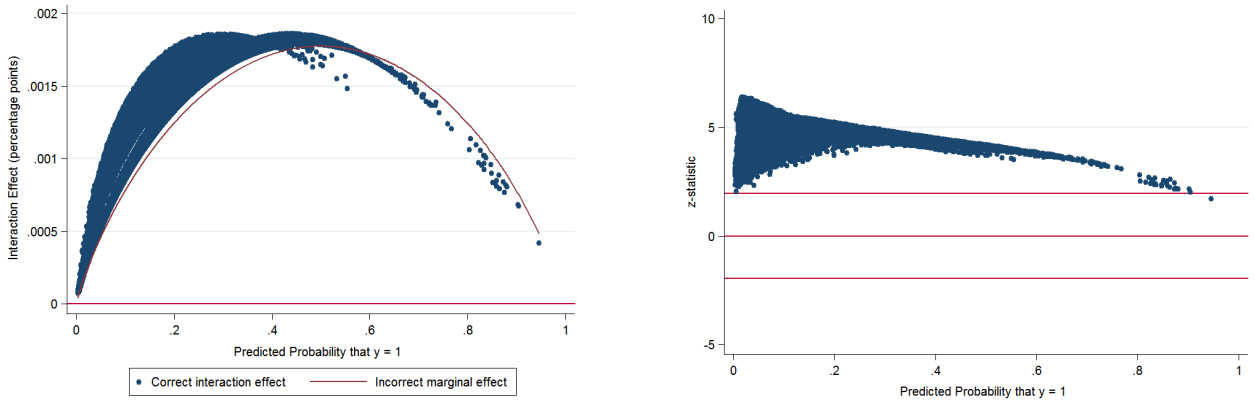


Figure A-1: Marginal effects between the indicator variable for affiliated funds and the performance ranks: Linear performance model. The graphs display the marginal effects and corresponding z-statistics by observation on the interaction variables between the affiliation dummy and the below- and above-median performance ranks in Table A-2, estimated using Ai and Norton (2003).

Panel D: Interaction Effects for Below-Median Performance (Table A-2, column 3)



Panel E: Interaction Effects for Above-Median Performance (Table A-2, column 3)

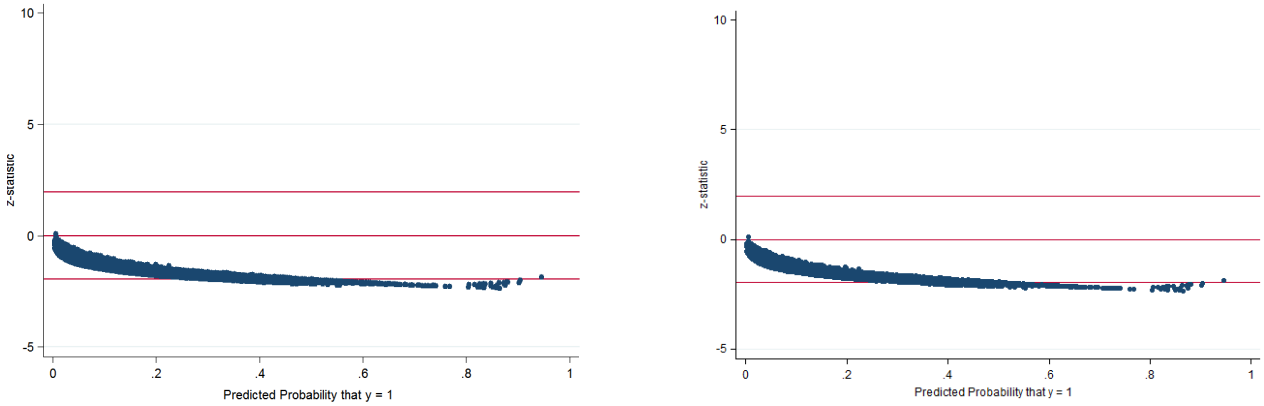
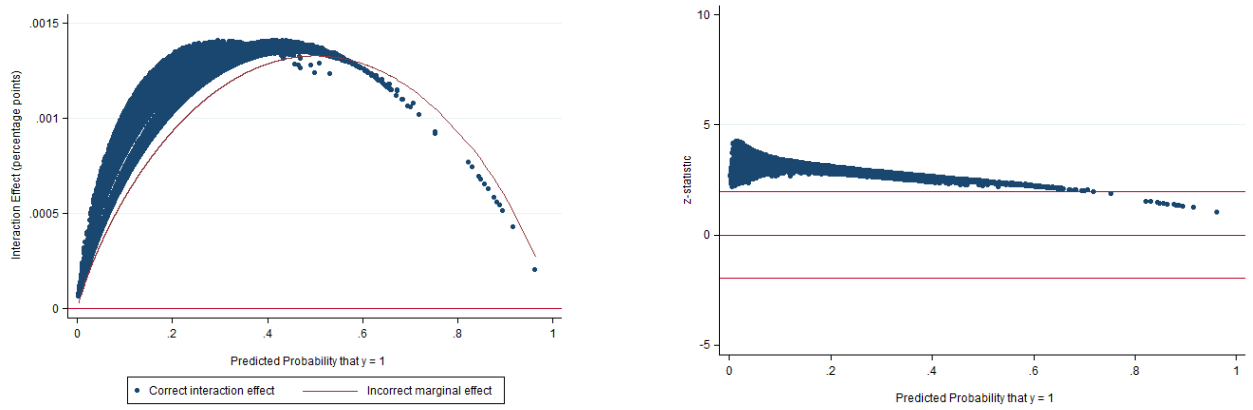
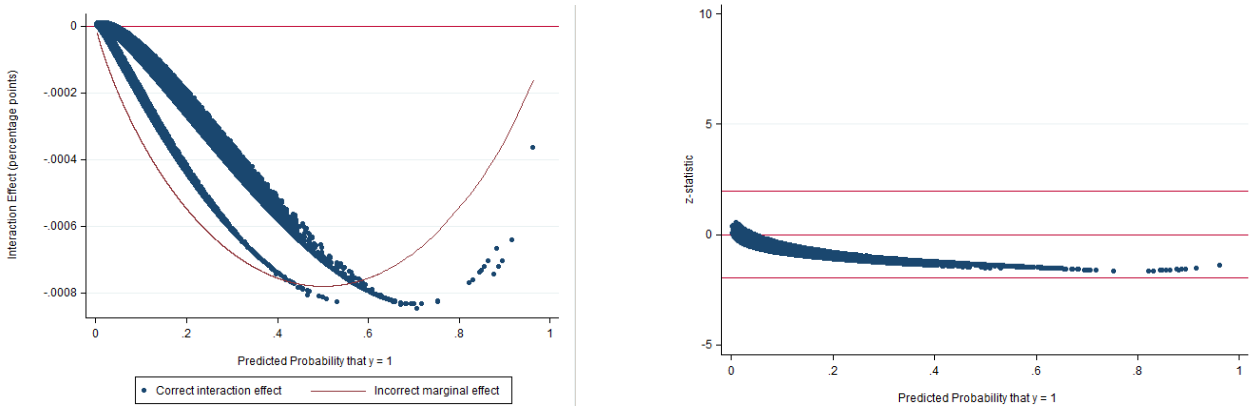


Figure A-2: Marginal effects between the indicator variable for affiliated funds and the performance ranks: 2-Segment model (Specification 1). The graphs display the marginal effects and corresponding z-statistics by observation on the interaction variables between the affiliation dummy and the below- and above-median performance ranks in Table A-2, estimated using Ai and Norton (2003).

Panel F: Interaction Effects for Below-Median Performance (Table A-2, column 4)



Panel G: Interaction Effects for Above-Median Performance (Table A-2, column 4)



Panel H: Interaction Effects for Negative Non-DC flows (Table A-2, column 4)

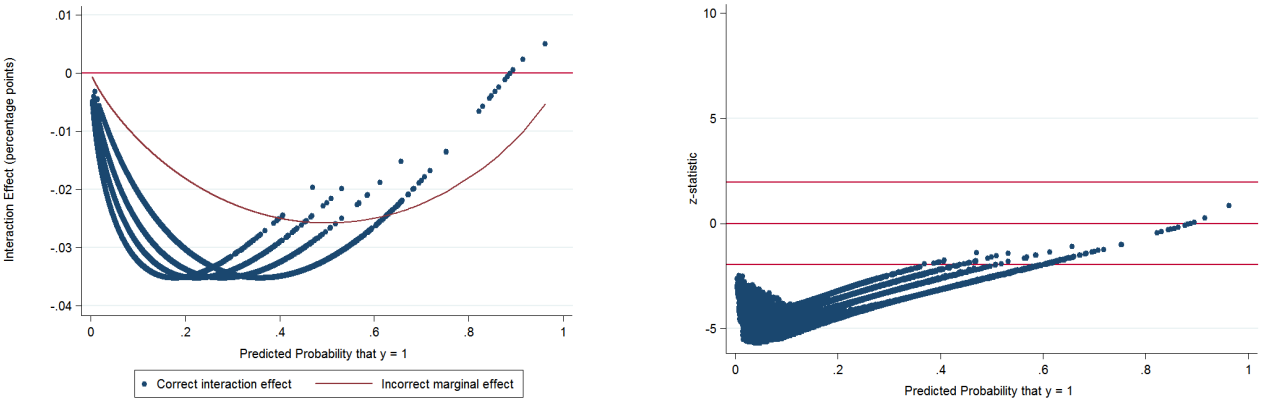
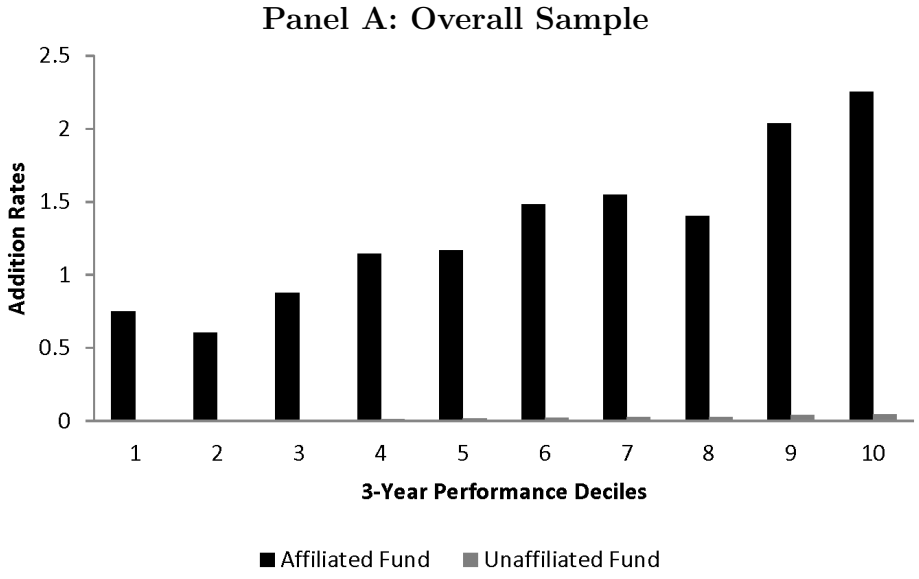


Figure A-3: Marginal effects between the indicator variable for affiliated funds and the performance ranks: 2-Segment model (Specification 2). The graphs display the marginal effects and corresponding z-statistics by observation on the interaction variables between the affiliation dummy and the below- and above-median performance ranks in Table A-2, estimated using Ai and Norton (2003).



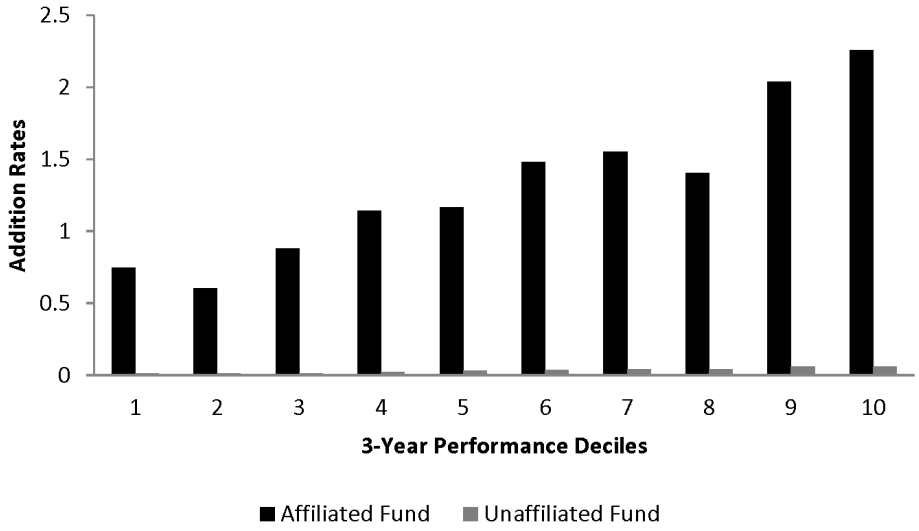


Figure A-4: Fund additions by affiliation. The figure depicts mean annual fund addition frequencies by affiliation and performance deciles. Panel A includes the full sample. Panel B includes only those funds that are offered by fund families that serve as trustees for at least one plan in our sample. 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.

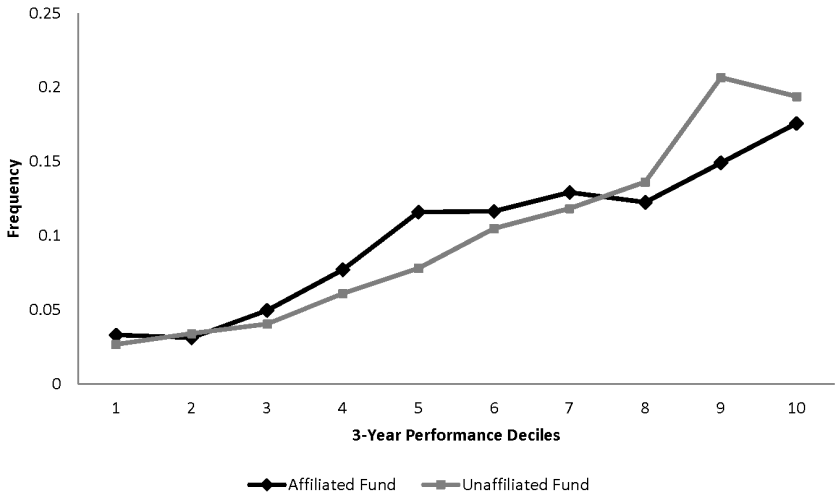


Figure A-5: The distribution of mutual fund additions by performance decile and fund affiliation. The figure shows the distribution of the funds that are added to a 401(k) menu at some point during our sample period by performance decile and affiliation. The dark line shows the fraction of affiliated funds in the various performance deciles, while the grey line provides the corresponding values for unaffiliated funds. Performance deciles are created from percentile performance ranks. These are calculated using overall rankings, in which fund performance is ranked relative to all other mutual funds in CRSP with the same style over the prior 36 months.

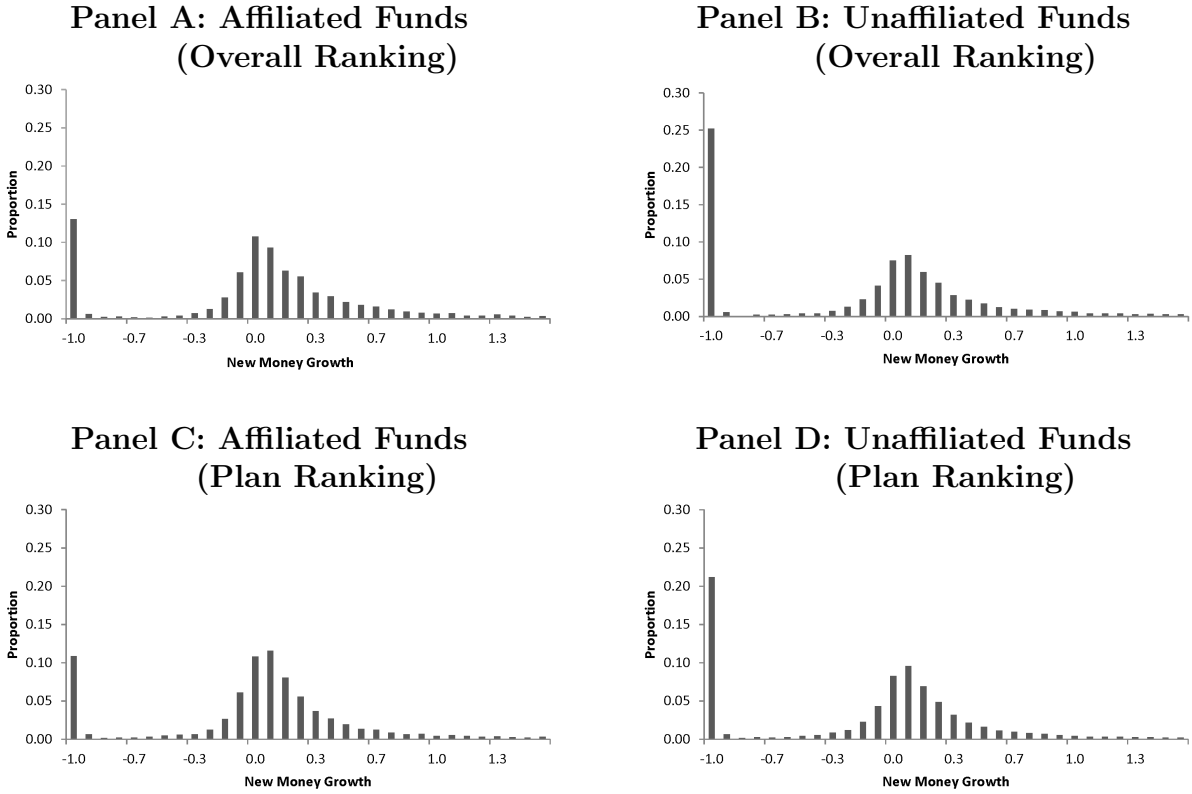


Figure A-6: New money growth of lower performance quintiles for affiliate and unaffiliated Funds. The figure displays the distribution of fund flows to poorly performing mutual funds on the menu by affiliation. Fund flows, or the growth rate of new money $NMG_{p,f,t}$ of fund f held in 401(k) plan p 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 the 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. Panels C and D depict the distributions of the corresponding flows using performance rankings based on only those mutual funds that are offered on the same 401(k) menu.