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 trustees of 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 and are costly to retirement savers.

JEL Classification: G23, J23

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

1 Introduction

Employer-sponsored 401(k) accounts have gained significant importance around the world. In the United States, the value of 401(k) assets reached $3.5 trillion at the end of the third quarter of 2012.[1] Their growth represents important business opportunities for mutual funds as they manage approximately half of the 401(k) investment pool. Moreover, mutual fund families often serve as trustees of these defined contribution (DC) plans and play an active role in creating the menu of investment options for the plans' participants.[2]

While the Employee Retirement Income Security Act of 1974 (ERISA) requires trustees to be prudent in selecting a suitable set of investment choices for their 401(k) clients, mutual fund trustees have a competing interest to maximize investments in their own proprietary funds. Surprisingly, little is known about whether and how these conflicting incentives influence the menu of options in 401(k) plans. This is concerning given that DC accounts are a main source of retirement income for many of the beneficiaries. Since retirement savings compound over long horizons, any inefficiency or trustee bias in this setting can significantly affect the employees' wealth at retirement and thus have important welfare consequences for society in general.

In this paper, we provide the first study of the conflicting incentives of mutual fund trustees. Focusing on fund entry and exit, we hypothesize that if the trustees' decisions are driven by their own financial interests, mutual fund trustees may be more inclined to include their own funds in the fund lineup – even when more suitable options are available from other fund families – and subsequently more reluctant to remove them. Moreover, they may also be less

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

[2] The trustee is the entity who holds the assets of the plan in trust. Trustees are typically appointed by the employer who sponsors the plan and have a fiduciary responsibility to administer the plan for the exclusive benefit of plan members. They must act in accordance with reasonable standards of prudence and offer a diversified set of options to participants and sponsors. Cohen and Schmidt (2009) describe in detail the role of the trustee in the decision process.

sensitive to the performance of these affiliated funds when making menu altering decisions.

To investigate this *favoritism* hypothesis, we hand collect information on the menu of mutual fund options offered in a large sample of defined contribution 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 that have a mutual fund trustee adopt an *open architecture* whereby investment options include not only funds from the trustee's family but from other mutual fund families as well. Therefore, an interesting feature of our dataset is that a given fund often contemporaneously appears on several 401(k) menus that are administered by different trustees. This means that open architecture allows the same fund to be an affiliated fund ("trustee fund") on some menus and an unaffiliated fund ("non-trustee fund") on others. This data feature provides us with a unique identification strategy and allows us to contrast how the very same fund is viewed across two different menus: one on which it is a trustee fund and another on which it is not.

We find that despite their fiduciary responsibilities, trustees have a strong preference for their own funds. Trustee funds are less likely to be removed from the plan across the board. Moreover, the biggest difference between how trustee and non-trustee 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 two and a half times more likely to be deleted from those menus on which they are unaffiliated with the trustee than from those where they are affiliated with the trustee.

Similarly, we find that trustees are substantially more likely to add their own funds to the menu across all performance deciles. Furthermore, trustee fund additions exhibit lower

prior performance than non-trustee additions and the probability of adding a trustee fund is less sensitive to performance than the probability of adding a non-trustee fund. Interestingly, mirroring our results for deletions, we also find that addition probabilities are inversely related to performance among poorly performing trustee funds.

The trustee's tilt toward affiliated funds need not affect plan participants however. Although the investment opportunity set of the plan is determined by the menu choices selected by the employer and the trustee, participants can freely allocate their contributions within the opportunity set. If participants anticipate trustee biases or are simply sensitive to poor performance, they can undo favoritism in their own portfolios by, for instance, not allocating capital to poorly performing trustee funds. Therefore to investigate whether trustee favoritism has an impact on the overall allocation of plan assets, we examine the sensitivity of participant flows to the performance of trustee and non-trustee funds. We show that participants are generally not sensitive to poor performance and thus they do not undo the trustee bias. This in turn indicates that plan participants are affected by the trustee's behavior.

Finally, while our evidence on favoritism is consistent with adverse trustee incentives, trustees are also likely to have private information about their own proprietary funds. Therefore, it is possible that they show a strong preference for these funds in menu altering decisions not because they are 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 the lackluster past performance – the decision to keep poorly performing trustee funds on the menu is information driven, then they should perform better in the future. We find that this is not the case: trustee funds that rank poorly based on past performance but are not delisted from the menu do not perform well in the subsequent year. We estimate that on average they underperform by approximately 3.6% annually on a risk-adjusted basis. This figure is large in and of itself, but its economic significance is magnified in the retirement

context by compounding. Our results suggest that the trustee bias we document in this paper has important implications for the employees' income in retirement.

Our study belongs to a nascent literature on trustees in defined contribution plans. Davis and Kim (2007) and Cohen and Schmidt (2009) study conflicts of interest that exist in the trustee relationship. Both papers argue that to protect the valuable business relation that arises between the sponsoring company and the trustee family, fund 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 creating liquidity for these shares and supporting the stock price of distressed firms. Davis and Kim (2007) document that the way trustee funds vote in shareholder meetings is influenced by the business ties they have as a trustee.

While these studies find that the sponsor can draw important benefits from appointing mutual fund trustees, mutual funds may also enjoy positive externalities from these arrangements in addition to capturing the large 401(k) asset pool. One such externality may be the opportunity to gain an information advantage about the sponsoring company through the trustee's access and connection to the company's management. Duan, Hotchkiss, and Jiao (2012) show that trustee families may indeed obtain valuable information about the sponsor, which provides them with profitable trading opportunities. We contribute to this literature by highlighting how adverse trustee incentives affect the fund lineup of the menu.

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 defined contribution plans.[3]

[3]Papers on the design of employer-sponsored retirement accounts include 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); Elton, Gruber, and Blake (2006, 2007); Brown, Liang, and Weisbenner (2007); Huberman and Jiang (2006); Rauh (2006); Goyal and Wahal (2008); Carroll et al. (2009); Tang et al. (2010); Balduzzi and Reuter (2012); Brown and Harlow (2012); Christoffersen and Simutin (2012); Mitchell

While papers in this literature commonly employ data that are either limited to plans offered by a single trustee or, alternatively, to a single year snapshot of the industry, our database contains a large cross-section of plans, trustees, and sponsors as well as an eleven-year time-series providing a rich laboratory for 401(k) research.

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. They show that family organization generates distortions in delegated asset management. Reuter (2006) provides evidence that lead underwriters will use allocations of underpriced IPOs to reward those institutions with which they have strong business relationships. Kuhnen (2009) investigates whether business networks mitigate agency conflicts by facilitating efficient information transfers or whether they are channels for inefficient favoritism. She finds that fund directors and advisory firms that manage the funds hire each other preferentially based on the intensity of their past interactions. Our paper provides evidence that mutual fund families favor their own affiliated funds when they act as trustees of 401(k) pension plans.[4]

The rest of the paper is structured as follows. Section 2 describes our data collection and provides summary statistics of our 401(k) plans as well as the mutual funds offered in the plans' menu. Sections 3–6 discuss our results. Section 7 concludes.

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and Utkus (2012); Sialm and Starks (2012); and Sialm, Starks, and Zhang (2012).

[4]Additional papers studying favoritism within asset management companies include Nanda, Wang, and Zheng (2004); Ritter and Zhang (2007); Massa and Rehman (2008); Evans (2010); Bhattacharya, Lee, and Pool (2012); and Chaudhuri, Ivkovic, and Trzcinka (2012).

2 Data and Summary Statistics

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

2.1 Data collection

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 the 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 tables 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. 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, 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. We supplement our Form 11-K information with plan level data from Form 5500, as described below. The resulting dataset has more than 302,000 observations, containing information at the firm-year-plan-menu 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, or guaranteed investment contracts. In approximately 20% 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. 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).[5]

[5]Following the PPA (2006), the Department of Labor added a new fiduciary protection to ERISA for default

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.

2.2 Sample description

Table 1 describes the composition of our sample by year. Our data covers 2,645 distinct plans sponsored by 1,853 firms from 1998 to 2009 (companies can sponsor multiple plans). Overall, the final dataset has 13,585 plan-year observations. The number of plans is smaller during the early part of the sample as disclosures on investments were generally less standardized. Similarly, our data for 2009 are potentially incomplete as they do not include late filers or filers who have a late fiscal year end. More than 56% of the menu options are mutual fund choices.[6]

investments. Section 404(c)(5) stipulates that if participants wave the right to direct their investments, the fiduciaries (sponsors and trustees) are protected from suits about the default investment option's market performance if those participants are invested in a qualified default investment alternative (QDIA). Eligible QDIAs include target-date funds, traditional balanced funds, and managed account advice services.

[6]For robustness, we also run our analyses below by excluding the first and the last years of our sample. This has no significant effects on our results.

The table also provides information about plan trusteeship and architecture. About 77% of plans in our sample are trusteed by a mutual fund family. The remaining plans are trusteed by commercial banks, consulting companies, individuals, or by the sponsoring company itself. We do not differentiate between these later categories and collapse them into one group which we refer to as "Other Trustees" or "Non-Mutual Fund Trustee." The ratio between the number of plans trusteed by management companies and by other entities has been slightly increasing over time but experienced a small decrease in the later years as a response to the increased competition in this market.[7]

The table shows an increase in the number of mutual fund investment options offered in the average plan over time. To summarize the growing importance of including funds from a number of different mutual fund families on the menu, which we refer to as *open architecture*, we report three metrics. *Trustee share* represents the proportion of total plan assets invested in mutual funds that are offered by the trustee family. Since this is zero for plans with non-mutual fund trustees, trustee share in this table provides the overall proportion of retirement assets invested with affiliated funds. We also report 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. These measures indicate a decline in the share of the assets managed by trustee families and an increase in the popularity of offering mutual funds from several different families.

In our sample, the average size of a 401(k) plan is approximately $280 million (with a median of $60 million), suggesting that our dataset covers several very large, well-established plans. The average plan size generally increases over our sample period, peaking at $364 million in 2007. On aggregate, our plans cover $376 billion in retirement assets in 2009

[7]See for instance, the Bloomberg article on March 23, 2011: `http://www.bloomberg.com/news/print/2011-03-23/banks-angle-for-bigger-share-of-4-trillion-retirement-market.html`

($485 billion in 2007) and over 9 million total participants per year. The typical account size is $41,365 and employees contribute $5,200 per year. The percentage of assets invested in employer securities varies across plans and years, with a mean of 17% of assets and a median of 10%. About 13% of our plans are collectively negotiated (i.e. unionized). Our sample is representative of the universe of plans sponsored by public companies filing Form 5500 with the Department of Labor in terms of plan size, number of participants, and industry composition.[8]

Table 2 describes the characteristics of mutual funds that have been added, kept, or deleted from the menu, by their trustee affiliation. We also report the difference between trustee and non-trustee characteristics along with the results of paired t-tests that evaluate the statistical significance of the difference. The corresponding standard errors are two-way clustered at the plan and fund levels.

Our sample contains 19,003 fund deletions, 139,182 fund-year observations that stay in the sample for at least two consecutive years, and 28,193 fund additions. Overall, funds that are deleted from the plans in our sample have the lowest average performance across the three groups, as measured by their percentile performance rank among funds of the same style in the CRSP mutual fund universe using past one-, three-, and five-year returns. Added funds are younger and come with better performance records than those that are kept or deleted from the menus. Trustee funds that are kept or added generally have lower performance over the past three and five years.

The table also shows that fees charged by trustee funds are, on average, significantly lower than those of non-trustee funds. Since in most cases we are not able to identify the exact

[8]Our sample covers 30-35% of the 401(k) assets of plans sponsored by publicly listed companies that report Form 5500. Filing Form 5500 with the Department of Labor (DOL) and Internal Revenue Service (IRS) is mandatory for all employee benefit plan that qualify under the Employee Retirement Income Security Act of 1974 (ERISA).

share class of the fund offered in the plan, we calculate fees as the weighted average expense ratio of all share classes reported in CRSP with the total net assets of each share class as weights. The difference between the expense ratios of trustee and non-trustee funds may be driven by the difference in fund styles across the two groups. To investigate this possibility, we also report average style-adjusted fees. We calculate the style-adjusted average expense ratio by subtracting from each fund's expense ratio the value weighted average expense ratio of all funds in its investment category as determined by its Lipper Objective Code. We find that trustee funds are cheaper on a style-adjusted basis as well.[9]

These results point to a potential benefit of employing mutual fund trustees, as they typically offer their own low-fee funds. Nevertheless, and probably the least explored dimension of this relationship in the literature, is the potential cost engendered by trustee favoritism. This paper investigates this hypothesis.

3 Fund Deletions

Investment allocations in 401(k) accounts are driven by both plan providers and plan participants. In a first step, the trustee, along with the sponsor and other plan fiduciaries, determines the investment options for the plan. In a second step, plan participants allocate their retirement savings and contributions to the various investment options. It is also the responsibility of the provider to insure that the plan continuously offers a suitable set of choices. Therefore, trustees dynamically adjust 401(k) menus by deleting some investment options and adding others. In this section, we study whether plan trustees favor their own mutual funds relative to funds affiliated with other mutual fund companies during these menu altering decisions.

[9]In unreported analyses, we find that the expense ratio of trustee funds is significantly lower even after controlling for fund size, age, turnover, as well as various plan characteristics.

3.1 Univariate Relationship

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. A mutual fund can be an investment option in a 401(k) plan where its management company is the plan's trustee ("trustee fund"), as well as in a plan offered by an unaffiliated trustee ("non-trustee fund"). Therefore, in each year, for each fund, we count the number of menus on which the fund is a trustee fund and the number of menus on which it is a non-trustee fund, respectively. We then count the number of affiliated and the number of unaffiliated menus from which the fund is delisted during the year. This allows us to determine the deletion frequencies for each fund for each year by affiliation.

To make the comparison between the deletion frequencies of trustee and non-trustee funds more meaningful, we also group funds into deciles based on past performance. In particular, we compute the style-adjusted returns of all mutual funds in the CRSP mutual fund database over the prior one, three, and five years. Funds are then sorted into decile portfolios based on their style-adjusted 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, as described above. In a second step, we average the deletion rates within the performance deciles by year. Finally, we average the decile deletion rates across time. Panel A shows the results based on all funds in our sample. In Panel B, we focus only on those funds that contemporaneously appear on multiple 401(k) menus, at least once as a trustee fund and at least once as a non-trustee 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 a fund is significantly less likely to be deleted from a plan in which it is a trustee fund than from those in which it is a non-trustee fund regardless of past performance. For example, Panel A indicates that the average trustee fund has a deletion rate of 11.6% across all performance deciles, whereas a non-trustee fund has an average deletion rate of 21.4%. Furthermore, we find that the differences in deletion rates widen significantly if we focus on poorly performing funds. For example, funds in the lowest performance ranking decile in Panel A have a probability of deletion of 29.6% for non-trustee funds and a probability of deletion of only 11.9% for trustee funds. Indeed we observe that the deletion rate of trustee funds in the lowest performance decile is actually lower than the deletion rates of trustee funds in deciles two through four. This is surprising provided that Carhart (1997) documents performance persistence among poorly performing funds.

Panel B shows similar results for the subsample of funds that are simultaneously offered as both trustee and non-trustee funds. In this analysis the funds in each decile are identical across the affiliated and unaffiliated groups. Thus, our results are not driven by differences in fund characteristics.

Table 3 summarizes the corresponding deletion frequencies by performance deciles based on one, three, and five year evaluation horizons. The table reports the deletion frequencies for trustee funds and non-trustee funds, as well as the difference between them. Analogously to Figure 1, average frequencies in Panel A are based on all funds in our sample, while Panel B calculates deletion probabilities using only those funds in our sample that simultaneously appear as trustee and non-trustee funds. Overall, we find that a fund is significantly more likely to be deleted from those menus on which it is not a trustee fund regardless of past performance under all three performance ranking horizons. Moreover, the difference between deletion probabilities is largest for poorly performing funds.

3.2 Multivariate Relation

Restricting our attention to those funds that simultaneously appear on several different menus offered by different trustees allows us to hold fund characteristics constant in our univariate analyses. To investigate whether the results in Section 3.1 are robust to controlling for various menu characteristics and to examine the performance sensitivity of affiliated and unaffiliated fund deletions, we estimate the following model:

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

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 at time t and zero otherwise, and $TF_{p,f,t}$ is an indicator variable for whether the trustee of pension plan p is affiliated with the management company of mutual fund f. *LowRank* and *HighRank* are defined as $LowRank_{p,f,t} = min(Rank_{p,f,t}, 0.5)$ and $HighRank_{p,f,t} = min(Rank_{p,f,t} - LowRank_{p,f,t}, 0.5)$, where $Rank_{p,f,t}$ is the performance rank of mutual fund f over the previous one, three, or five years. Performance ranks are formed based on the style-adjusted returns of all mutual funds in the CRSP mutual fund database over the prior one, three, and five years, as described in the previous section.

The other control variables Z include the natural logarithm of the option size (plan assets invested in the fund), the number of options, the expense ratio of the fund, the turnover of the fund's holdings, 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 time (year) fixed effects.[10]

[10]While fund-year fixed effects would allow for identification based on the same fund appearing on multiple

In our baseline model described in equation (1), we use two performance segments, evaluating the trustee's response to performance separately for below median and above median ranks. For robustness however, we also estimate our model using quintile based performance segments following Sirri and Tufano (1998) as well as a one-segment (linear) model. Favoritism toward affiliated funds implies that, all else equal, trustee funds are less likely to be delisted (i.e., $\beta_1 < 0$) and that trustee deletions are less sensitive to poor prior performance (i.e., $\beta_4 > 0$).

Table 4 reports the coefficient estimates. We estimate equation (1) 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.[11] Consistent with Figure 1 we find that trustee funds are significantly less likely to be deleted. A trustee fund has a lower probability of being delisted that ranges between 9.9% and 14%, depending on the specification. Consistent with performance chasing, we find that the probability of deletions decreases significantly with fund performance. For example, a ten percentage point increase in the fund's performance rank decreases the probability of deletions by between 1.8% and 3.2% for below median funds. Finally, we also find that deletions of trustee funds are less sensitive to poor performance than non-trustee funds as indicated by the highly significant positive β_4 coefficient. For trustee funds, the sensitivity of deletions to inferior fund performance is less than half of that of non-trustee funds.

The additional control variables indicate that funds with large plan investments are less

menus, as in our univariate setup, a fund's performance only varies over time. Therefore, to estimate the performance sensitivity of fund deletions, we do not use fund-year fixed effects.

[11] In Table A1 of the Appendix, we report the corresponding estimation results using a probit specification. The table displays the estimated marginal effects. For the interaction terms, these are calculated using the INTEFF command based on Ai and Norton (2003) and correspond to the average estimated marginal effect. Figure A1 of the Appendix provides a more complete picture and displays 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 4. In the rest of the paper, we only report our estimates using a linear probability model.

likely to be deleted and that 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 trustee funds are significantly less likely to be deleted from 401(k) plans than non-trustee funds and that this bias is particularly pronounced for poorly performing funds.

3.3 Robustness Tests

In this section, we report additional robustness tests for the base-case results summarized in Section 3.2.

3.3.1 Alternative Performance Ranking

In our baseline specification we rank mutual funds according to the style-adjusted returns of all mutual funds in the CRSP mutual fund database. We refer to this global ranking as "Overall Ranking." For robustness we now compute two alternative ranking methods, where the percentile performance rank 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 trustee may be pressured to remove the fund from the menu as underperformance in this setting is perhaps more transparent.

Table 5 summarizes the coefficient estimates from equation (1) when $Rank_{p,f,t}$ is defined using the alternative ranking methodologies. The results are qualitatively and quantitatively similar to the base-case results reported in Table 4. 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.

3.3.2 Linear Performance

In columns 1-3 of Table 6, we reestimate our baseline regression using a linear performance model (single performance segment) for robustness. For brevity, the table only reports the results using the three year horizon. Column 1 is based on performance ranking relative to funds in the same objective codes (i.e., overall ranking) and columns 2 and 3 report the corresponding results using the fund's performance rank relative to the 401(k) plan or the fund family. Consistent with the base-case specification from Table 4, we find that trustee funds are significantly less likely to be deleted with the difference in probabilities ranging from 5.1% to 9.5%. As in our baseline results, the sensitivity of trustee fund deletions to performance is significantly smaller for trustee funds.

3.3.3 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). 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 $LowQRank_{p,f,t} = min(Rank_{p,f,t}, 0.2)$, the performance in the three middle quintiles is given by $MidQRank_{p,f,t} = min(Rank_{p,f,t} - LowQRank_{p,f,t}, 0.6)$, and the performance in the highest quintile is given by $HighQRank_{p,f,t} = (Rank_{p,f,t} - LowQRank_{p,f,t} - MidQRank_{p,f,t})$.

Columns 4-6 of Table 6 report the estimates from the three piecewise linear segments

using our alternative ranking methods, based on the three year horizon. Consistent with the base-case specification from Table 4, we find that deletions are less sensitive to poor and intermediate performance for trustee funds. Interestingly, in our overall ranking model, we find that the deletions of non-trustee funds that rank in the highest performance quintile relative to other funds in the same objective codes actually increase with the performance rank.

3.3.4 Subsample Analysis

Table 7 shows the results of our linear probability model specified in equation (1) for various subsamples. For brevity, we only report the results using the three year horizon with the overall performance ranking. In the first four columns, we confirm that our results are consistent across different trustees. In the first column, we exclude the three largest trustees each year. These are the only trustees in our sample that have over 10% of all retirement assets. In column 2, we report our estimates for the three largest trustees only. Overall, we find qualitatively similar results across the two subsamples. Whereas affiliated trustee funds are 13.9% less likely to be deleted from the menu for non-top mutual fund trustees, we find that trustee funds are 12.7% less likely to be deleted from the menu for top-three mutual fund trustees. In addition, we find that trustee fund deletions are less sensitive to poor fund performance for both large and small mutual fund trustees. In column 3, we include trustee fixed effects since deletion probabilities might depend on the identity of the trustee. Our favoritism results remain after controlling for trustee fixed effects. In column 4, we reestimate our results using information only on those plans that are trusteed by a mutual fund family.

Columns 5 and 6 restrict the sample of mutual funds considered. In column 5 we exclude all target date funds, since these funds are often used as default investment options. In column 6, we restrict our sample to equity funds. The results in these specifications are very consistent

with the results in our base-case specification.

The Pension Protection Act of 2006 (PPA) introduced comprehensive new legislation for U.S. pension plans to protect retirement plan participants. Although the majority of the reforms concerned defined benefit plans, it also affected defined contribution plans by allowing companies to offer objective investment advice to participants and by requiring plans to provide specific benefit statements to participants.[12] 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.[13] To investigate whether these lawsuits and regulatory reforms affect our results, we divide our sample into two subperiods (1998-2006 and 2007-2009). Columns 7 and 8 of Table 7 indicate that our key results do not differ between the two subperiods. We find that trustee funds exhibit a lower propensity to be deleted from 401(k) menus and that deletions for trustee funds are less sensitive to prior fund performance for both subperiods.

4 Fund Additions

The previous section provides 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 document that similar biases exist for fund additions as well. We first provide univariate analyses to investigate whether the propensity to add a fund to a menu depends on the fund's affiliation with the trustee. We then examine the characteristics of newly listed trustee and non-trustee funds in a multivariate framework.

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

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

4.1 Univariate Relationship

We begin our analyses by calculating addition frequencies for affiliated and unaffiliated investment options, respectively. In Section 3.1, we compute mean deletion frequencies by averaging across the deletion propensities of all funds that could be deleted from a 401(k) plan in a given year. Our sample of 401(k) investment options represents the set of these funds. Analogously, to calculate mean addition frequencies we first determine the addition propensities of each fund that could be added to a 401(k) menu in a given year. For additions, the set of funds that could be added is represented by the CRSP mutual fund universe.

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

Consistent with Figure 1 and Table 3 for fund deletions, each year we also sort funds in the CRSP universe into deciles according to their style-adjusted performance over the prior one, three, and five years. Figure 2 and Table 8 report the average affiliated and unaffiliated addition frequencies by past performance decile. In both cases, 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 a trustee 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 addition frequency of the same fund to an affiliated or unaffiliated menu, respectively, consistent with our analyses for deletions in Section 3.1

above.

Figure 2 shows a substantial difference between the average addition frequencies for trustee and non-trustee funds using past performance rankings based on the previous 36 months. In the overall sample, the average addition frequency equals 1.08% for trustee funds and just 0.02% for non-trustee funds. Thus, trustee funds are more than fifty times more likely to be added to a plan than non-trustee funds, indicating a substantial trustee bias for fund additions.[14] This result extends to using performance rankings based on the previous one and five years, as summarized in Table 8.

We also find that addition frequencies increase disproportionately more with fund performance for non-trustee funds than for trustee-funds, indicating that non-trustee additions are much more sensitive to performance. An improvement in performance from the lowest to the highest decile increases the addition probability for non-trustee funds approximately eight-fold from 0.005% to 0.039%. At the same time, an equivalent improvement in performance for trustee funds results in only a 2.5 times larger addition probability (from 0.69% to 1.68%).

Finally, the results indicate that trustee funds in the bottom performance decile are more likely to be added to 401(k) plans than trustee funds in the second performance decile. For example, trustee funds in the lowest performance decile over the prior three years have an addition frequency of 0.69%, whereas trustee funds in the second performance decile have an addition probability of just 0.47%. In contrast, we do not find such non-monotonicities for non-trustee funds. These results are consistent with the hypothesis that plan trustees support their affiliated poorly-performing funds by adding them to 401(k) plans.

Panel B of Figure 2 and Table 8 replicates these results for the subsample of funds offered by families that serve as trustees of 401(k) plans. The affiliated addition frequencies are

[14]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.

exactly identical between the two panels. However, the addition frequencies of non-trustee funds are slightly higher for the subsample in Panel B since funds offered by families that serve as trustees are more likely to be selected by other unaffiliated trustees for their 401(k) plans.[15]

4.2 Sample of Additions

Next, we investigate the characteristics of affiliated and unaffiliated funds based on our sample of newly added funds. Table 2 from Section 2 provides univariate evidence that newly listed trustee funds exhibit lower past performance than non-trustee funds in the same category. We confirm this finding in Figure 3. The figure describes the distribution of trustee and non-trustee fund additions separately, by performance deciles. Fund performance is measured by the percentile performance rank of each fund in its style category in the past one, three, and five years, respectively, using the CRSP universe of mutual funds. The graph shows results based on fund performance in the past three years, but using one or five year ranks produces qualitatively similar patterns. The results reveal that the proportion of non-trustee funds with strong past performance is larger compared to that of trustee funds, while trustee 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 trustee and non-trustee funds, we estimate the following linear probability model for trustee additions:

$$TF^{ADD}{}_{p,f,t} = \beta_0 + \beta_1 \times Rank_{p,f,t} + Z'_{p,f,t}\gamma + \epsilon_{p,f,t}, \tag{2}$$

where the dependent variable takes the value of one if fund f added to plan p at time t is a trustee fund, and zero otherwise. Since the sample used in this analysis includes only

[15] In an unreported robustness test we estimate the addition proportions for trustee and non-trustee funds using only mutual funds that are included in at least one 401(k) plan. Although the addition proportions are around three times higher using this fund subsample, the results are qualitatively unaffected relative to the base-case specification.

fund additions, it reflects the choice between selecting a trustee fund over a non-trustee fund. $Rank_{p,f,t}$ is the percentile performance rank 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 9 with standard errors two-way clustered at the plan and fund levels. Consistent with trustee favoritism, trustee fund additions are associated with worse past performance even after controlling for other fund characteristics. This is represented by our $Rank_{p,f,t}$ coefficient estimates, which are significantly negative at the one percent level for each of our performance measures.[16]

5 Participant Flows

While the investment opportunity set of the plan is determined by the menu choices selected by the employer and the trustee, participants can freely allocate their contributions within the opportunity set. If participants anticipate trustee biases or are simply sensitive to poor performance, they can undo favoritism in their own portfolios by, for instance, not allocating capital to poorly performing trustee funds that are not removed from the menu. In this section, we investigate whether trustee favoritism has an impact on the overall allocation of plan assets by examining the sensitivity of participant flows to the performance of trustee and non-trustee 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 definition of fund flows:

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

[16]These results are reported using trustee fixed effects but are qualitatively equivalent when the trustee fixed effects are not included.

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%. This definition of new money growth allows us to decompose fund flows to existing menu options[17] into a component that is driven by the plan sponsor and the trustee (i.e., fund deletions, which are extensive margin flows of -100%) and a component that is driven primarily by plan participants (i.e., all other changes in the value invested in the menu option, which are intensive margin flows above -100%).[18] The analysis of extensive margin flows representing the decisions of plan sponsors and trustees is summarized in Section 3.2. To remove outliers, we winsorize $NMG1$ at the 95% level.

Figure 4 depicts the histograms of the percentage flows into various plan options for trustee and non-trustee funds in the lowest performance quintile over the previous three years based on various ranking methodologies. Consistent with Figure 1, which focuses on a special subset of the funds in our sample, we find that non-trustee options are significantly more likely to be deleted than trustee options overall. Figure 4 also shows that deletions contribute significantly to the total flows of new money, consistent with Sialm, Starks, and Zhang (2012).

Since equation (3) is not defined for fund additions, we also adopt two alternative measures for the growth rate of new money of fund f held in 401(k) plan p at time t using two alternative denominators for equation (3). The denominator of our first alternative measure ($NMG2$) is

[17] $NMG1$ is not defined for newly listed funds as for these, the value of the lagged plan position is 0.

[18] Whereas the extensive margin NMG1 rates are fund deletions, which are fully driven by choices of the plan sponsors and trustees, the intensive margin NMG1 rates are not only affected by plan participants but also by plan sponsors and trustees (e.g., additions of new funds that compete with old funds, preventing contributions to certain funds but grandfathering balances held by participants in these funds, selecting some funds as default investment options).

$V_{p,f,t} + V_{p,f,t-1}(1 + R_{f,t})$:

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

Under this definition, new money growth takes a value in the interval [-1,1]. In particular, it equals -100% for a fund that is eliminated as an investment option, as before, and +100% for a fund that is newly added to the pension plan. More gradual inflows and outflows into the fund are represented by intermediate values. Extensive margin new money growth that equals -100% or +100% corresponds to menu changes by sponsors and trustees. Intermediate values correspond to the changes plan participants make to their asset allocations.

Finally, the denominator of our second alternative new money growth measure ($NMG3$) is the plan value from the previous year:

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

To remove outliers, we winsorize $NMG3$ at the 95% level. While the values $NMG3$ takes under this third definition are not restricted to a specific range, we separate participant actions from those of the sponsors and the trustees by removing the set of additions and deletions from that of the rest of our sample.

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

$$\begin{aligned} NMG_{p,f,t} &= \beta_0 + \beta_1 \times TF_{p,f,t} + \beta_2 \times LowRank_{p,f,t} + \beta_3 \times HighRank_{p,f,t} \\ &+ \beta_4 \times TF_{p,f,t} \times LowRank_{p,f,t} + \beta_5 \times TF_{p,f,t} \times HighRank_{p,f,t} \\ &+ Z'_{p,f,t}\gamma + \epsilon_{p,f,t}. \end{aligned} \tag{6}$$

Equation (6) is analogous to our baseline equation (1) with two exceptions. First, our new dependent variable in equation (6) is NMG, a continuous variable under all three definitions

(which replaces fund deletions, i.e., extensive margin NMG of -100%). Second, if participants use the same allocation rule every year, growth occurs mechanically due to the additional money contributed to the retirement accounts over time. To capture this mechanical characteristic of intensive margin flows, we add plan growth as an additional control variable.[19]

Table 10 reports the corresponding coefficient estimates using the overall performance ranking based on the past 36 months. The first three columns report the coefficient estimates using the full sample of NMG including both extensive and intensive margin flows. The last three columns report the coefficient estimates using only the intensive margin NMG (including flows strictly larger than -100% for the first definition and including flows strictly between -100% and +100% for the second, for example).

The main results in columns 1–3 using total fund flows are broadly consistent with the deletion results from Table 4. Trustee funds attract more new money than non-trustee funds.[20] 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 trustee funds. For example, a ten percentage point increase in the performance rank over the previous three years for below-median funds increases flows over the next year by 6% for non-trustee funds and by only 1% for trustee funds. The additional control variables indicate that the growth rates tend to be larger for smaller investment options, for funds with lower expense ratios, for larger funds, and for younger funds.

To investigate the importance of participant flows, we restrict our attention to the intensive

[19]We calculate plan growth, using information in From 5500 on total contributions, total expenses and total assets.

[20]Our framework is significantly different from the flow benefit analysis in Cohen and Schmidt (2009). While they show that funds offered by the trustees in 401(k) menus have generally higher inflows and lower outflows (both retirement and retail flows), our paper investigates the different treatment funds are subject to when they belong to the trustee and when they do not.

margin money flows in the last three columns of Table 10. We find that participant flows are at best only marginally higher for trustee funds. Thus, the higher overall flows to trustee funds are primarily driven by the decisions of plan trustees and sponsors. The coefficients on the two performance ranking segments indicate that participants chase prior fund performance. It is interesting 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 plan trustees. The interaction effects between trustee funds and performance ranks indicate that plan participants do not differentiate much between trustee and non-trustee funds.

Overall, we find that plan participants do not offset the biased decisions of plan sponsors and trustees. Our results indicate that decisions of plan trustees have a substantial impact on flows to mutual funds. Mutual fund trustees can benefit by obtaining higher money flows into their affiliated funds and by avoiding large outflows for their poorly performing funds.

6 Future Performance

Our previous results indicate that 401(k) plan sponsors are less likely to delete trustee funds from their menus and that deletions of trustee 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 trustee funds exhibit superior subsequent performance. Indeed trustees 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, in this section we examine the performance of trustee and non-trustee funds that are kept, deleted, or added in the plans. At the end of each calendar year, we form equal-weighted portfolios of trustee and non-trustee funds separately based on

whether the funds were kept, deleted, or added to the 401(k) menu ("No Changes," "Deletions,"and "Additions") during the calendar year. We restrict our sample to domestic equity funds in these analyses. 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 and "Lowest Quintile," ("Lowest Decile") refers to a subportfolio in each group that contains only those funds that also rank in the lowest performance quintile (decile) based on past performance. We use the overall performance rankings during the prior three years as our baseline specification. For example, "Trustee Funds/Deletions/All Funds" refers to the equally-weighted portfolio of all trustee funds that are deleted from a menu during the year, while "Non-trustee Funds/Deletions/Lowest Decile" represents the portfolio of poorly performing non-trustee funds that are deleted from a menu. We rebalance our portfolios at the end of each year and calculate the portfolios' return for each of the next 12 months keeping the portfolios' composition fixed.

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

$$\begin{aligned} R_{f,t} - R_{TB,t} &= \alpha_{f,t} + \beta^{M}_{f,t}(R_{M,t} - R_{TB,t}) + \beta^{SMB}_{f,t}(R_{S,t} - R_{B,t}) \\ &\quad + \beta^{HML}_{f,t}(R_{H,t} - R_{L,t}) + \beta^{UMD}_{f,t}(R_{U,t} - R_{D,t}) + \epsilon_{f,t}. \end{aligned} \tag{7}$$

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. The Carhart (1997) model nests the CAPM model (which includes only the market factor) and the Fama and French (1993) model (which includes the size and the book-to-market factors in addition to the market factor).

Table 11 reports the abnormal returns of the various mutual fund portfolios. Panels A, B, and C report the Carhart alphas, the Fama-French alphas, and the CAPM alphas, respectively. The average Carhart alpha for trustee funds kept for at least two consecutive periods in the 401(k) plan is -0.04% per month and is not significantly different from zero. Similarly, the corresponding alpha for non-trustee funds is -0.06% per month.

More importantly, we find that trustee funds that were kept in the 401(k) plans by their sponsors despite their poor performance exhibit significantly negative Carhart and Fama-French alphas. For example, trustee funds ranked in the lowest performance quintile (decile) over the prior three years exhibit a Carhart alpha of -0.24% (-0.30%) per month. The results using the Carhart and the Fama-French alphas are both statistically and economically significant. On the other hand, the results are less pronounced using CAPM alphas. This represents an underperformance of between 2.9% and 3.6% per year, on a risk-adjusted basis. Compounded until retirement, these losses can have a large impact on the welfare of retirees.

Our results in Table 11 reveal that plan participants do not benefit from the private information trustees may have about their own proprietary funds: trustee choices in 401(k) plans are not information driven. Instead, consistent with Carhart (1997), poor performance persists. Overall, plan participants invested into affiliated funds favored by trustees would have obtained a higher risk-adjusted performance had they switched their retirement savings from the underperforming trustee funds to other trustee funds.

7 Conclusion

Mutual fund families serving as trustees of 401(k) plans have a fiduciary duty to act in the interest of participants but they also have a competing incentive to attract and retain retirement contributions into their own proprietary funds. In this paper, we examine how trustee incentives influence the set of investment choices offered in the plan.

Despite the increasing importance of 401(k) plans as a retirement vehicle, little research has evaluated the consequence of offering the trusteeship of the plan to a mutual fund company. This is surprising, provided that small inefficiencies in the selection of investments options, especially early in the participant's career, can have an significant impact on retirement income.

Our paper takes a first step in this direction. We find that mutual fund trustees display favoritism toward their own funds. In particular, we show that trustee funds are less likely to be removed from the menu relative to non-trustee funds, independent of their performance record. Moreover, the difference in deletion propensities between trustee and non-trustee 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 understand these biases. We also show that trustees' resistance to remove their own poorly performing funds generates a significant subsequent negative abnormal return of 2.9–3.6% per year for participants investing in those funds.

One question that we do not address in this paper is whether or not sponsoring companies should employ mutual fund families as plan trustees. Instead, we take a first step to uncover the various incentives that accompany the trustee relation and their effect on plan design.

Future research should explore and contrast additional costs and benefits of employing mutual fund and non-mutual fund trustees in the management of 401(k) plans.

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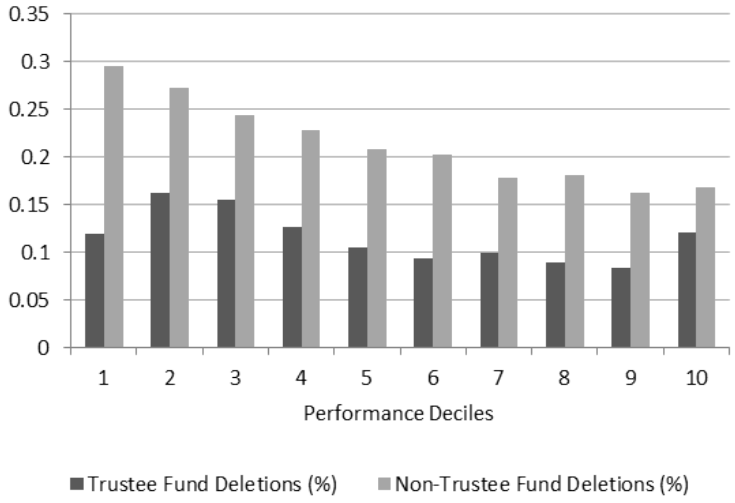
Panel A: Overall Sample



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

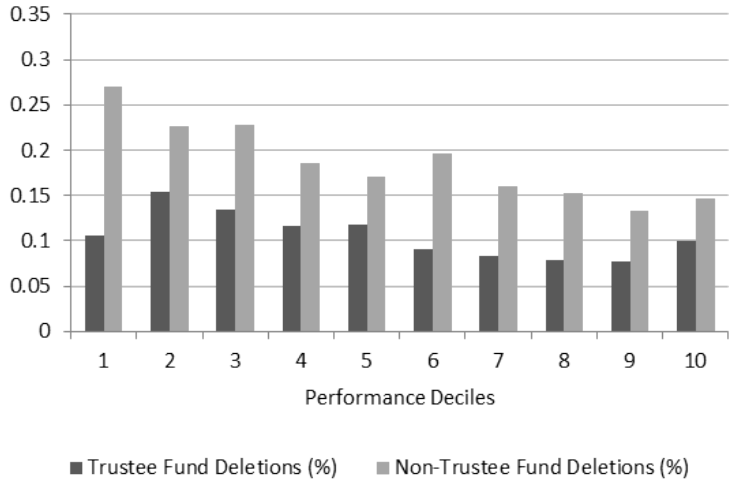


Figure 1: Fraction of Fund Deletions by Trustee and Non-Trustee Funds. The figure depicts the mean annual fund deletion frequencies by trustee affiliation and performance decile. Panel A includes the overall sample of mutual funds. Panel B includes the subsample of funds, where funds appear contemporaneously on multiple 401(k) menus, at least once as a trustee fund and at least once as a non-trustee 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 is ranked using style-adjusted returns over the prior three years relative to the universe of mutual funds in CRSP. We then average across the funds' deletion frequencies by performance and affiliation.

Panel A: Overall Sample

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

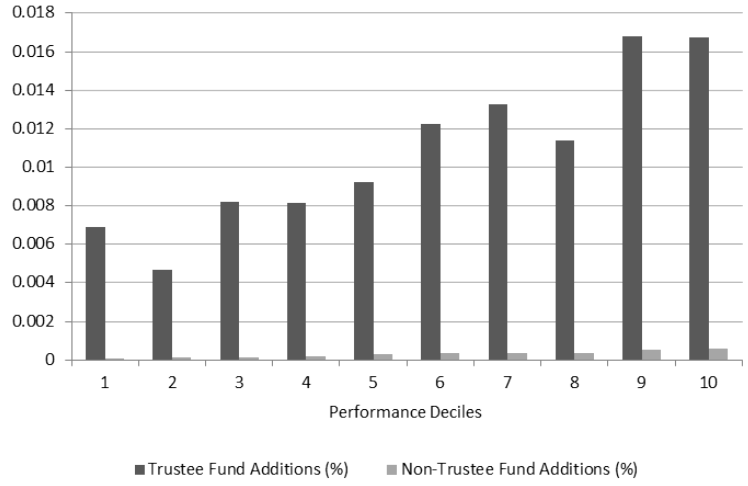


Figure 2: Fraction of Fund Additions by Mutual Fund and Non-Mutual Fund Trustees. The figure depicts the mean annual fund addition frequencies by trustee affiliation and performance decile. Panel A includes the overall sample of mutual funds. Panel B includes the subsample of funds, which are offered by fund families that serve as trustees for some firms 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 is ranked using style-adjusted returns over the prior three years relative to the universe of mutual funds in CRSP. We then average across the funds' addition frequencies by performance and affiliation.

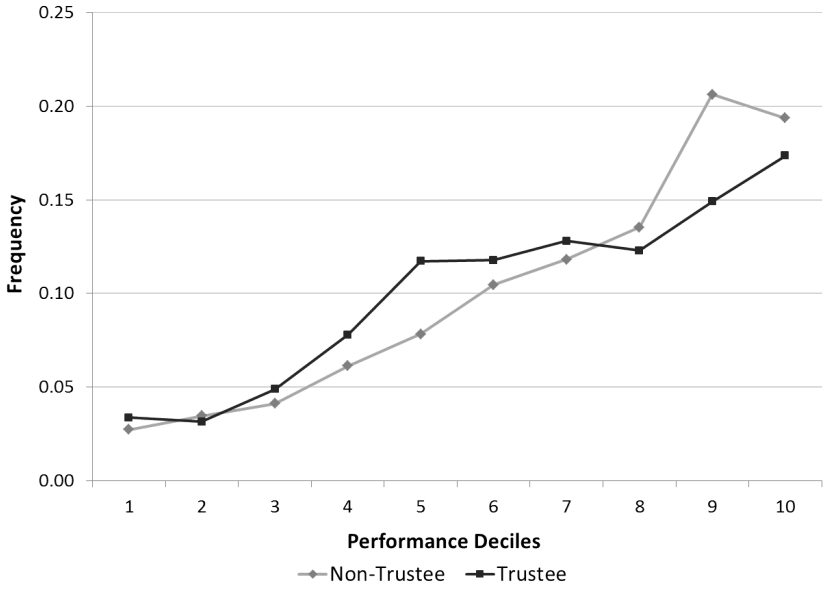


Figure 3: The Distribution of Mutual Funds Additions by Performance Decile and Fund Affiliation.

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 fractions of trustee funds in the various performance deciles, while the grey line provides the corresponding values for non-trustee funds. Performance deciles are created from percentile performance ranks. These are calculated using overall overall rankings, in which fund performance is ranked relative to all other mutual funds with the same investment style in CRSP, based on returns in the prior 36 months.

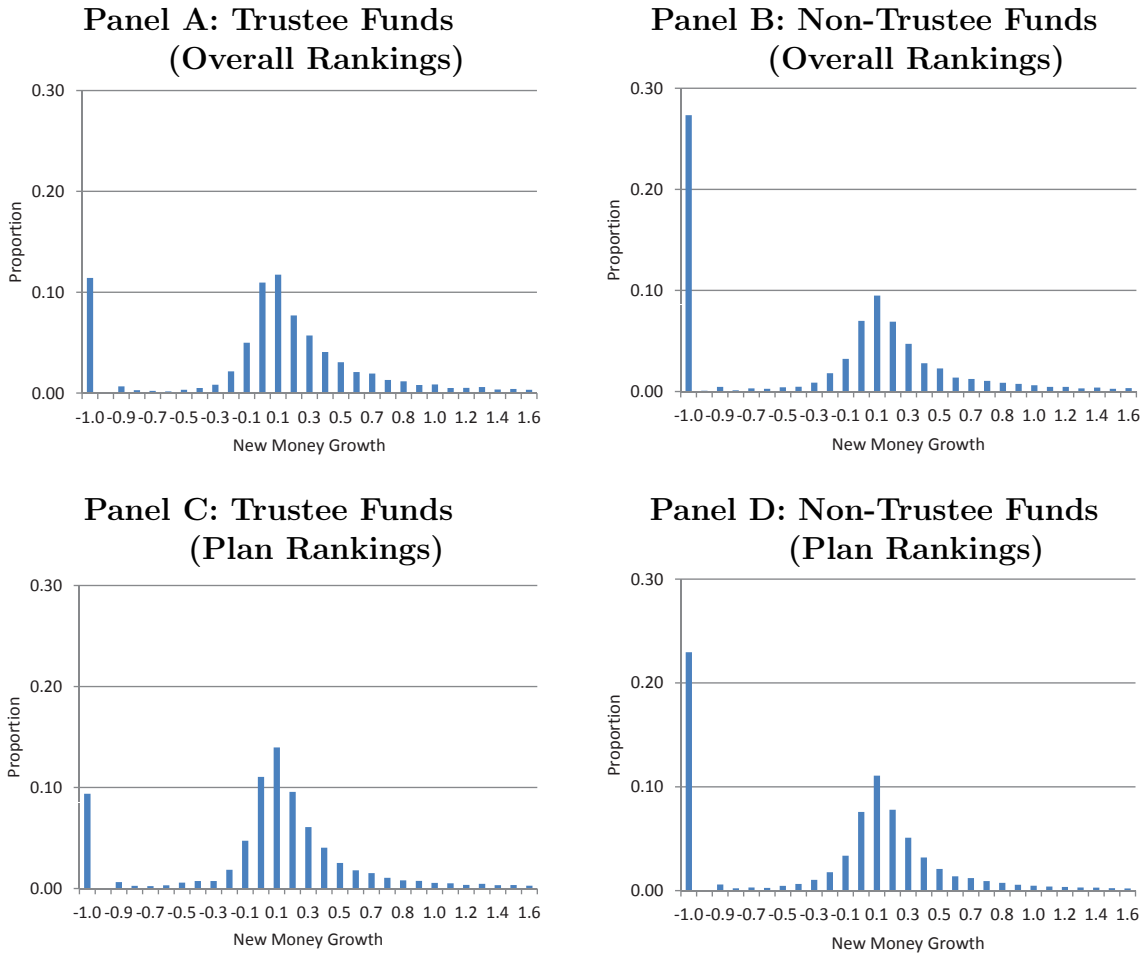


Figure 4: New Money Growth of Lower Performance Quintiles for Mutual Fund and Non-Mutual Fund Trustee Funds.

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 $R_{f,t}$ (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 NMG equals exactly -100%. In Panel A and B, the distributions describe fund flows to those trustee and non-trustee funds, respectively, that fall into the worst performance decile of the universe of mutual funds in their style category. 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.

Table 1: Trustee Summary Statistics.
The table provides descriptive statistics by year. Columns 1 and 2 report the number of plans and plan sponsors captured in our sample, respectively. Columns 3 and 4 show the total number of mutual fund and non-mutual fund trustees, respectively, while columns 5 and 6 report the corresponding distinct number of trustees by type. In columns 7-11, we provide information about the architecture of the plan. These include the number of mutual fund options offered, 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	Total Number				Distinct Number		Plan Architecture				
	Sponsors	Plans	Mutual Fund Trustees	Other Trustees	Mutual Fund Trustees	Other Trustees	No. of Options	No. of Trustee Options	Trustee Share	No. of Mgmt. Comp.	Herfin-dahl Index
1998	621	735	439	296	73	57	6.98	2.35	0.34	2.96	0.67
1999	766	924	637	287	90	83	7.83	2.85	0.34	3.46	0.64
2000	835	1,035	758	277	89	95	9.25	3.54	0.36	3.98	0.59
2001	923	1,125	838	287	91	100	10.39	4.13	0.38	4.45	0.57
2002	1,013	1,250	955	295	97	107	11.45	4.63	0.38	4.97	0.55
2003	1,104	1,341	1,116	225	101	113	12.00	4.75	0.36	5.33	0.51
2004	1,105	1,333	1,112	221	100	112	13.16	5.23	0.34	5.76	0.48
2005	1,095	1,298	1,086	212	93	101	13.79	5.42	0.33	6.06	0.45
2006	1,034	1,238	968	270	93	93	14.58	5.83	0.32	6.25	0.44
2007	1,000	1,183	891	292	86	96	15.96	5.95	0.29	6.65	0.42
2008	970	1,135	859	276	82	82	17.23	6.53	0.29	7.06	0.42
2009	849	988	743	245	70	73	17.85	6.43	0.27	7.41	0.40
Total	11,315	13,585	10,402	3,183	1,065	1,112	13.11	5.07	0.33	5.62	0.494

Table 2: Mutual Funds Summary Statistics.
Panels A, B, and C of the table describe the funds that are deleted from, kept, or added to a 401(k) menu in our sample. We report the average fund age, fund size (in millions), the volatility of monthly fund returns, turnover, the raw and style-adjusted expense ratio, and the funds' mean percentile performance ranks. Performance ranks are calculated over the previous one, three, or five years based on overall rankings. The overall performance rank of each fund represents the performance of the fund relative to other funds in the same objective code. With the exception of fund age and fund size, all values are expressed as percentages. The averages are reported for trustee and non-trustee funds separately, along with the results of the paired t-test testing whether the difference is significantly different from zero. Standard errors for this test are two-way clustered at the plan and fund levels. Significance levels are denoted by *, **, ***, which correspond to 10%, 5%, and 1% levels, respectively.

Panel A: Mutual Funds Deletions

Trustee Fund	N	Fund Age	Fund Size	Return Std. Dev.	Turnover	Exp. Ratio	Exp. Ratio Style Adj.	Perf Rank 1 Yr.	Perf Rank 3 Yr.	Perf Rank 5 Yr.
0	15,380	17.98	7,810.90	4.08	92.49	1.06	0.17	48.00	50.67	55.13
1	3,623	17.55	7,249.91	3.43	78.86	0.79	−0.03	50.61	51.39	52.79
Diff		−0.42	−560.99	−0.65***	−13.63***	−0.27***	−0.20***	2.61**	0.72	−2.34**

Panel B: Mutual Funds Kept

Trustee Fund	N	Fund Age	Fund Size	Return Std. Dev.	Turnover	Exp. Ratio	Exp. Ratio Style Adj.	Perf Rank 1 Yr.	Perf Rank 3 Yr.	Perf Rank 5 Yr.
0	86,522	19.39	15,323.91	4.00	77.87	0.94	0.06	54.89	60.05	63.42
1	52,660	17.35	12,176.73	3.37	51.93	0.56	−0.22	55.44	58.07	59.28
Diff		−2.03	−3,147.18***	−0.62***	−25.94***	−0.38***	−0.29***	0.55	−1.98***	−4.15***

Panel C: Mutual Funds Additions

Trustee Fund	N	Fund Age	Fund Size	Return Std. Dev.	Turnover	Exp. Ratio	Exp. Ratio Style Adj.	Perf Rank 1 Yr.	Perf Rank 3 Yr.	Perf Rank 5 Yr.
0	21,196	15.10	9,962.67	3.99	83.80	0.96	0.07	62.31	67.39	68.61
1	6,997	10.32	5,443.62	3.23	55.78	0.59	−0.22	58.69	63.78	65.11
Diff		−4.78***	−4,519.06*	−0.77***	−28.02***	−0.36***	−0.28***	−3.62***	−3.62***	−3.50***

Table 3: Fund Deletion Proportions by Performance Deciles.
The table summarizes the mean annual fund deletion frequencies (as a %) by trustee affiliation and performance decile. Panel A includes the overall sample of mutual funds. Panel B includes the subsample of funds, where funds appear contemporaneously on multiple 401(k) menus, at least once as a trustee fund and at least once as a non-trustee 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 is ranked using style-adjusted returns over the prior three years relative to the universe of mutual funds in CRSP. We then average across the funds' deletion frequencies by performance and affiliation. Significance levels are denoted by *, **, ***, which correspond to 10%, 5%, and 1% levels, respectively and are based on standard errors that are clustered at the fund level.

Panel A: All Funds

Performance	1 Year			3 Years			5 Years		
Decile	T	NT	T-NT	T	NT	T-NT	T	NT	T-NT
1	10.8	25.5	−14.7***	11.9	29.6	−17.7***	13.1	27.2	−14.2***
2	15.2	23.7	−8.6***	16.2	27.2	−11.0***	15.3	27.9	−12.6***
3	13.1	23.1	−10.0***	15.5	24.5	−9.0***	13.8	24.8	−10.9***
4	12.9	23.4	−10.5***	12.6	22.9	−10.3***	11.3	24.3	−13.0***
5	11.8	19.6	−7.7***	10.6	20.8	−10.2***	11.7	21.2	−9.5***
6	11.1	19.1	−7.9***	9.3	20.3	−10.9***	10.7	20.9	−10.2***
7	8.5	19.4	−10.9***	10.0	17.8	−7.9***	9.8	19.8	−10.1***
8	10.5	18.7	−8.2***	9.0	18.1	−9.1***	9.3	17.0	−7.7***
9	8.5	18.0	−9.5***	8.3	16.2	−7.9***	9.3	15.9	−6.7***
10	10.9	17.3	−6.5***	12.2	16.9	−4.7***	11.3	17.0	−5.8***

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

Performance	1 Year			3 Years			5 Years		
Decile	T	NT	T-NT	T	NT	T-NT	T	NT	T-NT
1	9.1	21.3	−12.2***	10.5	27.0	−16.5***	13.5	25.9	−12.4***
2	13.5	21.7	−8.2***	15.4	22.6	−7.2***	13.4	25.6	−12.3***
3	13.4	20.4	−7.0***	13.5	22.7	−9.2***	11.8	21.5	−9.7***
4	11.5	20.9	−9.4***	11.6	18.6	−7.1***	11.6	19.3	−7.7***
5	12.4	19.0	−6.6***	11.8	17.0	−5.2***	11.0	18.9	−7.9***
6	9.1	15.8	−6.7***	9.0	19.6	−10.6***	11.0	18.6	−7.6***
7	6.9	14.7	−7.8***	8.3	16.1	−7.8***	9.0	18.3	−9.3***
8	9.5	15.5	−6.0***	7.9	15.3	−7.4***	7.9	15.5	−7.5***
9	8.3	16.7	−8.4***	7.8	13.3	−5.5***	7.9	11.9	−4.0***
10	9.3	14.5	−5.3***	10.0	14.7	−4.6**	9.7	13.7	−4.0**

Table 4: Linear Probability Model for Fund Deletions.
The table reports the OLS coefficient estimates of the following model for fund deletions: $DEL_{p,f,t} = \beta_0 + \beta_1 \times TF_{p,f,t} + \beta_2 \times LowRank_{p,f,t} + \beta_3 \times HighRank_{p,f,t} + \beta_4 \times TF_{p,f,t} \times LowRank_{p,f,t} + \beta_5 \times TF_{p,f,t} \times HighRank_{p,f,t} + Z'_{p,f,t}\gamma + \epsilon_{p,f,t}$, 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 at time t and zero otherwise, and $TF_{p,f,t}$ is an indicator variable for whether the trustee of pension plan p is affiliated with the management company of mutual fund f. $LowRank$ and $HighRank$ are defined as $LowRank_{p,f,t} = min(Rank_{p,f,t}, 0.5)$ and $HighRank_{p,f,t} = min(Rank_{p,f,t} - LowRank_{p,f,t}, 0.5)$, where $Rank_{p,f,t}$ is the percentile performance rank of mutual fund f over the previous one, three, or five years based on the performance of the fund relative to other CRSP funds in the same objective code. The other control variables Z include the natural logarithm of the option size, the number of options, the expense ratio of the fund, the turnover of the fund's holdings, 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 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.

	1 Year	3 Years	5 Years
Trustee Fund	−0.099***	−0.140***	−0.119***
	(0.015)	(0.018)	(0.022)
LowRank	−0.181***	−0.324***	−0.230***
	(0.029)	(0.034)	(0.037)
HighRank	−0.054**	−0.072***	−0.164***
	(0.024)	(0.023)	(0.024)
LowRank*Trustee Fund	0.171***	0.247***	0.152***
	(0.035)	(0.042)	(0.052)
HighRank*Trustee Fund	−0.020	−0.003	0.085***
	(0.030)	(0.027)	(0.030)
Log(Option Size)	−0.007***	−0.007***	−0.008***
	(0.002)	(0.002)	(0.002)
No. of Options	−0.001***	−0.001***	−0.001***
	(0.000)	(0.000)	(0.000)
Exp. Ratio	5.070***	4.611***	5.169***
	(0.948)	(0.931)	(0.976)
Turnover	0.013***	0.013***	0.014***
	(0.004)	(0.004)	(0.004)
Log(Fund Size)	−0.023***	−0.021***	−0.019***
	(0.002)	(0.002)	(0.002)
Fund Age	0.000**	0.000	0.000
	(0.000)	(0.000)	(0.000)
Std. Dev.	−0.046	0.262	0.370*
	(0.207)	(0.207)	(0.206)
Observations	99,967	99,967	99,967
R-Squared	0.061	0.069	0.066

Table 5: Linear Probability Model for Fund Deletions: Alternative Rankings.
The table reports the OLS coefficient estimates of the following model for fund deletions: $DEL_{p,f,t} = \beta_0 + \beta_1 \times TF_{p,f,t} + \beta_2 \times LowRank_{p,f,t} + \beta_3 \times HighRank_{p,f,t} + \beta_4 \times TF_{p,f,t} \times LowRank_{p,f,t} + \beta_5 \times TF_{p,f,t} \times HighRank_{p,f,t} + Z'_{p,f,t}\gamma + \epsilon_{p,f,t}$, 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 at time t and zero otherwise, and $TF_{p,f,t}$ is an indicator variable for whether the trustee of pension plan p is affiliated with the management company of mutual fund f. $LowRank$ and $HighRank$ are defined as $LowRank_{p,f,t} = min(Rank_{p,f,t}, 0.5)$ and $HighRank_{p,f,t} = min(Rank_{p,f,t} - LowRank_{p,f,t}, 0.5)$, where $Rank_{p,f,t}$ is the percentile performance rank of mutual fund f over the previous one, three, or five years based either on the fund's percentile rankings within a specific 401(k) plan or on the fund's percentile rankings within the fund's family. The other control variables Z include the natural logarithm of the option size, the number of options, the expense ratio of the fund, the turnover of the fund's holdings, 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 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		
	1 Year	3 Years	5 Years	1 Year	3 Years	5 Years
Trustee Fund	−0.081***	−0.088***	−0.103***	−0.070***	−0.075***	−0.076***
	(0.012)	(0.014)	(0.015)	(0.014)	(0.016)	(0.017)
LowRank	−0.135***	−0.231***	−0.185***	−0.073***	−0.164***	−0.159***
	(0.020)	(0.024)	(0.020)	(0.024)	(0.029)	(0.033)
HighRank	−0.042*	−0.055**	−0.186***	−0.052**	−0.052**	−0.078***
	(0.023)	(0.022)	(0.019)	(0.025)	(0.025)	(0.027)
LowRank*Trustee Fund	0.134***	0.139***	0.110***	0.099***	0.116***	0.106**
	(0.030)	(0.031)	(0.024)	(0.033)	(0.041)	(0.044)
HighRank*Trustee Fund	−0.015	0.019	0.105***	−0.020	−0.038	−0.013
	(0.030)	(0.030)	(0.024)	(0.033)	(0.036)	(0.036)
Log(Option Size)	−0.007***	−0.007***	−0.008***	−0.007***	−0.007***	−0.007***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
No. of Options	−0.002***	−0.002***	−0.001***	−0.002***	−0.002***	−0.002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Exp. Ratio	5.553***	5.465***	5.246***	5.439***	5.424***	5.619***
	(0.953)	(0.938)	(0.971)	(0.960)	(0.948)	(0.943)
Turnover	0.012***	0.011***	0.014***	0.013***	0.013***	0.013***
	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)	(0.003)
Log(Fund Size)	−0.024***	−0.022***	−0.020***	−0.024***	−0.024***	−0.023***
	(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.	−0.116	0.131	0.383*	−0.003	0.106	0.264
	(0.213)	(0.215)	(0.211)	(0.217)	(0.208)	(0.205)
Observations	100,299	100,299	100,299	100,269	100,269	100,269
R-squared	0.059	0.065	0.066	0.057	0.059	0.060

Table 6: Linear Probability Model for Fund Deletions: Alternative Functional Forms. The table reports the OLS coefficient estimates of the model for fund deletions described in Table 4 using a linear performance specification (one-segment model) in columns 1-3, and a three-segment piecewise linear specification in columns 4-6. For the three-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 $LowQRank_{p,f,t} = min(Rank_{p,f,t}, 0.2)$, the performance in the three middle quintiles is given by $MidQRank_{p,f,t} = min(Rank_{p,f,t} - LowQRank_{p,f,t}, 0.6)$, and the performance in the highest quintile is given by $HighQRank_{p,f,t} = (Rank_{p,f,t} - LowQRank_{p,f,t} - MidQRank_{p,f,t})$, where $Rank_{p,f,t}$ is the percentage performance rank of mutual fund f over the previous three years based on either overall rankings, 401(k) plan rankings, and fund family rankings. 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.

	Linear Performance			Three Segments		
Ranking	Overall	Plan	Family	Overall	Plan	Family
Trustee Fund	−0.095***	−0.071***	−0.051***	−0.164***	−0.106***	−0.105***
	(0.012)	(0.012)	(0.012)	(0.031)	(0.025)	(0.027)
Rank	−0.181***	−0.145***	−0.103***			
	(0.015)	(0.017)	(0.015)			
LowQRank				−0.467***	−0.576***	−0.407***
				(0.120)	(0.094)	(0.112)
MidQRank				−0.210***	−0.111***	−0.082***
				(0.019)	(0.015)	(0.020)
HighQRank				0.215***	−0.026	−0.068
				(0.074)	(0.095)	(0.077)
Rank*Trustee Fund	0.103***	0.079***	0.034*			
	(0.017)	(0.019)	(0.018)			
LowQRank*Trustee Fund				0.479***	0.293**	0.359**
				(0.164)	(0.126)	(0.145)
MidQRank*Trustee Fund				0.112***	0.064***	0.012
				(0.023)	(0.020)	(0.025)
HighQRank*Trustee Fund				−0.176*	0.001	−0.009
				(0.095)	(0.123)	(0.122)
Log(Option Size)	−0.007***	−0.007***	−0.007***	−0.007***	−0.007***	−0.007***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
No. of Options	−0.001***	−0.002***	−0.002***	−0.001***	−0.002***	−0.002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Exp. Ratio	4.884***	5.524***	5.485***	4.539***	5.470***	5.376***
	(0.941)	(0.940)	(0.949)	(0.934)	(0.937)	(0.947)
Turnover	0.013***	0.012***	0.013***	0.014***	0.011***	0.013***
	(0.004)	(0.003)	(0.004)	(0.004)	(0.003)	(0.004)
Log(Fund Size)	−0.021***	−0.022***	−0.024***	−0.021***	−0.022***	−0.024***
	(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.	0.326	0.180	0.126	0.247	0.111	0.107
	(0.213)	(0.216)	(0.206)	(0.204)	(0.216)	(0.209)
Observations	99,967	100,299	100,269	99,967	100,299	100,269
R-squared	0.067	0.064	0.059	0.069	0.065	0.060

Table 7: Linear Probability Model for Fund Deletions: Robustness Tests.
The table reports the OLS coefficient estimates of the model for fund deletions described in Table 4 for various subsamples of our data. We exclude the three largest trustees each year in the first column, estimate the model for the three largest trustees in the second, and estimate our model with trustee fixed effects in column 3. Column 4 reestimates our results using information only on those plans that are trusteed by a mutual fund family. Column 5 excludes target date funds and column 6 excludes all non-equity funds. Finally, in columns 7 and 8, we divide our sample into the subperiods 1998-2006 and 2007-2009, respectively. 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.

	Exclude Top 3 MF Trustees	Top 3 MF Trustees	Include Trustee FE	Only MF Trustees	Exclude Target Date Funds	Only Equity Funds	Prior to 2007	After 2006
Trustee Fund	−0.139***	−0.127***	−0.157***	−0.149***	−0.131***	−0.117***	−0.117***	−0.147***
	(0.022)	(0.037)	(0.017)	(0.020)	(0.020)	(0.023)	(0.029)	(0.022)
LowRank	−0.316***	−0.312***	−0.320***	−0.329***	−0.366***	−0.385***	−0.305***	−0.334***
	(0.034)	(0.074)	(0.034)	(0.039)	(0.035)	(0.038)	(0.051)	(0.041)
HighRank	−0.068***	−0.128***	−0.076***	−0.065**	−0.083***	−0.098***	−0.125***	−0.020
	(0.023)	(0.045)	(0.021)	(0.027)	(0.024)	(0.024)	(0.030)	(0.030)
LowRank*Trustee Fund	0.178***	0.247***	0.242***	0.254***	0.208***	0.181***	0.236***	0.228***
	(0.055)	(0.082)	(0.040)	(0.047)	(0.045)	(0.052)	(0.065)	(0.051)
HighRank*Trustee Fund	0.009	0.036	0.008	−0.012	0.030	0.023	0.036	−0.037
	(0.037)	(0.048)	(0.026)	(0.032)	(0.031)	(0.033)	(0.038)	(0.034)
Log(Option Size)	−0.008***	−0.006*	−0.008***	−0.008***	−0.009***	−0.009***	−0.007***	−0.008***
	(0.002)	(0.003)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
No. of Options	−0.001***	−0.003***	−0.002***	−0.002***	−0.001***	−0.001***	−0.001***	−0.001***
	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)
Exp. Ratio	3.920***	9.453***	4.534***	4.870***	4.413***	3.343***	5.876***	4.303***
	(1.025)	(1.963)	(0.890)	(1.057)	(1.024)	(1.114)	(1.385)	(1.088)
Turnover	0.011***	0.020***	0.011***	0.012***	0.011***	0.026***	0.015***	0.009**
	(0.003)	(0.007)	(0.003)	(0.004)	(0.003)	(0.007)	(0.006)	(0.004)
Log(Fund Size)	−0.023***	−0.023***	−0.024***	−0.020***	−0.021***	−0.020***	−0.025***	−0.019***
	(0.002)	(0.004)	(0.002)	(0.002)	(0.002)	(0.002)	(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)	(0.000)	(0.000)	(0.000)	(0.000)
Std. Dev.	0.496**	−0.603**	0.188	0.263	0.474**	0.600**	−1.009***	0.579***
	(0.228)	(0.239)	(0.133)	(0.227)	(0.207)	(0.239)	(0.364)	(0.225)
Observations	63,996	36,303	94,153	82,295	85,899	66,341	49,412	50,887
R-squared	0.059	0.091	0.093	0.073	0.065	0.076	0.075	0.068

Table 8: Fund Addition Proportions by Performance Deciles.
The table summarizes the mean annual fund addition frequencies (as a %) by trustee affiliation and performance decile. Panel A includes the overall sample of mutual funds. Panel B includes the subsample of funds, which are offered by fund families that serve as trustees for some firms 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 is ranked using style-adjusted returns over the prior three years relative to the universe of mutual funds in CRSP. We then average across the funds' addition frequencies by performance and affiliation. Significance levels are based on standard errors that are clustered at the fund level and are denoted by *, **, ***, which correspond to 10%, 5%, and 1% levels, respectively.

Panel A: All Funds

Performance	1 Year			3 Years			5 Years		
Decile	T	NT	T-NT	T	NT	T-NT	T	NT	T-NT
1	1.038	0.008	1.030***	0.690	0.005	0.685***	0.573	0.005	0.569***
2	0.613	0.009	0.604***	0.470	0.007	0.463***	0.497	0.005	0.492***
3	0.930	0.012	0.919***	0.820	0.008	0.812***	0.789	0.009	0.780***
4	0.896	0.014	0.881***	0.813	0.011	0.801***	0.658	0.011	0.647***
5	0.949	0.017	0.932***	0.924	0.014	0.909***	0.863	0.014	0.849***
6	1.045	0.020	1.025***	1.223	0.020	1.203***	0.916	0.016	0.900***
7	1.042	0.020	1.022***	1.327	0.021	1.305***	1.424	0.020	1.404***
8	1.328	0.024	1.304***	1.142	0.024	1.118***	1.375	0.027	1.348***
9	1.530	0.030	1.500***	1.681	0.037	1.644***	1.861	0.040	1.820***
10	1.434	0.034	1.400***	1.676	0.039	1.637***	1.856	0.039	1.817***

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

Performance	1 Year			3 Years			5 Years		
Decile	T	NT	T-NT	T	NT	T-NT	T	NT	T-NT
1	1.038	0.017	1.021***	0.690	0.009	0.681***	0.573	0.008	0.565***
2	0.613	0.011	0.601***	0.470	0.010	0.459***	0.497	0.006	0.490***
3	0.930	0.019	0.912***	0.820	0.013	0.807***	0.789	0.015	0.775***
4	0.896	0.023	0.873***	0.813	0.019	0.794***	0.658	0.021	0.638***
5	0.949	0.027	0.922***	0.924	0.029	0.895***	0.863	0.028	0.835***
6	1.045	0.034	1.011***	1.223	0.034	1.189***	0.916	0.030	0.887***
7	1.042	0.032	1.009***	1.327	0.037	1.290***	1.424	0.032	1.392***
8	1.328	0.039	1.289***	1.142	0.036	1.106***	1.375	0.036	1.339***
9	1.530	0.047	1.483***	1.681	0.051	1.630***	1.861	0.061	1.800***
10	1.434	0.044	1.390***	1.676	0.056	1.619***	1.856	0.060	1.796***

Table 9: Linear Probability Model for Trustee Additions.
The table reports the OLS coefficient estimates of the following model for trustee fund additions: ${TF^{ADD}}_{p,f,t} = \beta_0 + \beta_1 \times Rank_{p,f,t} + Z'_{p,f,t}\gamma + \epsilon_{p,f,t}$, where ${TF^{ADD}}_{p,f,t}$ is an indicator variable equal to one if mutual fund f added to the plan p at time t is affiliated with the management company acting as the plan's trustee and zero otherwise. $Rank_{p,f,t}$ is the performance rank of mutual fund f over the previous one, three, or five years based on overall rankings, 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 the same objective code. The other control variables Z include the number of options, 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 (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
Rank (1 Yr.)	-0.136^{***}		
	(0.028)		
Rank (3 Yrs.)		-0.191^{***}	
		(0.037)	
Rank (5 Yrs.)			-0.226^{***}
			(0.043)
No. of Options	-0.001^{**}	-0.001^{**}	-0.001^{**}
	(0.000)	(0.000)	(0.000)
Log(Plan Assets)	-0.016^{***}	-0.016^{***}	-0.016^{***}
	(0.003)	(0.003)	(0.003)
Exp. Ratio	-0.138^{***}	-0.135^{***}	-0.131^{***}
	(0.024)	(0.024)	(0.024)
Turnover	0.000	-0.001	-0.002
	(0.010)	(0.010)	(0.010)
Log(Fund Size)	-0.006	-0.004	-0.000
	(0.007)	(0.007)	(0.007)
Fund Age	-0.002^{**}	-0.002^{***}	-0.002^{***}
	(0.001)	(0.001)	(0.001)
Std. Dev.	0.026	0.050	0.054^{*}
	(0.033)	(0.033)	(0.033)
Observations	16,511	16,511	16,511
R-squared	0.741	0.742	0.743

Table 10: Fund Flow Regressions.
The table reports the coefficient estimates of the following OLS regression: $NMG_{p,f,t} = \beta_0 + \beta_1 \times TF_{p,f,t} + \beta_2 \times LowRank_{p,f,t} + \beta_3 \times HighRank_{p,f,t} + \beta_4 \times TF_{p,f,t} \times LowRank_{p,f,t} + \beta_5 \times TF_{p,f,t} \times HighRank_{p,f,t} + Z'_{p,f,t}\gamma + \epsilon_{p,f,t}$, where the explanatory variables of the regression are analogous to those in Table 4 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 participants, 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. Finally, $NMG3$ shares the numerator with the previous two definitions but we replace the denominator by lagged plan size. Regression results using $NMG3$ as the dependent variable are reported in columns 3 and 6. The performance rank of mutual fund f is calculated over the previous three years based on the overall ranking. 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
Trustee Fund	0.249***	0.178***	1.009***	0.064*	0.022*	0.004
	(0.041)	(0.024)	(0.246)	(0.036)	(0.013)	(0.132)
LowRank	0.006***	0.004***	0.037***	0.002***	0.001***	0.012***
	(0.001)	(0.000)	(0.005)	(0.001)	(0.000)	(0.003)
HighRank	0.004***	0.002***	0.018***	0.003***	0.001***	0.009***
	(0.001)	(0.000)	(0.003)	(0.000)	(0.000)	(0.003)
LowRank*Trustee Fund	−0.005***	−0.003***	−0.012**	−0.001	−0.000	−0.005
	(0.001)	(0.001)	(0.006)	(0.001)	(0.000)	(0.003)
HighRank*Trustee Fund	0.001	0.000	−0.013***	0.000	−0.000	−0.002
	(0.001)	(0.000)	(0.004)	(0.001)	(0.000)	(0.003)
Plan Growth	0.871***	0.394***	5.912***	0.886***	0.374***	7.669***
	(0.073)	(0.041)	(0.432)	(0.069)	(0.026)	(0.397)
Log(Option Size)	−0.086***	−0.024***	−0.241***	−0.111***	−0.036***	−0.075***
	(0.005)	(0.003)	(0.017)	(0.004)	(0.002)	(0.011)
No. Options	−0.001	0.000	0.009**	−0.003**	−0.001***	−0.020***
	(0.001)	(0.001)	(0.004)	(0.001)	(0.000)	(0.003)
Exp. Ratio	−12.121***	−6.913***	−26.163**	−6.923***	−2.228***	1.897
	(2.153)	(1.239)	(11.041)	(1.790)	(0.617)	(6.032)
Turnover	−0.018**	−0.015***	−0.077***	0.001	0.000	−0.002
	(0.007)	(0.005)	(0.025)	(0.006)	(0.002)	(0.018)
Log(Fund Size)	0.027***	0.025***	0.232***	−0.001	0.001	0.083***
	(0.005)	(0.003)	(0.029)	(0.005)	(0.002)	(0.017)
Fund Age	−0.001***	−0.001**	−0.003	−0.001***	−0.000***	−0.001
	(0.000)	(0.000)	(0.003)	(0.000)	(0.000)	(0.002)
Std. Dev.	−0.530	−0.371	5.085***	0.215	0.046	2.517**
	(0.486)	(0.291)	(1.756)	(0.348)	(0.123)	(1.218)
Observations	89,276	89,276	89,276	77,911	77,911	77,911
R-squared	0.168	0.105	0.056	0.251	0.222	0.108

Table 11: Abnormal Returns of Mutual Fund and Non-Mutual Fund Trustees.
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 trustee and non-trustee domestic equity funds separately based on whether the funds were kept, deleted, 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 original 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) based on past performance. The panels report results using the overall performance rankings 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	
	Trustee Funds	Non-Trustee Funds	Trustee Funds	Non-Trustee Funds	Trustee Funds	Non-Trustee Funds
All Funds	−0.04	−0.06	−0.08	−0.06	−0.04	−0.06
	(0.04)	(0.04)	(0.06)	(0.04)	(0.05)	(0.04)
Lowest Quintile	−0.24**	−0.09	−0.18	−0.12	−0.15	−0.01
	(0.10)	(0.09)	(0.13)	(0.10)	(0.15)	(0.11)
Lowest Decile	−0.30**	−0.07	−0.35**	−0.16	0.03	0.08
	(0.13)	(0.14)	(0.17)	(0.16)	(0.28)	(0.18)

Panel B: Fama-French Alphas

	No Changes		Deletions		Additions	
	Trustee Funds	Non-Trustee Funds	Trustee Funds	Non-Trustee Funds	Trustee Funds	Non-Trustee Funds
All Funds	−0.04	−0.06	−0.08	−0.06	−0.04	−0.06
	(0.04)	(0.04)	(0.06)	(0.04)	(0.05)	(0.04)
Lowest Quintile	−0.24**	−0.09	−0.18	−0.12	−0.15	−0.00
	(0.10)	(0.10)	(0.13)	(0.11)	(0.15)	(0.11)
Lowest Decile	−0.30**	−0.07	−0.35**	−0.16	0.02	0.08
	(0.13)	(0.16)	(0.17)	(0.17)	(0.28)	(0.19)

Panel C: CAPM Alphas

	No Changes		Deletions		Additions	
	Trustee Funds	Non-Trustee Funds	Trustee Funds	Non-Trustee Funds	Trustee Funds	Non-Trustee Funds
All Funds	0.02	0.02	−0.04	−0.00	−0.00	0.04
	(0.05)	(0.04)	(0.06)	(0.05)	(0.05)	(0.04)
Lowest Quintile	0.00	0.17	−0.07	0.10	0.02	0.24
	(0.14)	(0.15)	(0.14)	(0.16)	(0.16)	(0.15)
Lowest Decile	−0.07	0.24	−0.22	0.09	0.08	0.34
	(0.16)	(0.26)	(0.21)	(0.29)	(0.31)	(0.24)

Appendix

Table A1: Probit Model for Fund Deletions: Two Piecewise Linear Segments.
The table reports the estimated marginal effects of the following probit model for fund deletions: $DEL_{p,f,t} = \beta_0 + \beta_1 \times TF_{p,f,t} + \beta_2 \times LowRank_{p,f,t} + \beta_3 \times HighRank_{p,f,t} + \beta_4 \times TF_{p,f,t} \times HighRank_{p,f,t} + \beta_5 \times TF_{p,f,t} \times LowRank_{p,f,t} + Z'_{p,f,t}\gamma + \epsilon_{p,f,t}$, 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 at time t and zero otherwise, and $TF_{p,f,t}$ is an indicator variable for whether the trustee of pension plan p is affiliated with the management company of mutual fund f. $LowRank$ and $HighRank$ are defined as $LowRank_{p,f,t} = min(Rank_{p,f,t}, 0.5)$ and $HighRank_{p,f,t} = min(Rank_{p,f,t} - LowRank_{p,f,t}, 0.5)$, where $Rank_{p,f,t}$ is the performance rank of mutual fund f over the previous one, three, or five years based on overall rankings, 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 the same objective code, whereas the inside performance rank only depends on the fund's ranking within the 401(k) plan. The other control variables Z include the natural logarithm of the option size, the number of options, the expense ratio of the fund, the turnover of the fund's holdings, 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 and year fixed effects. The marginal effects for the interaction terms are computed using the INTEFF command based on Standard errors are clustered at the plan level and are reported in parentheses. Significance levels are denoted by *, **, ***, which correspond to 10%, 5%, and 1% levels, respectively.

	Overall Ranking			Plan Ranking		
	1 Yr.	3 Yrs.	5 Yrs.	1 Yr.	3 Yrs.	5 Yrs.
Trustee Fund	−0.065***	−0.074***	−0.059***	−0.059***	−0.051***	−0.052***
	(0.008)	(0.008)	(0.010)	(0.007)	(0.007)	(0.007)
LowRank	−0.129***	−0.208***	−0.130***	−0.093***	−0.155***	−0.134***
	(0.011)	(0.013)	(0.014)	(0.010)	(0.010)	(0.009)
HighRank	−0.051***	−0.070***	−0.145***	−0.045***	−0.060***	−0.115***
	(0.012)	(0.012)	(0.013)	(0.011)	(0.010)	(0.010)
LowRank*Trustee Fund	0.105***	0.132***	0.062***	0.080***	0.064***	0.060***
	(0.021)	(0.022)	(0.023)	(0.017)	(0.016)	(0.016)
HighRank*Trustee Fund	−0.003	0.028*	0.084***	0.018	0.047***	0.064***
	(0.018)	(0.018)	(0.019)	(0.017)	(0.019)	(0.019)
Log(Plan Size)	−0.007***	−0.007***	−0.007***	−0.007***	−0.006***	−0.006***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Options	−0.001***	−0.001***	−0.001***	−0.002***	−0.002***	−0.002***
	0.000	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Fee	4.393***	3.938***	4.405***	4.762***	4.619***	4.757***
	(0.536)	(0.539)	(0.542)	(0.538)	(0.530)	(0.529)
Turnover	0.008***	0.008***	0.009***	0.008***	0.007***	0.007***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Log(Fund Size)	−0.021***	−0.019***	−0.017***	−0.021***	−0.020***	−0.018***
	(0.001)	(0.001)	(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)	(0.000)	(0.000)	(0.000)	(0.000)
Std. Dev.	−0.033	0.242**	0.328***	−0.092	0.129	0.356***
	(0.120)	(0.120)	(0.115)	(0.131)	(0.130)	(0.121)
Observations	99,967	99,967	99,967	100,299	100,299	100,299
Adj. R-Squared	0.080	0.088	0.086	0.077	0.084	0.086

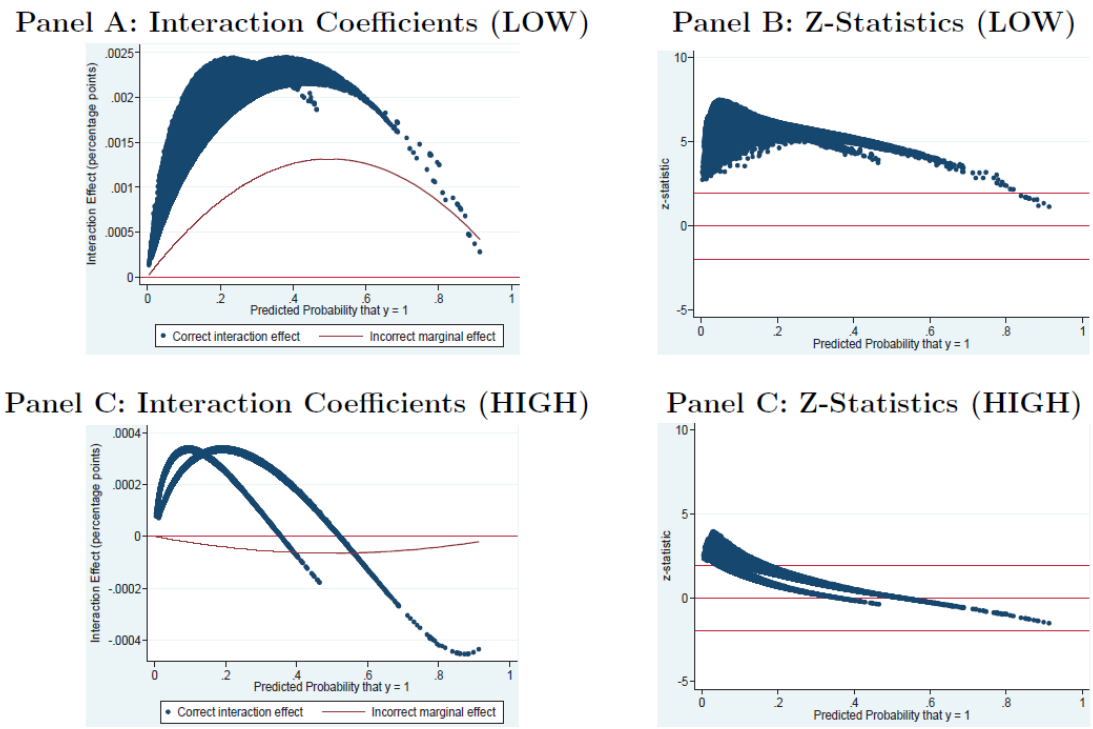


Figure 1: Interaction Effects by Ai-Norton

Figure A1: Robustness of Interaction Effect Between Trustee Indicator Variable and Performance Rank.

The following graphs display the interaction effects and corresponding z-statistics on the interaction variable between the trustee dummy and the performance ranks in Table A1 of the Appendix, estimated using Norton, Wang, and Ai (2004). The interaction effect is defined as the change in the predicted probability of deletion for a change in both the fund performance and the fund affiliation.