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OUT OF SIGHT NO MORE? THE EFFECT OF FEE DISCLOSURES ON 401(K) INVESTMENT ALLOCATIONS

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ABSTRACT

We examine the effects of a 2012 regulatory reform that mandated fee and performance disclosures for the investment options in 401(k) plans. We show that participants became significantly more attentive to expense ratios and short-term performance after the reform. The disclosure effects are stronger among plans with large average contributions per participant and weaker for plans with many investment options. Additionally, these results are not driven by secular changes in investor behavior or sponsor-initiated changes to the investment menus. Our findings suggest that providing salient fee and performance information can mitigate participants' inertia in retirement plans.

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1 Introduction

Defined contribution (DC) pension plans, such as 401(k) plans, have become an important investment vehicle for households saving for retirement.[1] In DC plans, employees have the responsibility to decide how much to save and how to allocate their savings across different investment options. However, many retirement savers may not be sufficiently aware of all relevant information to make optimal financial decisions. Individual investors often ignore information that is "out of sight" and react to salient attention-grabbing information, as discussed by Barber, Odean, and Zheng (2005).

In this paper, we examine whether the 2012 participant-level disclosure reform by the Department of Labor (DOL) affects investment decisions in 401(k) plans. Aiming to increase participants' awareness of the key features of the investment menu, DOL rule 404(a)(5) requires fiduciaries to provide expense- and performance-related summary statements directly to participants. While the information contained in these disclosures was publicly available before the reform, it was often buried in long fund prospectuses or regulatory filings. Hence, the new rule increased the salience of fees and prior performance and brought this information more "in sight."

To investigate whether participants become more attentive to fund fees and investment performance after the regulatory reform, we hand-collect information on the menu of options offered in a large sample of 401(k) plans using plan-level annual filings from 2010 to 2013, along with participants' allocations to each of these options. We augment these plan-option-year-level data with information on plan- and fund-level characteristics. Based on the timing of the regulation, the pre-reform observations in our experiment are the years 2010 and 2011, while the post-reform years are 2012 and 2013.

Our data have several advantages. For example, a given fund often contemporaneously appears on several 401(k) menus. Menus offer a different set of investment options, as sponsors and plan providers select different choices for participants in each plan. In addition, some mutual funds are not included in 401(k) plans, allowing us to contrast the impact of the new disclosures on funds that appear on our 401(k) menus to those that do not. These data features guide our identification strategy.

We begin by examining whether investors become more attentive to fund fees in their allocation decisions after the disclosure reform. There are several reasons why one may expect

[1] 401(k) plans held $6.2 trillion in assets as of December 31, 2019, on behalf of more than 58 million active participants according to the ICI (https://www.ici.org/401k).

to see no change in allocations following the new disclosures. Participants may already be aware of the fees and performance of their investment options since this information is publicly available. Alternatively, they may not read the new disclosures or may be overwhelmed by this information. A tepid response to the new regulation would be consistent with prior studies that show that retirement savers are often passive and rarely change their investment allocations (Madrian and Shea (2001), Agnew, Balduzzi, and Sundén (2003), and Sialm, Starks, and Zhang (2015)).

We find that participants' sensitivity to fees increases after the reform. This result holds using several different measures of fund flows: For example, funds with a one-standard-deviation higher expense ratio (i.e., 0.36 percentage points) experience a statistically significant reduction in their plan share of 0.17 percentage points per year after the regulatory change. This annual portfolio reallocation is also economically significant, as it corresponds to around 6% of the median fund plan share of 2.9%.

We then ask whether our findings are driven by participants merely allocating more money to cheaper funds, or whether they are also actively withdrawing from the funds that are more expensive. We find that investors actively move money away from expensive funds: a one-standard-deviation increase in the expense ratio is associated with an eight percentage points higher probability that a fund experiences negative flows after the reform.

To better understand the effect of the reform on fee-sensitivities, we examine whether the disclosure makes the cheapest and the most expensive options more salient, thus helping participants to identify these 'extreme-fee' options in the plan. Consistent with the rank effect of Hartzmark (2015), we find that the impact of the reform is non-linear: participants become especially sensitive to the lowest-fee funds. These extreme funds receive abnormally high flows after the regulatory change, beyond what can be explained by the linear expense ratio.

Index funds may benefit disproportionately from the reform, as these funds tend to be among the cheapest options in many plans. Thus, at least part of the heightened fee sensitivity in our baseline results may be a result of investors switching from more expensive active funds toward cheaper passive funds. We confirm that investors allocate significantly more flows toward index funds after the reform. Yet, we find that flows become more sensitive to fees within both actively-managed funds as well as within the set of passively-managed funds. Taken together, these results suggest that the regulation implicitly promotes passively-managed funds and thus contributes to the popularity of indexing.

One concern is that our results may not be unique to the 2012 regulatory reform and may instead be driven by secular movements in participants' sensitivity to fees. To address this issue, we re-run our analysis using a series of placebo periods, where we counterfactually assume that the regulatory reform occurred in different years. We do not find a discontinuous relation between fees and changes to flows around these placebo years.

To further confirm that changes in investor attentiveness to fees are not driven by other confounding factors, we also use fund-level data from CRSP and show that after the disclosure reform the sensitivity of flows to fees increases significantly with the proportion of assets held in DC pension plans. Furthermore, we do not find a significant change in the fee sensitivity for the control group of funds not exposed to DC clients.

Having shown that participants become significantly more sensitive to fund fees in their investment allocations after the regulatory reform, it is interesting to ask who reacts to fee information. In particular, we look at two specific plan-level characteristics that may influence how participants respond to disclosures, namely participants' average contribution rate and the number of available choices. Participants with larger contributions may be financially more sophisticated, or they may pay more attention because they have more money on the line. On the one hand, if the reform provides new information, these investors may react more strongly. On the other hand, highly-sophisticated investors could already be aware of the fees and thus not react to the disclosures. We find that participant-directed investment allocations in plans where average participant contributions are larger experience a stronger increase in their sensitivities to fund fees after the reform, compared to other plans. Additionally, plans with a very large number of options may overwhelm participants with too much information, making relative comparisons more difficult, as discussed by Cronqvist and Thaler (2004), Carroll et al. (2009), and Keim and Mitchell (2018). Consistent with this argument, we find that the post-reform increase in fee sensitivities is larger in plans that do not offer a large number of investment options.

While the main focus of rule 404(a)(5) is to better inform participants about plan fees and expenses, the disclosures also provide participants with comparative information about the historical performance of the plan's investment options. Specifically, the rule requires that they tabulate the one-, five-, and ten-year returns for all fund options in the plan, whenever return information at those horizons is available. To the extent that plan investors chase performance, we expect return-flow sensitivities to increase around the disclosure reform. Whereas there is some evidence that high-fee funds on average exhibit inferior long-term net performance (e.g., Gil-Bazo and Ruiz-Verdu (2009) and Fama and French (2010)), evidence

on whether there is persistence in fund performance is more mixed (e.g., Grinblatt and Titman (1992), Hendricks, Patel, and Zeckhauser (1993) Carhart (1997), Bollen and Busse (2005), Fama and French (2010), and Berk and van Binsbergen (2015)).

We find that participant-directed flows become significantly more sensitive to one-year returns after the reform, but the results on changes in flow sensitivity to five- and ten-year performance are generally not significant. Higher sensitivity to one-year performance may occur since one-year performance is typically displayed more prominently in the first column of the disclosed data table.

Our interpretation of the previous results is that participants respond to the new disclosures by allocating more flows to cheaper funds, and to funds with higher one-year performance. A potential alternative explanation of these findings is that plan sponsors or providers are mapping participants to cheaper funds by changing the menus. For example, one such possibility is that sponsors may change the default option around the reform. While the use of plan-by-fund fixed effects and our results on negative flows mitigate this concern, we address this alternative explanation by analyzing menu additions and deletions by plan providers, as well as by re-estimating our results using the subsample of plans that have no menu changes around the reform. We do not find evidence for a discontinuous change in plan menus driven by plan sponsors.

Finally, we examine changes in participant investments in company stock, which is one of the investment options in many plans. Many plans have the option to invest either in diversified mutual funds or, alternatively, allocate money to the employer's stock, which typically has a zero expense ratio. We find that when a plan's mutual fund investment options are particularly expensive, participants shift more assets toward the employer's stock once they acquire better information about these fees through the new disclosures. Furthermore, we also find that plan participants chase short-term employer stock performance more aggressively after the regulatory reform. This reallocation toward company stock is an unintended consequence of the fee disclosure.

The main contribution of our paper is to provide the first evidence on the effect of the DOL's disclosure reform on fund allocations by 401(k) plan participants. Despite considerable prior evidence that pension participants are passive and do not react to new information, our results show that participants become more attentive to fund fees and to short-term fund performance after the regulation. The shift in investor attention that we document is important, given that differences in fees or inefficiencies in the selection of investment options can have a significant impact on retirement savings outcomes.

Our paper directly contributes to the literature that shows that individual decisions are affected by the salience of information, as discussed theoretically by Bordalo, Gennaioli, and Shleifer (2012, 2013). Understanding the role of salience when individuals have limited attention but can access a large amount of information is important because it suggests that regulatory reforms concerning how information is disclosed or third-party decisions on how information is aggregated have real-life consequences.

In the context of financial decisions, Barber, Odean, and Zheng (2005) show that mutual fund investors are influenced by salient, attention-grabbing information. Similarly, Barber and Odean (2008) provide evidence that individual investors are net buyers of attention-grabbing securities. Bertrand and Morse (2011) find that the disclosure of already known information in a different format affects the behavior of payday borrowers. Agarwal et al. (2015) study the effect of disclosing interest savings associated with making larger-than-minimum payments for credit cards. Attention effects have also been documented by Stango and Zinman (2014) for bank overdraft fees and by Karlan et al. (2016) for commitment savings accounts.[2] Several papers examine attention-induced effects in mutual funds. Choi, Laibson, and Madrian (2010) use an experimental setting to highlight the dark side of displaying return performance. Studies also show that investors react to policy changes and are influenced by third-party data providers.[3]

Another related influential literature examines the effectiveness of behavioral nudges to encourage retirement savings in DC plans and to break the well-documented inertia of 401(k) pension participants. For example, early work by Madrian and Shea (2001) and Choi et al. (2004a, 2005b) show that default allocations in DC plans have large and lasting effects on the saving behavior of a substantial fraction of newly-hired employees, and that opt-out provisions in DC plans dramatically increase 401(k) participation rates.[4] Yet, studies that look at the impact retirement related disclosures show mixed results. For example, Beshears et al. (2010) use an experiment to estimate the effect of a disclosure intervention

[2]In a similar spirit, Chetty, Looney, and Kroft (2009) discuss the impact of the salience of commodity taxes on consumer demand; Figlio and Lucas (2016) examine whether publicly disseminating information on school quality affects the real estate market in the area; and Dranove et al. (2003) ask how health outcomes change after the introduction of hospital report cards. See DellaVigna (2009) for a review.

[3]See for example, Del Guercio and Tkac (2008), Duarte and Hastings (2012), Kaniel and Parham (2017), Shaton (2017), Gao and Huang (2017), Da et al. (2018), Evans and Sun (2018), and Ben-David et al. (2019))

[4]Several other papers have identified inefficiencies in the structure of DC plans retirement: Huberman and Jiang (2006), Elton, Gruber, and Blake (2006, 2007), Brown, Liang, and Weisbenner (2007), Carroll et al. (2009), Choi, Laibson, and Madrian (2009), Tang et al. (2010), Chalmers, Johnson, and Reuter (2013), Goldreich and Halaburda (2013), and Dvorak (2015).

that provides experimental subjects with SEC's Summary Prospectus that simplifies mutual fund disclosure. They find that such an intervention yields little change in allocations among actively managed funds. Badoer, Costello, and James (2020) find that a more prominent disclosure of the indirect fees earned by 401(k) service providers is associated with a reduction in the compensation paid to service providers of small retirement plans, and Hong (2019) studies the decisions of pension plans and participants following a pension reform in Hong Kong that broadened the available investment options.

The rest of the paper is structured as follows. Section 2 provides information on the legislative timeline of rule 404(a)(5). Section 3 describes our data collection and provides summary statistics of our 401(k) plans as well as the mutual funds offered on the plans' menus. Sections 4 and 5 study whether the disclosure reform affected the sensitivity of flows to fees and performance, respectively. Section 6 investigates whether the investment menus were adjusted in 401(k) plans. Section 7 concludes.

2 Institutional Background

Individual retirement plan participants are responsible for making investment decisions in DC plans. An important question is whether participants have the information, ability, and time to make optimal savings decisions. Accordingly, the DOL has issued a series of regulatory initiatives in recent years under the Employee Retirement Income Security Act of 1974 (ERISA) to ensure that both plan fiduciaries and plan participants receive a clear and comprehensive description of their plans, especially concerning plan costs. This paper focuses on the participant-level disclosure reform, rule 404(a)(5), which requires plan fiduciaries to disclose information about plan fees, expenses, and performance to participants. Figure 1 shows an example of fee and performance disclosures to participants following the 2012 regulation from the Department of Labor.

[Insert Figure 1 about here]

This regulation had a relatively long legislative history. In particular, as a first step in developing the disclosure rule, the DOL published a 2007 Request for Information in the Federal Register. The Request generated over 100 public comment letters concerning the planned fee and performance disclosures to plan participants. The DOL then published a notice of proposed rule-making in the 2008 Federal Register, which further solicited public

comments on the issue. On October 20, 2010, the Department published the final regulation in the Federal Register, which mostly followed the structure of the original proposed rule.

In addition to the participant-level disclosure rule, the DOL simultaneously developed a rule on fiduciary-level plan disclosures, which requires service providers to furnish information to the plan's fiduciaries on the direct and indirect fees these providers collect for services rendered to the plan.[5] A proposed rule was published in December 2007, and a corresponding interim final rule (408(b)(2)) was issued on July 16, 2010. On June 1, 2011, the effective date of 408(b)(2) was delayed to January 1, 2012.

Though the participant-level disclosure requirements were set to begin before those at the fiduciary level, public commentators argued that it would be preferable if the effective date of the participant-level regulation would be delayed until after 408(b)(2) takes effect, as information obtained from service providers would be useful to plan fiduciaries when they issue participant disclosures. In response to these comments, to align the compliance dates of the two rules, the final compliance date for rule 408(b)(2) was set to April 1, 2012. Additionally, the DOL amended the transition rule in 404(a)(5) to require that participant-level disclosures are made no later than 60 days after the effective date of the fiduciary-level disclosures.

While the two rules were simultaneously developed, it is important to point out that any potential effects from these regulations likely differ on the extensive and intensive margins. In particular, plan fiduciaries and providers were aware of the pending rule changes. Accordingly, they may have made changes to their menu design by adding and deleting investment options long before the final effective disclosure date. In contrast, the change in plan participants' information environment occurred at a specific point in time. Thus, rule 404(a)(5) provides a shock for participant reallocation decisions. For this reason, we focus on whether participants reallocate their 401(k) savings across options after the reform's effective date. In the latter part of this paper, we also provide some discussion on whether investment options were adjusted around the disclosure reform.

3 Data and Summary Statistics

This section describes our data collection and the properties of the sample.

[5]Badoer, Costello, and James (2020) examine the effect of this law on the prevalence of direct vs. indirect compensation arrangements in 401(k) plans.

3.1 Data Collection

To investigate whether 401(k) participants become more attentive to investment fees in their plans after the disclosure reform, we manually collect the investment options offered in a large sample of 401(k) plans for the 2010-2013 period. Because the first disclosures were sent out during 2012, we designate the plan-years 2010 and 2011 as the pre-reform period and the plan-years 2012 and 2013 as the post-reform period.[6]

Our sample is comprised of two sets of plans. First, we hand-collect information for the plans studied in Pool, Sialm, and Stefanescu (2016) for the 2010 to 2013 period. Second, we augment that original set of plans with information on the 1000 largest plans in the U.S. in 2009. While the original sample in Pool, Sialm, and Stefanescu (2016) was collected from Form 11-K filings filed with the SEC, information on the menu of investment options for the new time period and plans is collected from Form 5500 filed with the DOL.[7] Form 11-K and Form 5500 provide the same description of the plans, including the menu of investment options offered to participants at the end of the fiscal year. However, unlike Form 11-K, which only covers plans offering the employer's stock as an investment option, Form 5500 is filed by all pension benefit plans covered by the Employee Retirement Income Security Act (ERISA).[8]

From Form 5500 filings, we collect the table that describes the 'Schedule of Assets,' which is typically included on the last pages of the forms. In most cases, the table reports the complete set of investment options offered by the plan, including the employers' stock, mutual funds, separate accounts, stable value funds, and guaranteed investment contracts. We supplement our menu information with various plan characteristics such as total plan size and the number of participants, downloaded from various schedules of Form 5500.

Studying choices between options in defined contribution plans is arguably an ideal setting to evaluate the effect of fund characteristics on flows. This is because participants' choice sets are limited and, importantly, fully observable. Plans typically include around 20 options, which makes a comparison of options feasible.

To obtain information on the mutual funds included in DC plans, we match our menu data to the CRSP Survivorship Bias-Free U.S. Mutual Fund database by fund name. We further

[6]While most of the plans in our sample follow the calendar year as their fiscal year, a small subset does not. For these plans, we designate any fiscal year end month after December 2012 as the *Post* period.

[7]Effective January 1, 2009, the Department of Labor ("DOL") mandated electronic filing of Form 5500, and these forms and their attachments became easily accessible on the DOL website.

[8]Our baseline results are nevertheless similar across these two samples, as summarized in the Internet Appendix.

match to the exact share class of a fund whenever possible. Share class information comes from several sources. First, for a subsample of plans, share class information is obtained from the 'Schedule of Assets' table. Second, in some of the cases, the 'Schedule of Assets' table contains information on the number of shares 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, which allows us to identify the correct share class. Third, in some cases, Part 1/3 of Schedule C on Form 5500 specifies the share class of the fund ('payor'), even when the 'Schedule of Assets' table does not. Finally, some funds only have one share class. We can identify the correct share class for over 60% of our funds, yet there is substantial heterogeneity across plans, as we can identify the actual share class of every fund in some plans but have no share class information for other plans. Whenever we know the share class information for more than 95% of funds offered in a plan-year, we use the share class-specific information; if we do not know the share class for most funds in a plan, we instead use the minimum expense ratio across the funds' share classes.[9] While we acknowledge that this means that we cannot perfectly measure the fees of all the options in our sample, any fee mismeasurement should attenuate our results. For funds of funds in our sample, we calculate expense ratios as the sum of the expense ratio charged by the fund of funds and the value-weighted expense ratio charged by the portfolio funds.

Because many of our tests will compare funds within the same broad "style," we manually classify each mutual fund into the following six style groups: domestic equity funds, foreign equity funds, balanced funds, domestic fixed income, foreign fixed income, and other, by mapping Lipper fund styles into these broader categories. We create separate indicator variables for money market, target-date, and index funds. We manually group funds into target-date funds based on a fund's name. To identify index funds we utilize the fund's name along with the CRSP flags for index funds.

3.2 Sample description

Panel A of Table 1 provides summary statistics for our sample at the plan-year level. We restrict our sample to plan-years that offer at least three and no more than 100 options on

[9]Most of the 401(k) plans in our sample are very large and thus may have access to the lowest fee share classes that are available. For robustness, we show in the Internet Appendix that the results are similar if we ignore all share class information and instead use the value-weighted fee across all share classes of a fund as our proxy for an option's expense ratio.

the menu. The final sample covers 5,577 plan-years between 2010 and 2013. Throughout our analysis, all non-binary variables are winsorized at the 1% level.

The average plan size is $799 million. The average plan has 13,000 participants. Participants in our sample have, on average, approximately $77,200 in their 401(k) accounts, and contribute around $4,600 per year to their plan.[10] Although our sample only contains, on average, 1,395 plans per year, it covers $1.3 trillion in retirement assets in 2013 and approximately 18 million participants. This represents roughly a third of the total 401(k) assets in the U.S.[11]

[Insert Table 1 about here]

Plans offer around 21 investment options to participants, where 18 of these options have been on the menu for at least two consecutive years, while the rest are funds that have been added in the current year. In this paper, we focus on participants' investment decisions; therefore, we exclude newly added funds as well as deleted funds in our analyses. We further drop target-date funds from the sample in most of our analyses, as they are often chosen as default investment options.[12] On average, plans in our sample offer a total of 12 non-target-date fund options that have not been newly added to the plan.

Panel B of Table 1 further describes the set of options across different styles that are available to participants. Around half of the fund options in our sample are domestic equity funds (50,469 plan-fund-year observations), 19% are balanced funds, and 17% are domestic fixed income funds. The sample of balanced funds is dominated by target-date funds. Panel B also reports the average expense ratio of these different fund styles and how often a plan-year has at least one fund of a certain style. For example, 98% of plans have at least one domestic equity fund, whereas only 8% have a foreign fixed income fund. Because plans typically include about six domestic equity funds (excluding target-date funds), we will often perform our analyses separately for this style of funds.

[10] Note that these are not participant-level statistics, but rather plan-level statistics where contributions are defined as total plan contributions divided by the number of participants.

[11] According to the ICI, total assets in 401(k) plans amounted to $4.1 trillion at the end of 2013 (https://www.ici.org/info/ret_19_q4_data.xls). Mutual funds accounted for 64% of these assets.

[12] Although default options are generally not identified in Form 5500, the 2013-2014 Edition of the Annual Defined Contribution Benchmarking Survey by Deloitte Consulting finds that lifecycle or target-date funds account for between 72% and 82% of default investment options for automatic enrollment (https://www2.deloitte.com/content/dam/Deloitte/us/Documents/human-capital/us-cons-annual-defined-contribution-benchmarking-survey2013-081914.pdf, p. 14).

We use four different measures of fund flows for fund f, in plan p, in year t. The first measure $Flow^1$ normalizes dollar flows by the lagged value of all mutual fund investment options in a plan:

$$Flow^1_{p,f,t} = \frac{V_{p,f,t} - V_{p,f,t-1}(1 + R_{f,t})}{\sum_i V_{p,i,t-1}} \tag{1}$$

The dollar flows are estimated as $V_{p,f,t} - V_{p,f,t-1}(1 + R_{f,t})$, where $V_{p,f,t}$ is the value of the investments in mutual fund f held in 401(k) plan p at time t and $R_{f,t}$ is the total return of fund f at time t. The flows are computed at an annual frequency. This measure gives the same weight to a dollar flow regardless of whether it flows into a small or a large option in a plan.

The second measure $Flow^2$ is based on the change in the plan share of an investment option in a 401(k) plan from one year to the next after adjusting for the returns of the corresponding investment options:

$$Flow^2_{p,f,t} = \frac{V_{p,f,t}}{\sum_i V_{p,i,t}} - \frac{V_{p,f,t-1}(1 + R_{f,t})}{\sum_i V_{p,i,t-1}(1 + R_{i,t})} \tag{2}$$

The third measure $Flow^3$ normalizes the dollar flow by the average of the initial and the final value of an investment option. This measure gives more weight to a dollar that flows to a smaller option since it captures the effect of flows on the change in the relative size of a given option. We divide by the average of the contemporaneous and lagged size to reduce the impact of outliers, as some of the lagged option sizes tend to be very small:

$$Flow^3_{p,f,t} = \frac{V_{p,f,t} - V_{p,f,t-1}(1 + R_{f,t})}{(V_{p,f,t-1} + V_{p,f,t})/2} \tag{3}$$

The fourth measure $Flow^4$ is simply an indicator variable for whether the dollar flows are positive:

$$Flow^4_{p,f,t} = I(V_{p,f,t} - V_{p,f,t-1}(1 + R_{f,t}) > 0) \tag{4}$$

The fourth measure allows us to separate investment options that receive inflows from those that receive outflows. Outflows for contributing plan participants require an active decision to rebalance their investment options, whereas inflows may be driven by automated contributions.

Table 2 presents plan-fund-year-level descriptive statistics for the non-target date funds in our sample.[13] Participants invest approximately $21.4 million in the average mutual fund on the menu, representing 3.91% of the total invested capital across all mutual funds, and participants pay, on average, around 60 basis points in the form of mutual fund expense ratios. The first two flow measures have medians close to zero, but exhibit wide distributions. For example, the change in the plan share ranges from -0.48% at the 25th percentile to 0.26% at the 75th percentile.[14] If we normalize flows by the option size, then the mean flow is 6.7%, as contributions tend to exceed withdrawals from our plans. Around 54% of plan options receive positive inflows. The average one-year returns of the investment options tend to be higher than the annualized five- and ten-year returns due to the relatively poor performance of the stock market during the financial crisis from 2007-2009.

Panel B summarizes the correlations between the flow measures. All four flow measures exhibit relatively high correlations ranging between 0.43 and 0.66.

[Insert Table 2 about here]

4 Fees and fund flows

This section summarizes our results that analyze the impact of the disclosure regulation on portfolio allocation decisions.

4.1 Aggregate Relation

To illustrate the relation between fees and flows around the time of the disclosure reform, we begin by describing the changing fee-sensitivities of flows in these 401(k) plans. For each plan and each year we separately compute flows to low- and high-fee funds:

$$Flow_{p,t}^{BelowMedian} = \frac{\sum_{BelowMedian}\left(V_{p,f,t} - V_{p,f,t-1}(1+R_{f,t})\right)}{\sum_{BelowMedian} V_{p,f,t-1}} \quad (5)$$

$$Flow_{p,t}^{AboveMedian} = \frac{\sum_{AboveMedian}\left(V_{p,f,t} - V_{p,f,t-1}(1+R_{f,t})\right)}{\sum_{AboveMedian} V_{p,f,t-1}} \quad (6)$$

[13] Table A.1 in the Internet Appendix reports similar statistics for target-date funds.

[14] The average change in the plan share is negative in this subsample because target date funds are excluded. When all funds on the menu are included in the calculations, average change in plan share is zero, as expected based on the definition of this measure.

In a first step, we sum the dollar flows to below-median (above-median) fee options within a plan and a year, where the median is measured separately for each plan, year, and style. We then separately divide the summed dollar flows for below- and above-median-fee options by the lagged sum of assets held in these fund options at the end of the prior year. Thus, for each plan and year we have two separate percentage flow measures for below- and above-median-fee options. In a second step, we then average the below- and above-median flows across all plans in each year from 2010 to 2013.

Panel A of Figure 2 plots in blue solid bars the average flow (equal-weighted across plans) to below-median-fee investment options by year in our sample, and in orange checkered bars the average equal-weighted flow to above-median-fee investment options by year. The figure shows that before the 2012 reform, the flows are very similar across high- and low-fee investment options. We then observe a shift in 2012, where the lower-fee funds now receive more flows than the more expensive funds, and this trend continues to hold in 2013. After the reform, the percentage flows of low-fee funds are around double those of high-fee funds.

We also depict the standard error bars, which capture the 95% confidence intervals based on the cross-sectional variation in flows across plans. We also test whether the flows are statistically significantly different across the two fee samples. The p-values for the difference between low- and high-fee funds are tabulated under the graph. For the sample including all fund styles, we find p-values of 10.5% in 2012 and 2.6% in 2013. The results are similar for domestic equity funds, as shown in Panel B.

[Insert Figure 2 about here]

We can obtain a back-of-the-envelope estimate of the economic magnitude of the total savings due to the aggregate reallocations based on Figure 2. Annual flows to below-median funds exceed the flows to above-median funds by around 2.2 percentage points in 2012 and by 4.8 percentage points in 2013, resulting in a cumulative reallocation from above-median funds to below-median funds of around 7 percentage points over these two years. The typical fee difference between above-median and below-median funds is 54 basis points per year, as indicated by the interquartile range in Table 2. Thus, the savings in fees are around 3.8 basis points per year (i.e., 0.07×0.0054). This corresponds to an annual saving of \$490 million, given that our sample covers \$1.3 trillion of 401(k) assets (i.e., $0.00038 \times \$1.3$ trillion). Finally, since our sample is around one-third of the overall 401(k) market, the aggregate

fee savings can be around three times higher to the extent that participants in other plans behave similarly.

The results in Figure 2 need to be interpreted with caution since this methodology does not enable us to control for plan and fund characteristics. In the remainder of the paper we include various fixed effects to adjust for important differences across plans and funds.

4.2 Baseline specification

To investigate the relation between low- and high-fee funds before and after the reform formally, we next estimate the following baseline regression model:

$$\begin{aligned} Flow_{p,f,t} &= \beta_1 ExpRatio_{p,f,t-1} + \beta_2 Post_t + \beta_3 ExpRatio_{p,f,t-1} \times Post_t \\ &+ \mathbf{\Gamma' Controls}_{p,f,t-1} + \epsilon_{p,f,t}, \end{aligned} \tag{7}$$

where $Flow_{p,f,t}$ is one of our four measures of flows for fund f included in plan p in year t, $ExpRatio_{p,f,t-1}$ is the lagged expense ratio of fund f in plan p, and $Post$ is an indicator that takes the value of one for either of the two fiscal years following the reform, and zero for the two years before the reform. $\mathbf{Controls}_{p,f,t-1}$ is a vector of relevant control variables and fixed effects.[15]

We include several types of fixed effects and additional controls to absorb variation in flows and fees unrelated to the reform. We include size-by-year controls since large options may have systematically different flows than small options. The size variable is measured as the lagged fraction of a plan's assets invested in the fund, and we allow its relation with flows to vary by year. Plan-by-fund fixed effects allow for a *within-investment-option* comparison of fees and flows and further control for possible compositional changes in a plan's menu. Additionally, we also control for plan-by-style-by-year fixed effects (plan-by-year fixed effects in specifications where we analyze the results within domestic equity funds only), which make the comparison of flows and fees across options to be within the same plan, year, and fund style. Finally, we also include fund family-by-year fixed effects to account for possible time variation in flows and fees specific to a particular fund family. Such time variation could be driven by omitted variables or events at the family level, such as marketing or media coverage. The standard errors are two-way clustered throughout our analyses by fund and plan. The

[15] Note that the expense ratio of a fund can differ across 401(k) plans if plans choose different share classes. This explains why the expense ratio has subscripts p, f, and t.

sample in the baseline regression includes 1803 unique funds and 1385 unique plans, while the regressions within domestic equity funds includes 917 unique funds and 1366 plans.

Panel A of Table 3 reports the results for the four flow measures for our full sample of mutual fund investment options across all fund styles. We find that flows (normalized by the sum of lagged assets across all options) become significantly more sensitive to fees after the disclosure reform, as shown in the first column. The coefficient estimate of -0.559 implies that a fund with a one-standard-deviation higher expense ratio (i.e., 0.36 percentage points) experiences a 0.20 percentage-point lower flow per year (i.e., 0.559×0.36) after the reform when measured as a fraction of the lagged sum of money invested across all options. Economically, this magnitude corresponds to around one-quarter of the inter-quartile range from -0.355 to 0.430.

The second column reports results using our second flow measure based on the change in percentage allocations adjusted for returns. This measure has a nice interpretation: Fund options with a one-standard-deviation lower expense ratio experience an increase in their plan allocations of 0.17 percentage points per year (i.e., 0.474×0.36) after the reform. This annual portfolio reallocation corresponds to around 6% of the median fund plan share of 2.9%.

The results are also consistent if we normalize dollar flows by the average of the lagged and current option size. These estimates indicate that a fund with a one-standard-deviation higher expense ratio is predicted to receive around 2.1 percentage points lower flows per year after the reform.

The regressions that use continuous dependent variables show that funds with lower fees receive relatively higher flows after the reform. We next ask whether this is driven by participants merely allocating more of their investments to cheaper funds, or whether they also withdraw money from more expensive funds. This is important, because if our findings are merely driven by the former, the change in fee sensitivities may not come from participants' heightened awareness of investment costs. Instead, the change may be driven by plan providers who select the menu of investment options for the plan. For example, these providers may designate the cheapest fund on the menu as the default option around the reform.

To test whether more expensive funds are more likely to experience negative flows after the reform, column (4) uses an indicator for whether the sign of flows is positive as the dependent variable. The results are consistent with participants withdrawing money from more expensive funds after the reform. Specifically, a one-standard-deviation higher fee is

associated with an eight percentage point (i.e., 0.36×0.23) greater probability that a fund experiences negative flows. This is an economically sizeable effect compared to an average probability of having negative flows of 46%. Another feature of using an indicator variable for the sign of flows is that this measure is not affected by the choice of scaling, that is, whether flows are normalized by the sum of lagged assets across all mutual funds in the plan (as in column (1)) or by the average of the lagged and current option size (as in column (3)).

[Insert Table 3 about here]

The results in Panel A include plan-style-year fixed effects to control for the fact that different styles of funds can have systematically different fees and may also see correlated flows. For example, fixed income or international funds may be more popular in some years than others, and these fund styles also have different fees on average. Yet, there remains much heterogeneity across the options when analyzing all funds simultaneously. To address this concern, we re-estimate the results using only domestic equity funds, which correspond to a more homogeneous group of mutual funds. This may facilitate the interpretation and help ensure the robustness of our results. We choose to focus specifically on domestic equity funds because this fund style has by far the highest number of options. As Panel B of Table 1 shows, 98% of all plan-years have at least one domestic equity fund, and on average these plans offer six different domestic equity funds (excluding target-date funds). By contrast, the number of possible choices within the other fund styles is typically more limited.

Panel B of Table 3 shows that the results are similar in magnitude among the domestic equity funds as across the full sample. For example, a one-standard-deviation change in the expense ratio predicts a 0.21 percentage point higher flow when normalized by the sum of all mutual fund options. In sum, these results show that flows from plan participants become significantly more sensitive to fund expenses after the defined contribution disclosure reform of 2012.

The economic magnitude of these effects is sizable, especially taking into account that small fee differences can have major impacts on accumulated wealth levels for retirement savers with long investment horizons. However, fee disclosures in and of themselves may not be sufficient. Disclosure policies need to be complemented with well-designed plan menus, reasonable default options, and financial education for participants.

4.3 Alternative specifications and subsamples

The baseline specification in Table 3 includes high-dimensional fixed effects that absorb variation of flows due to time, plan, style, fund, and family. To investigate whether the results are sensitive to the various specifications, in Table 4 we present results using different combinations of fixed effects. We sequentially introduce style-year fixed effects, plan-year fixed effects, plan-style-year fixed effects, plan-fund fixed effects, and family-year fixed effects. All specifications include size controls that differ across years. The last specification corresponds to the baseline specification in Table 3. Fund flows are captured by our first flow measure, which normalizes dollar flows by the sum of mutual fund assets.

[Insert Table 4 about here]

Table 4 reports that the coefficients on the interaction between the expense ratio and the reform indicator variable are significantly negative for all specifications. The magnitude of the coefficient more than doubles in magnitude (i.e., from -0.289 to -0.672) after introducing plan-by-fund fixed effects. Thus, the effects of the reform are more pronounced when we focus on changes of allocations within the same funds of the same plans.

Interestingly, the coefficients on the uninteracted expense ratio change substantially across specifications. The coefficient is negative without plan-by-fund fixed effects. This indicates that investment options with higher fees attract lower money flows before the reform. This sensitivity to fees more than doubles after the disclosure reform, as the magnitude on the interaction effect exceeds the direct effect. In contrast, the coefficients on the expense ratio become insignificant in the two specifications that include plan-by-fund fixed effects. This result occurs because mutual fund fees do not change substantially over time. The plan-by-fund fixed effects therefore absorb the effect of average fund expenses on flows.

Although fund fees do not typically change from one year to the next, the disclosure reform of 2012 may have motivated some funds to adjust their fees. Panel A of Table A.2 in the Internet Appendix uses fees that are kept constant over the sample period. Specifically, in this panel, we measure each fund's expense ratio as of 2009 instead of using the one-year-lagged expense ratio. This allows us to abstract from changes in fees that could contaminate our results. Because this fee is held constant over the sample period, it is fully subsumed by the plan-by-fund fixed effects. The results in this panel are consistent with those in Table 3. Finally, in Panel B of Table A.2, we re-estimate our baseline model by using the

value-weighted expense ratio across the share classes of a fund as the proxy for each option's expense ratio. We find that these results are again very similar to our results in Table 3.

Our baseline results combine two samples that include plans with different characteristics. The 11-K sample is based on publicly-traded firms that include company stocks as a menu option and the Form 5500 sample includes the largest 1000 plans in 2009. Table A.3 in the Internet Appendix shows that our baseline results are similar across the two data sources.

In Table 3, we compare fund flows during the two-year post-period with those in the two-year pre-period. In Table A.4 in the Internet Appendix, we compare flows in the year after the reform (2012) with those in the year before the reform (2011). This allows us to focus on the immediate impact of the reform. The results are similar to the results of our baseline event window of 2010-2013.

Although we have plan menu data prior to 2010, in our baseline specification in Table 3 we only use data from 2010-2013. This ensures that the pre- and post-periods are of equal length and not too distant from our regulatory change. Furthermore, our sample composition is more homogenous over the 2010-2013 period. Prior to 2010 we only have the 401(k) plan menus from Form 11-K, which only covers plans where the employer's stock is an investment option. Nonetheless, we re-estimate Table 3 using the entire 2000-2013 sample. The results, which are reported in Table A.5 in the Internet Appendix, show that our baseline findings are robust to using this extended time period. In all specifications, our coefficient estimates on the interaction term between the expense ratio and the reform indicator are similar to those estimated in Table 3, both in terms of economic magnitude and statistical significance.

In Table 3 and the subsequent robustness checks, we cluster the standard errors by fund and plan as flows are correlated within these dimensions. Table A.6 shows that the disclosure effect is statistically significant using other clustering assumptions. Clustering the standard errors by fund and plan corresponds to relatively conservative estimates of the standard errors.

4.4 Extreme fees

One feature of the disclosure reform is that it may facilitate identifying and thus choosing the cheapest fund in a plan. In Table 5, we examine the extent to which flows respond differently to funds that have the most extreme expenses (defined as the cheapest or most expensive

option in the plan) around the reform. In columns (1)–(3), we examine all funds, and in columns (4)–(6) we further focus on the set of domestic equity funds.[16]

[Insert Table 5 about here]

Table 5 shows that after the reform, the cheapest funds receive significantly higher flows. The coefficient of 0.446% on the indicator variable for the cheapest fund in column (1) corresponds to around one-quarter of the standard deviation of 1.7% of flows in Table 2. Column (2) further shows that the most expensive funds also receive lower flows after the reform, although this result is only marginally significant. In column (3), we further control for the linear relation with expenses and show that the lowest–expense funds receive abnormally high flows, after the reform *beyond* what can be explained by their continuously measured expense ratio. In other words, the reform has a differential effect on the options with the most extreme expenses, consistent with the rank effect of Hartzmark (2015).

We find broadly similar results in columns (4)–(6) where we only focus on domestic equity funds. The cheapest option receives more flows than what can be explained by the continuously measured expense ratios in this subsample as well.

4.5 Index funds

We next investigate to what extent the reform resulted in reallocations from active funds to index funds, and whether participants also become more sensitive to fees *within* the available set of active funds, as well as within the set of index funds.

Index funds on average tend to be significantly cheaper options than actively managed funds. Therefore, at least part of the heightened sensitivity to fees that we observe is likely to result from participants allocating more flows toward index funds. We test this in Panel A of Table 6, where we interact *Post* with whether the option is an index fund or not. The results confirm that DC plan participants indeed allocate significantly more flows toward index funds after the reform. However, the table also shows that the lowest-fee funds continue to attract additional flows in the post-reform period in this specification.

[Insert Table 6 about here]

[16] In the regressions that only use domestic equity funds, the cheapest and most expensive funds are defined within domestic equity.

A second possible effect of the increased fee sensitivity could be a reallocation from the relatively more expensive active funds toward the relatively cheaper active funds in a plan and, similarly, reallocations within the set of index funds. In Panel B of Table 6, we split the sample into active funds (columns (1)–(2)) and index funds (columns (3)–(4)). We find that participants become more sensitive to fees after the reform within both their choice set of active funds and index funds. For active funds, the estimates on the interaction effect decrease (when compared to those in Table 3) from -0.559 to -0.195 for the whole sample and from -0.586 to -0.258 for domestic equity funds. Thus, the impact of the disclosure is more muted within the group of actively-managed funds, indicating that the reallocation from active funds to index funds partially contributes to the overall effects. In columns (3)–(4), we consider fee sensitivities within the sample of index funds. We find that the relatively cheaper index funds in a plan receive more flows after the reform compared to the more expensive index funds in the same plan. The point estimates are larger than those within the set of active funds.

Taken together, the results in Table 6 provide some insights on the interaction between the regulatory change and the popularity of indexing. In particular, they suggest that the regulation implicitly promotes passively-managed funds and thus contributes to the recent shift towards indexing.

4.6 Counterfactual placebo events

The previous sections show that flows become more sensitive to fees after the disclosure reform. It is possible, however, that this result could be confounded by a secular movement over time whereby flows become increasingly more sensitive to fees year-after-year. In this section, we therefore examine how significant the measured effect around the reform is in a historical context, and whether there is a trend toward ever greater fee-sensitivities in the years leading up to the reform.

To examine these questions, we rerun our baseline model using a series of 'placebo periods.' In other words, instead of using the actual experiment with pre-period 2010-2011 and post-period 2012-2013, we extend our sample backward in time and run the same regression over alternative rolling four-year periods before the passage of the 404(a)(5) DOL rule. Other than using different sample years, the empirical specification in these models is identical to that in Table 3.

The results of these tests are reported in Table 7. Panel A shows results for all funds, while Panel B tabulates the results for the subsample of domestic equity funds. The results confirm

that the 2010–2013 period is a significant outlier in the distribution of fee-sensitivities. All coefficients on the interaction effect for the placebo events are smaller in absolute terms than the corresponding estimates reported in Table 3. In fact, five out of nine coefficient estimates in the overall sample are (insignificantly) positive, including the two periods immediately preceding the reform. More importantly, there is no trend of ever-increasing fee-sensitivities in the years immediately before the reform that could confound our baseline results. This result holds both across all funds (Panel A) and among domestic equity funds (Panel B).

[Insert Table 7 about here]

Two interaction effects are marginally statistically significant, albeit with opposite signs: The coefficient for 2001–2004 in the overall sample is negative with a t-statistic of -1.74 and the coefficient for 2008–2011 in the domestic equity sample is positive with a t-statistic of 1.77. Obtaining two marginally significant coefficients is not too surprising as one would expect 10% of the 18 interaction coefficients to be significant at a 10% significance level.[17]

The placebo results also provide an alternative method to evaluate our baseline estimates. In particular, our baseline coefficient estimate for model 1 in Table 3 (-0.559) lies well to the left of zero, specifically 3.12 standard deviations away, based on the standard deviation inferred from the placebo analysis. While this is comforting, there are limitations to using our nine placebo estimates to infer standard errors. One potential concern of this placebo specification is that the composition of plans changes over time. As mentioned previously, the sample prior to 2010 is based on 11-K forms, which have to be filed by firms that include their common stock as an investment option in their 401(k) plans. We augment this sample from 2010-2013 with the menus from the Form-5500 filings of the largest 1000 plans. Thus, the plans prior to 2010 tend to be smaller than the plans in our main sample. Furthermore, we observe substantially fewer plans prior to 2010. For example, the number of annual observations equals 47,634 for our baseline sample in Table 3, but just an average of 25,182 for the nine placebo periods ranging from 2000-2011.

[17]Possible drivers of the negative coefficient may be the 2004 reform that improved mutual fund disclosures involving mutual funds (https://www.sec.gov/rules/final/33-8393.htm), the increased scrutiny of mutual funds in the early 2000s due to the Enron bankruptcy in 2001, or the mutual fund scandal of 2003 (e.g., Poterba (2003), Houge and Wellman (2005), Zitzewitz (2006), Karpoff, Lee, and Martin (2008) and Sialm and Tham (2016)).

In summary, these analyses show that the baseline results in Table 3 are substantial—not only in absolute economic magnitude—but also when compared to other recent periods, and are not driven by an increasing trend in fee-sensitivities in the years leading up to the reform.

4.7 Heterogeneity across plan participants

Although the disclosure reform affects all 401(k) plans in the United States, we may expect that participant responses to these disclosures to vary depending on the characteristics of plans. This section studies two such possibilities: we investigate whether participants who make large annual contributions to their retirement accounts and whether participants in plans that have more investment options on the menu react differently to the regulatory change.

Participants who contribute more money to their plans have a stronger reason to pay attention to the underlying investment fees, so we may expect their fee-sensitivities to be stronger. A limitation of our data is that we only observe aggregate plan-fund-level information, but not individual contributions or balances. Yet, we do know the total contributions across all participants in a plan, and the number of participants, which allows us to exploit heterogeneity across plans in the *average* dollar contributions per participant.

While we expect participants who make larger contributions to care more about fees, this does not necessarily mean that they will respond more to the change in disclosures. This is because these participants may have a stronger incentive to learn about fees and performance even *before* the reform. Therefore, new disclosures will only benefit these participants if they did not acquire sufficient information on these plan features before the reform.

In Panel A of Table 8, we study the heterogeneous effects across plans of average participant contributions by interacting $Expense\ ratio \times Post$ with $Large\ contributions$ in equation (7), where $Large\ contributions$ is an indicator variable based on whether the annual dollar contribution per participant is above the sample median in 2009 (the year immediately before the start of our main period of analysis). We do not need to include the direct effect for large contributions separately, since it is absorbed by Plan-by-Fund fixed effects.

The coefficients on the triple-interactions $Expense\ ratio \times Post \times Large\ contributions$ are negative for the overall sample and the domestic equity subsample. This implies that the disclosure has a stronger effect on fee-flow-sensitivities in plans where participants contribute more money to the plan. In terms of economic magnitudes, the effect in the overall sample is almost 50% larger for plans where the average contribution rate by participants is high;

specifically, the effect is -0.440 for low-contribution plans vs. -0.641 (i.e., $-0.440 - 0.201$) for high-contribution plans. Column (2) shows that this difference is even larger when we focus on allocations within the set of domestic equity funds. These findings suggest that the new disclosures provide useful information to even those participants who are more likely to be motivated to minimize fees and thus seek information on their 401(k) funds before the reform.

[Insert Table 8 about here]

In Panel B of Table 8, we study whether the reform differentially affects participants in plans with many options compared to those participants who have relatively fewer options. The number of choices can have an ambiguous effect on allocations around the reform. On the one hand, the disclosure could make fee sensitivity stronger among plans with many choices if the reform simplifies comparisons among the investment options. On the other hand, the reform could have a larger effect in plans with fewer choices as these disclosures may be easier to process. This latter hypothesis is related to Cronqvist and Thaler (2004), Carroll et al. (2009), and Keim and Mitchell (2018), who find that retirement savers are often overwhelmed when facing a larger number of investment options.

To study this question, we divide the number of plans into equal terciles in the corresponding years. The low group includes plans with fewer than 16 or 17 choices (the cutoff varies slightly across years) and the high group includes plans with more than 24 choices. The middle group is the omitted category in the regression. The triple-interaction term is positive for the high group, which means that participants in plans with many choices react *less* to the new information. Interestingly, the coefficient on the triple interaction for the low group is also positive, although not statistically significant. We do not include the direct effects for the two size categories separately, since they are absorbed by the plan-fund fixed effect.

4.8 Target-date funds

In the previous tests, we focus specifically on the sample of non-target-date funds. The reason is that target-date funds tend to be default options, and their flows are thus more likely to be confounded by plan sponsor choices. Some participants may simply be defaulted in the target-date option corresponding to their age if they do not make an active decision about

how to allocate their retirement contributions. Furthermore, if a participant wants to invest in a target-date fund, the choice of the specific fund (e.g., whether it is a 2030 or a 2040 target-date fund) is less likely to be affected by differences in fees between these funds than by other factors such as the intended retirement horizon and the desired risk level. Therefore, we hypothesize that the disclosure reform has a smaller impact among target-date funds.

Table A.8 in the Internet Appendix tabulates results on the effect of the regulatory change on fee-sensitivities if we add target-date funds to our sample. Our sample size increases from 47,634 to 75,814 observations. We report the results for all fund styles using the four measures of flows. We include interaction effects with an indicator variable for target-date funds. The results confirm that the disclosure reform increased the sensitivity of flows to fees after the reform for non-target date funds. However, the coefficients on the triple interaction $Expense\ ratio \times Post \times Target\text{-}date\ fund$ are not statistically significant for three of the four flow measures. Furthermore, the overall change in the sensitivity to fees after the reform for target-date funds (i.e., $\beta_2 + \beta_5$) is not significantly-different from zero, as summarized in the last row. These results are consistent with the argument that participants choose a particular target-date fund not based on its fee, but rather on the expected retirement horizon or the fund's risk profile.

4.9 Fund-level evidence

The previous sections study the effects of the new disclosures on the allocation of flows across the set of options within individual 401(k) plans. Efficient allocation of flows is important for retirement savers, and our evidence suggests that the reform significantly affected flows. In this section, we bring the analysis to a more aggregate level and ask whether the reform also affected overall mutual fund flows.

Table 9 reports our analysis, which is based on fund-year level data from the CRSP mutual fund database for the 2010–2013 period. Using a triple-difference test, we examine how funds' fee-sensitivities change from the pre- to the post-reform period, interacted with a measure of each fund's *exposure* to flows from DC participants and the new disclosure requirement. We use three different measures of exposure, which we will refer to as *DC intensity*: (1) whether the fund is included in any of the plans in our sample, (2) the natural logarithm of one plus the number of 401(k) plans in our sample that include the fund, and (3) the fraction of a fund's net assets that can be attributed to the 401(k) plans in our sample.

This specification also allows us to compare the change in the sensitivity of flows to fees for our treatment sample of funds with a presence in 401(k) plans to the change for a control sample of funds with no presence in 401(k) plans.

The summary statistics in Panel A of Table 9 show that around a third of all funds in CRSP are included in at least one of the 401(k) plans in our sample, and conditional on being included in at least one plan, the average number of plans that a fund belongs to is eight. Moreover, for those funds, the fraction of a fund's total net asset value made up of 401(k) assets from these plans is 7.2%.

[Insert Table 9 about here]

It is important to emphasize that these numbers are only a proxy for *DC intensity* because our data only contain a subsample of all DC plans. However, we have no reason to expect that our measure is biased in the cross-section in terms of capturing funds' relative degrees of exposure to flows to and from DC plans; in other words, funds with higher *DC intensity* based on our sample should also likely have higher exposures to those DC plans that are not captured in our sample.

Panel B reports the results on fee sensitivities. We regress fund-year level flows on expense ratios, with interactions with *Post* and *DC intensity*. The primary variable of interest is the triple-interaction $Expense\ ratio \times Post \times DC\ intensity$. This variable captures whether funds with higher *DC intensity* experience stronger increases in fee-sensitivities after the reform than other funds. In all regressions, we include separate size controls by year (size is measured as the log of total net assets), fund fixed effects, fund style-by-year fixed effects, as well as family-by-year fixed effects. *DC intensity* is measured as of 2009 (the year immediately before our sample period), and held constant during our sample period; the non-interacted variable *DC intensity* is thus subsumed by fund fixed effects. As in our previous analysis, target-date funds are excluded from the data, although results are essentially unchanged if we do include them.[18]

The results in Panel B show that *DC intensity* predicts a stronger change in the fee-sensitivity of fund flows after the disclosure reform. This result shows that the disclosure reform has a measurable effect at the fund-level as well. These findings hold when measuring *DC intensity* based on whether a fund is included in any plan at all, when based on the

[18] At the fund-level across all funds in CRSP, less than 5% of funds are target-date funds.

number of plans a fund is a part of, or when measured as the fraction of a fund's assets that comes from the DC plans in our sample.

Furthermore, the coefficients on the interaction between the expense ratio and *Post* are insignificant across all specifications. This means that mutual funds that are not part of any of the 401(k) plans in our sample do not exhibit any differential sensitivity of flows to fees after the regulatory reform. Thus, the treated sample of mutual funds in DC plans exhibit a change in sensitivity to fees whereas the control sample does not exhibit a change.

5 Performance and flows

The 2012 disclosures provide plan participants with a new way of comparing fees across investment options. However, the new disclosures also offer participants comparative information about past performance. Specifically, the new disclosure format requires plan fiduciaries to tabulate one-, five-, and ten-year returns for all fund options whenever these return horizons are available.[19]

For a small fraction of funds the past performance is missing, as they do not have sufficiently long return histories.[20] The absence of returns may also influence plan participants, as they may be unwilling to invest in investment options that do not exhibit a sufficiently long track record.

To the extent that plan participants chase performance, we may expect return-flow sensitivities to increase after the disclosure reform. While chasing low fees will predictably result in lower fees, chasing high past performance may not necessarily produce higher future returns due to the relatively low persistence of performance in the mutual fund industry (Carhart (1997)). Therefore, it is unclear whether participants may react at all to the performance information.

In Table 10, we examine whether fund flows become more sensitive to returns after the regulatory change. In these regressions, we add one-, five-, and ten-year returns (measured up until the start of the plan's fiscal year) and their interactions with our *Post* indicator to our baseline model in equation (7). Furthermore, we also include interaction effects that capture

[19] An extensive literature has studied the relation between flows and performance in mutual funds (e.g., Chevalier and Ellison (1997), Sirri and Tufano (1998), Del Guercio and Tkac (2002), Berk and Green (2004), Barber, Odean, and Zheng (2005), Ivkovic and Weisbenner (2009), Spiegel and Zhang (2013), Sialm, Starks, and Zhang (2015), Solomon, Soltes, and Sosyura (2014), Barber, Huang, and Odean (2016), Berk and van Binsbergen (2016), Phillips, Pukthuanthong, and Rau (2016), and Dannhauser and Pontiff (2020)).

[20] We find that 0.17% of observations have missing one-year returns, 2.4% have missing five-year returns, and 8.2% have missing ten-year returns.

when an investment option does not have a sufficiently long return history. Specifically, if returns at a given horizon are missing, we replace these missing returns with the mean return by style and year and include interaction effects with an indicator variable for missing returns. Thus, the coefficient on the interaction effects with missing returns will indicate whether plan participants reacted differently to short return histories after the disclosure reform. We also control for the expense ratio and the expense ratio interacted with the *Post* indicator variable to avoid spurious estimates that could arise from a possible correlation between fees and past performance. As in Table 3, we further control for plan-by-fund fixed effects, plan-by-style-by-year fixed effects, family-by-year fixed effects, and size controls by year.

The results in Table 10 show that the flow sensitivity to one-year returns becomes stronger after the reform. The economic magnitude of the one-year performance effect is similar to the magnitude of the expense effect. For example, a one-standard-deviation change in the one-year performance of 15% is associated with a 0.31 percentage point increase in flows (i.e., 0.15×2.070). Yet, this sensitivity is weak or mostly not significant for the five- and ten-year performance horizons. The heightened sensitivity to short-term performance may be justified since empirical evidence indicates that there is more performance persistence in the short term (e.g., Hendricks, Patel, and Zeckhauser (1993), Carhart (1997), and Bollen and Busse (2005)). It is also likely that participants more heavily update their one year return expectations when disclosures are received.

We also observe a significantly negative coefficient on the interaction with the missing return indicator variable. For example, flows decline by 0.23 percentage points using the first flow measure after the reform for funds that do not exhibit a ten-year track record.

[Insert Table 10 about here]

The results in Panel B are consistent if we focus only on domestic equity funds.

Finally, we note that the one-year sensitivity results have to be interpreted with caution. Participants may have been just as sensitive to short-term performance before the reform, but their short-horizon return information varied based on when they accessed this information. After the disclosure reform, participants update their information sets about one-year returns based on the same data at the same time, allowing the econometrician to identify the sensitivity. Longer-horizon return metrics are less sensitive to this timing effect.

6 Menu allocations

In this section we discuss whether the regulatory reform affected the menus in 401(k) plans and the allocations to employer stock.

6.1 Menu changes

Our interpretation of the previous results is that participants respond to the new disclosures by allocating more flows to cheaper funds, and to some extent also to funds with higher one-year performance. A potential alternative explanation of these findings is that plan sponsors or providers are mapping participants to cheaper funds by changing the menus. One such possibility is that the sponsor may change the default option around the reform. Several arguments speak against this hypothesis. First, it is unlikely that the majority of sponsors change default options at the same time, and precisely in 2012.[21] Second, as shown in Table 3, we observe strong evidence of more negative flows for relatively more expensive funds after the reform—a result that cannot be explained by sponsors merely changing where new money goes.

Nonetheless, we further investigate the possibility that sponsors change the investment options around the time of the reform. When a mutual fund option in a plan is deleted, assets from this fund will typically be moved to a new option, unless participants actively allocate their investments to a different fund. Such reallocations could influence our results if the money is reinvested in a cheaper option and if the trend toward using cheaper replacement options increases precisely in 2012.

To examine whether reinvestments could drive our results, we re-estimate our analyses excluding all plan-years where any option is dropped. Fund deletions are relatively common—around 60% of plan-years have at least one option dropped, and on average around 10–15% of options are replaced in any given year. As an alternative and slightly less conservative approach, we exclude any funds where at least one option within that fund-style is dropped from the plan. We do so because, when a fund is dropped, the default replacement is generally in the same style. Because the probability of deleting at least one option is higher when there are more options in a plan, the number of plan-fund-year observations drops by more than 60%. Table A.8 in the Internet Appendix reports these results. We find that the estimates are remarkably similar in economic magnitude even in this more limited sample. These findings

[21] This regulatory reform has been in the works for many years before plan participants received their first disclosures, giving plan sponsor several years to make changes to plans in light of the pending reforms.

suggest that our baseline results are not an artifact of plan sponsors changing their behavior around the reform.

Finally, another possibility is that plan sponsors more aggressively remove particularly expensive options in 2012, which would result in participants having no choice but to direct money toward cheaper funds. This hypothesis cannot drive our baseline results, which employ plan-by-fund fixed effects and thus control for the composition of funds in a plan. Further, as Figure A.1 in the Internet Appendix shows, deletions are not particularly common right around 2012 compared to other years.

The question of whether the reform makes plan sponsors more likely to delete relatively expensive options to make the plans look better to participants is nevertheless an interesting one on its own. In other words, did the disclosure reform to participants also affect sponsor incentives? To test this, Table A.9 in the Internet Appendix regresses an indicator for an option being deleted on the fee of the option interacted with *Post*, as well as several plan- and fund-level control variables. We find that the coefficient on the expense ratio itself is positive, which means that on average more expensive funds are more likely to be deleted, but this sensitivity of deletions to fees does not become stronger after the disclosure reform.

6.2 Allocation to employer stocks

We next look at the choice between investing in mutual funds, compared to the alternative of investing in employer stock.[22] In the 66% of plans in our sample that have the option to invest in employer stock, participants on average allocate 15.4% of the plan's assets toward employer stock. Investing in employer stock is typically a zero-fee option to participants. It is, however, fraught with high idiosyncratic risk and limits participants' ability to diversify their labor income.

We hypothesize that if a plan's mutual fund options are relatively more expensive, then participants may shift more assets toward their employer stock when they acquire better information about these fees through the new disclosures. To address this question, we regress the fraction of plan assets invested in employer stock on the average fee of a plan's mutual fund options. The results are tabulated in Table 11.

The table shows that plan participants reallocate toward employer stock after the reform when the investment options in a plan are relatively expensive and when the one-year

[22]See Benartzi (2002), Poterba (2003), Huberman and Sengmueller (2004), Benartzi et al. (2007), and Brown, Liang, and Weisbenner (2007) for discussions on the optimality of employer stock as an investment option in 401(k) plans.

performance of the company's stock is relatively high. As reported in Table 1, the average fee across all funds in a plan is 57 basis points with a standard deviation of 19 basis points. The regression coefficient of 0.013 in Table 11 means that, after the reform, plans with a one-standard-deviation higher average fee experience an approximately 0.25 percentage-point larger change in assets allocated to employer stock. While this magnitude is economically and statistically small, it nevertheless shows that participants can be incentivized to increase their investments in employer stock by being presented with more expensive mutual fund options in their 401(k) plans. This reallocation toward company stock thus is a potential unintended consequence of the fee disclosure.

7 Conclusions

Participants in DC pension plans have been shown to be inert and to rarely change their investment allocations, as discussed by Madrian and Shea (2001), Agnew et al. (2003), and Sialm, Starks, and Zhang (2015). Our paper argues that this inertia can be mitigated by providing more salient fee and performance information to plan participants.

Using a hand-collected dataset on investment menus for a large sample of 401(k) plans, we study a 2012 regulatory reform that provides plan participants data on the expense ratios and the prior performance of the investment options in their plans. We find that participants become significantly more attentive to expense ratios after the reform. We also find some evidence that investor flows become more sensitive to short-term prior performance. Our results show that such disclosures can facilitate portfolio allocations by plan participants by bringing relevant decision criteria within sight.

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Figure 1 **Example of the new disclosure format**
This figure shows an example of the fee and performance disclosure following the reform. Panel A shows the fee disclosure table format, and Panel B shows the performance disclosure format. Source: Department of Labor at https://www.dol.gov/sites/default/files/ebsa/about-ebsa/our-activities/resource-center/publications/providing-information-in-participant-directed-plans-model-chart.pdf

A. Fee disclosure example

Fees and Expenses			
Name / Type of Option	**Total Annual Operating Expenses** As a %	Per $1000	**Shareholder-Type Fees**
Equity Funds			
S&P 500 Index Fund	0.18%	$1.80	$20 annual service charge subtracted from investments held in this option if valued at less than $10,000.
Large Cap Fund	2.45%	$24.50	2.25% deferred sales charge subtracted from amounts withdrawn within 12 months of purchase.
Int'l Stock Fund	0.79%	$7.90	5.75% sales charge subtracted from amounts invested.
Bond Funds			
Bond Index Fund	0.50%	$5.00	N/A
Other			
Stable Value Fund	0.65%	$6.50	Amounts withdrawn may not be transferred to a competing option for 90 days after withdrawal.
Target Date 2020 Fund	1.50%	$15.00	Excessive trading restricts additional purchases (other than contributions and loan repayments) for 85 days.

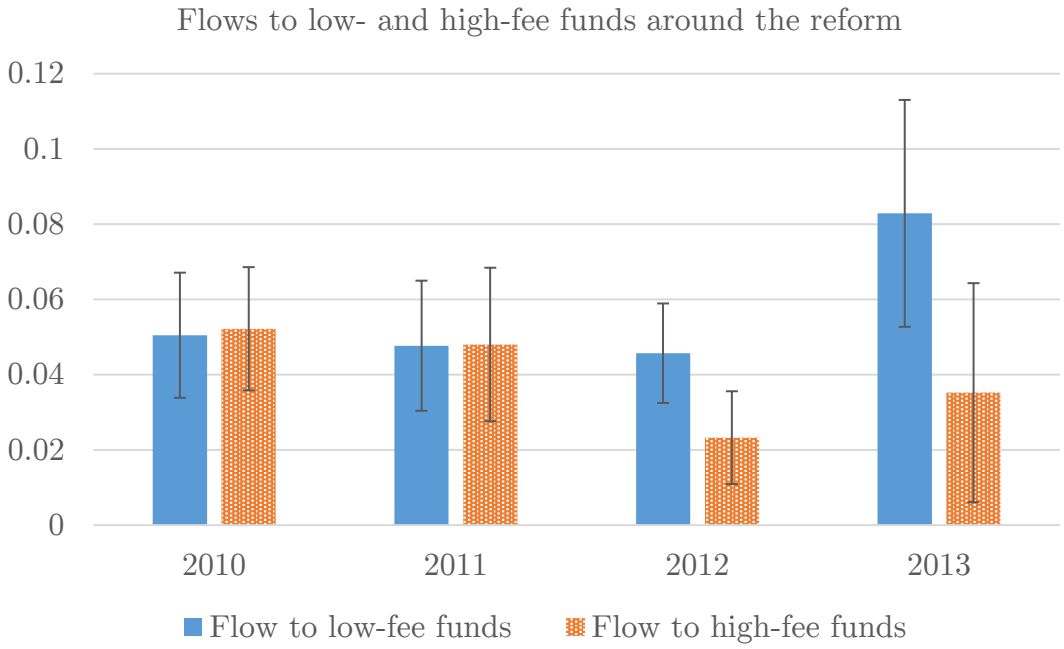
B. Performance disclosure example

Performance Information – Variable Return Investments								
Name/ Type of Option	**Average Annual Total Return as of 12/31/12** 1yr.	5yr.	10yr.	Since Inception	**Benchmark** 1yr.	5yr.	10yr.	Since Inception
Equity Funds								
S&P 500 Index Fund	26.5%	.34%	-1.03%	9.25%	26.46%	.42%	-.95%	9.30%
					S&P 500			
Large Cap Fund	27.6%	.99%	N/A	2.26%	27.80%	1.02%	N/A	2.77%
					US Prime Market 750 Index			
Int'l Stock Fund	36.73%	5.26%	2.29%	9.37%	40.40%	5.40%	2.40%	12.09%
					MSCI EAFE			
Bond Funds								
Bond Index Fund	6.45%	4.43%	6.08%	7.08%	5.93%	4.97%	6.33%	7.01%
					Barclays Cap. Aggr. Bd.			
Other								
Stable Value Fund	4.36%	4.64%	5.07%	3.75%	1.8%	3.1%	3.3%	4.99%
					3-month US T-Bill Index			
Target Date 2020 Fund	27.94%	N/A	N/A	2.45%	26.46%	N/A	N/A	3.09%
					S&P 500			
					23.95%	N/A	N/A	3.74%
					Generations 2020 Composite Index			

Figure 2 **Fee sensitivity of flows**

These figures plot flows to low-fee (blue solid bars) vs. high-fee (orange checkered bars) funds by year around the disclosure reform. Flows to low-fee funds are calculated as the sum of all flows to below-median fee funds (the median is defined within each plan, year, and style), divided by the lagged sum of assets in those funds. Flows to high-fee (above-median) funds are defined analogously. We limit the sample to plan-years that have between 3 and 100 funds and exclude target-date funds and funds that were added or deleted during the year. Panel A shows results for all funds and Panel B for domestic equity funds only. Below the graph, we report *p*-values for the difference between the flows to high- and low-fee funds each year. These *p*-values are for the coefficients for the vector β_1 based on the year-by-year regression: $flow = \alpha + \beta_1 * \text{I[high-fee]} + \varepsilon$, employing standard errors that are robust to heteroskedasticity.

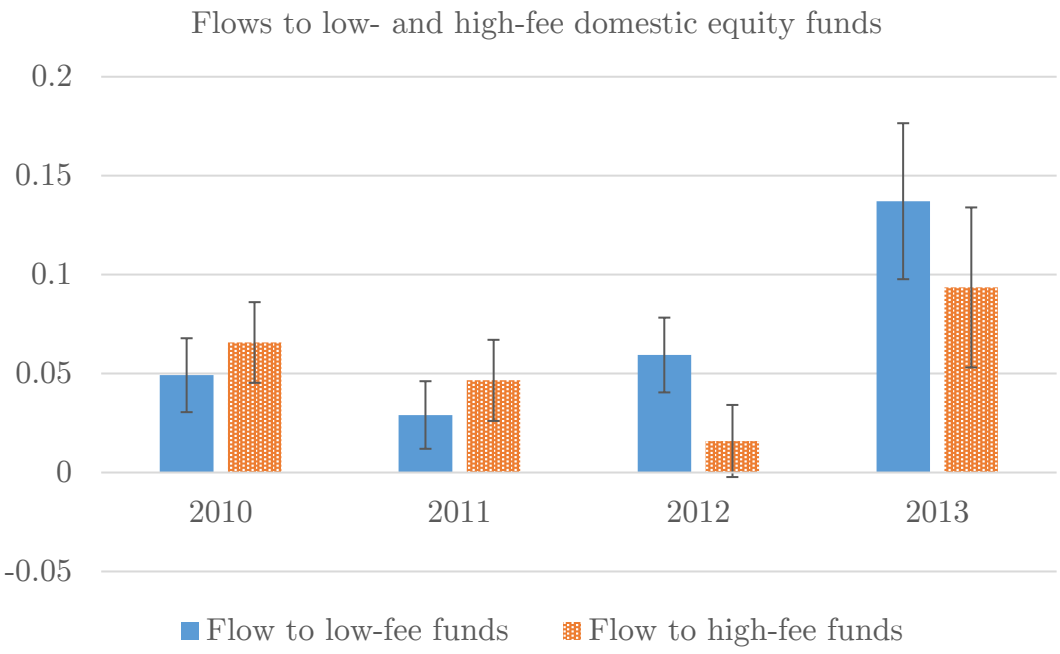
A. All fund styles



Year	2010	2011	2012	2013
p-value for difference:	0.885	0.981	0.105	0.026

Figure 2, continued

B. Domestic equity funds only



Year	2010	2011	2012	2013
p-value for difference:	0.241	0.198	0.001	0.130

Table 1 **Descriptive statistics: Plan-level variables**

This table reports sample summary statistics for variables used in this paper. The sample covers plans that have between 3 and 100 funds as investment options, from 2010 to 2013. Panel A shows statistics of variables at the plan-year level. *#Funds in plan* is the number of fund options available in a plan. *Fee dispersion* is the difference in expense ratio between the 10^{th} and 90^{th} percentile fund in a plan-year. The table reports indicators of whether a plan includes employer stock, target-date funds, or index funds, and the fraction of mutual fund assets that are invested in these options conditional on having that option (the fraction of plan assets in the case of employer stock). Panel B shows the number of funds available across various fund styles. We group our sample into the following six fund styles: balanced funds, domestic equity funds, foreign equity funds, domestic fixed income, foreign fixed income, and other, by mapping Lipper codes into these broader categories.

A. Summary statistics (plan-year level variables)

	mean	sd	p1	p25	p50	p75	p99	N
Plan size ($m)	799	2,004	2	67	322	747	8,536	5,577
# Plan participants ('000)	13.0	41.9	0.1	1.3	4.4	11.5	139.4	5,576
Contributions per participant ($)	4,586	2,448	601	2,650	4,274	6,470	8,794	5,492
Assets per participant ($ '000)	77.2	62.7	2.1	34.6	61.9	102.1	301.5	5,576
# Funds in plan (incl. newly added)	20.57	10.07	4	14	20	25	62	5,577
# Funds in plan (continued)	17.63	9.17	1	11	18	23	46	5,577
# Funds in plan, (cont. non-target date)	11.85	7.23	1	8	11	14	41	5,577
# Funds in plan, (cont. target date)	5.78	5.09	0	0	6	11	13	5,577
Average fee across all funds in plan (%)	0.57	0.19	0.16	0.44	0.61	0.69	1.05	5,575
Fee dispersion within plan (%)	0.70	0.25	0.10	0.54	0.71	0.86	1.29	5,575
Any employer stock in plan	0.66	0.47	0	0	1	1	1	5,577
Pct. of assets in employer stock	15.4%	16.4%	0.0%	4.3%	10.5%	20.7%	80.5%	3,693
Any target-date fund in plan	0.72	0.45	0	0	1	1	1	5,577
Pct. in target-date funds	25.5%	18.0%	0.0%	13.2%	21.5%	33.5%	84.7%	3,986
Any index fund in plan	0.92	0.27	0	1	1	1	1	5,575
Pct. in index funds	26.3%	23.0%	0.0%	8.7%	18.6%	39.5%	94.1%	5,111

B. Fund choice sets

	Fund-Plan-Year level						Plan-year level (non-target date funds)				
	Total funds	% of all funds	Non-Target-date funds	Target-date funds	Avg. exp. ratio (%)	Std.Dev. of exp. ratio	% of plan-years with at least one fund	#funds (if at least one)	p10	p50	p90
Balanced	18,525	18.8%	3,596	14,929	0.57	0.27	48%	1.35	1	1	2
Domestic Equity	50,469	51.3%	36,745	13,724	0.58	0.35	98%	6.76	3	6	10
Domestic Fixed Income	17,188	17.5%	13,585	3,603	0.38	0.23	93%	2.63	1	2	4
Foreign Equity	10,646	10.8%	10,646	0	0.73	0.36	92%	2.08	1	2	3
Foreign Fixed Income	530	0.5%	530	0	0.74	0.20	8%	1.19	1	1	2
Other	971	1.0%	971	0	0.82	0.29	13%	1.31	1	1	2

Table 2 **Descriptive statistics: Investment option-level variables**

Panel A reports sample summary statistics for fund-by-plan level variables used in this paper. The sample covers plans that have between 3 and 100 funds as investment options, from 2010 to 2013. The observations are at the fund-plan-year level. We only include continuing funds (i.e., newly added or deleted funds are excluded), and we further limit the sample to non-target-date funds. *Fund value* is the dollar value invested in a mutual fund option in a plan, *Fund plan share* is the "market share" of a fund within a plan. *Expense ratio* is measured as the expense ratio of the specific fund share class in the plan, or as the minimum fee of the fund if the share class information is not available. *Flow (to plan assets)* is the annual dollar flow to a fund in a plan divided by the lagged sum of assets across all mutual funds in the plan; *Flow (change in plan share)* is the change in the market share of a fund in a plan from last year to the current year, adjusted for the return of each option over the same period, where the market share is defined among all continued funds that have available returns; *Flow (to option size)* is the dollar flow to a fund divided by the average of the starting and ending total fund value. Returns are annualized returns. Panel B reports the correlations between the four different measures of flows. All continuous variables are winsorized at the 1% level.

A. Summary statistics (fund-plan-year level variables, continued non-target-date funds)

	mean	sd	p1	p25	p50	p75	p99	N
Fund value ($1,000)	21,400	36,800	2	1,037	6,050	23,700	177,000	64,995
Fund plan share (%)	3.91	3.57	0.00	1.09	2.95	5.75	15.23	64,559
Expense ratio (%)	0.60	0.36	0.04	0.32	0.62	0.85	1.39	64,483
Flow (to plan assets) (%)	0.12	1.71	-4.46	-0.36	0.02	0.43	7.89	60,957
Flow (change in plan share) (%)	-0.11	1.16	-4.22	-0.48	-0.03	0.26	3.98	60,957
Flow (to option size) (%)	6.69	37.79	-100.00	-7.08	1.09	13.20	171.48	60,957
Flow positive (indicator)	0.537	0.499	0	0	1	1	1	60,957
Return 1-year (%)	14.5	15.0	-16.0	4.0	13.8	23.0	57.4	64,881
Return 5-year (%)	3.1	3.3	-4.6	1.1	3.0	5.3	11.8	63,438
Return 10-year (%)	6.1	3.6	-1.9	3.6	6.2	8.2	15.6	59,543

B. Correlation between flow measures

	Flow (to plan assets) (%)	Flow (change in plan share) (%)	Flow (to option size) (%)	Flow positive (indicator)
Flow (to plan assets) (%)	1			
Flow (change in plan share) (%)	0.579	1		
Flow (to option size) (%)	0.657	0.459	1	
Flow positive (indicator)	0.511	0.427	0.553	1

Table 3 **Fee-flow sensitivities around the disclosure reform**

This table reports results on the change in fee-flow sensitivities following the 2012 disclosure reform. The observations are at the fund-plan-year level. The sample period is 2010-2013, two years before and two years after the reform. The sample includes only continuing funds, (i.e., we exclude funds that were newly added and funds that were deleted during the year). Panel A describes results for all fund styles, and Panel B for domestic equity funds only. *Expense ratio* is the expense ratio of the fund (for the exact share class in the plan when available, or otherwise the minimum expense ratio across a fund's share classes). *Post* is an indicator for plans' fiscal years that end after December 1, 2012. The size control is measured as the lagged fund "market share" within the plan, interacted with year indicators. Plan*Fund fixed effects, Plan*Style*Year fixed effects (which become Plan*Year fixed effects in Panel B), and Fund Family*Year fixed effects are included as indicated. The sample includes 1803 unique funds and 1385 unique plans (Panel B includes 917 unique domestic equity funds and 1366 plans). *t*-statistics based on standard errors that are robust to heteroskedasticity and two-way clustered by fund and plan are reported in parentheses below the coefficient estimates. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

A. All fund styles

	Flow (to plan assets)	Flow (change in plan share)	Flow (to option size)	Flow positive (indicator)
	(1)	(2)	(3)	(4)
Expense ratio * Post	-0.559***	-0.474***	-5.882***	-0.230***
	(-4.58)	(-5.03)	(-2.88)	(-6.35)
Expense ratio	0.204	0.176	5.739	0.183***
	(1.33)	(1.34)	(1.33)	(2.90)
Plan*Fund FE	Yes	Yes	Yes	Yes
Size*Year controls	Yes	Yes	Yes	Yes
Plan*Style*Year FE	Yes	Yes	Yes	Yes
Fund Family*Year FE	Yes	Yes	Yes	Yes
R^2	0.821	0.697	0.765	0.702
N	47,634	47,634	47,634	47,634

Table 3, continued

B. Domestic equity only

	Flow (to plan assets)	Flow (change in plan share)	Flow (to option size)	Flow positive (indicator)
	(1)	(2)	(3)	(4)
Expense ratio * Post	-0.586***	-0.518***	-6.517***	-0.229***
	(-3.97)	(-4.78)	(-2.63)	(-4.90)
Expense ratio	0.180	0.224	9.463**	0.204***
	(1.00)	(1.55)	(2.07)	(2.62)
Plan*Fund FE	Yes	Yes	Yes	Yes
Size*Year controls	Yes	Yes	Yes	Yes
Plan*Year FE	Yes	Yes	Yes	Yes
Fund Family*Year FE	Yes	Yes	Yes	Yes
R^2	0.815	0.667	0.773	0.690
N	29,545	29,545	29,545	29,545

Table 4 **Fees and fund flows, fewer fixed effects and controls**
This table is similar to Table 3 with fewer fixed effects, where the controls are introduced sequentially.

A. All fund styles

	(1)	(2)	(3)	(4)	(5)
Expense ratio * Post	-0.290***	-0.272***	-0.289***	-0.561***	-0.559***
	(-4.41)	(-4.87)	(-4.97)	(-6.37)	(-4.58)
Expense ratio	-0.100*	-0.180***	-0.196***	0.186	0.204
	(-1.95)	(-4.33)	(-4.81)	(1.23)	(1.33)
Style*Year FE	Yes	Yes	Yes	Yes	Yes
Size*Year controls	Yes	Yes	Yes	Yes	Yes
Plan*Year FE		Yes	Yes	Yes	Yes
Plan*Style*Year FE			Yes	Yes	Yes
Plan*Fund FE				Yes	Yes
Fund Family*Year FE					Yes
R2	0.057	0.513	0.596	0.812	0.821
N	60,061	59,988	53,676	47,840	47,634

B. Domestic equity only

	(1)	(2)	(3)	(4)
Expense ratio * Post	-0.337***	-0.385***	-0.672***	-0.586***
	(-4.49)	(-6.09)	(-7.13)	(-3.97)
Expense ratio	-0.163***	-0.199***	0.128	0.180
	(-2.62)	(-4.02)	(0.70)	(1.00)
Year FE	Yes	Yes	Yes	Yes
Size*Year controls	Yes	Yes	Yes	Yes
Plan*Year FE		Yes	Yes	Yes
Plan*Fund FE			Yes	Yes
Fund Family*Year FE				Yes
R^2	0.068	0.597	0.805	0.815
N	33,276	33,117	29,692	29,545

Table 5 **Extreme fees**

This table reports results on the change in the flow sensitivities to extreme fees (defined as the maximum or minimum fee within the plan-year) following the 2012 disclosure reform. The observations are at the fund-plan-year level. The sample, control variables, and fixed effects are defined in the same way as in Table 3. Columns (1)-(3) report results using the full sample (all fund styles), and columns (4)-(6) limit the sample to domestic equity funds only (Plan*Style*Year FE becomes Plan*Year FE for the domestic equity subsample). *Minimum fee* and *Maximum fee* are indicators for whether the fund is the lowest- or highest-fee option in the plan (columns (1)-(3)), or within the set of domestic equity funds (columns (4)-(6)). *t*-statistics based on standard errors that are robust to heteroskedasticity and two-way clustered by fund and plan are reported in parentheses below the coefficient estimates. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

Dependent variable: Flow (to plan assets)						
	All fund styles			Domestic equity only		
	(1)	(2)	(3)	(4)	(5)	(6)
Minimum fee * Post	0.446***	0.445***	0.345***	0.446***	0.443***	0.361***
	(5.25)	(5.24)	(4.13)	(5.16)	(5.11)	(4.36)
Minimum fee	-0.191***	-0.190***	-0.123*	-0.135	-0.133	-0.079
	(-2.61)	(-2.59)	(-1.67)	(-1.25)	(-1.23)	(-0.73)
Maximum fee * Post		-0.087*	-0.007		-0.081*	-0.033
		(-1.79)	(-0.14)		(-1.73)	(-0.61)
Maximum fee		-0.003	-0.040		0.014	-0.005
		(-0.07)	(-0.77)		(0.31)	(-0.11)
Expense ratio * Post			-0.359***			-0.269**
			(-3.34)			(-1.98)
Expense ratio			0.131			0.081
			(0.83)			(0.43)
Plan*Fund FE	Yes	Yes	Yes	Yes	Yes	Yes
Size*Year controls	Yes	Yes	Yes	Yes	Yes	Yes
Plan*Style*Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Fund Family*Year FE	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.821	0.821	0.821	0.816	0.816	0.816
N	47,634	47,634	47,634	29,545	29,545	29,545

Table 6 **Active and Index funds**

Panel A reports results on the effects of the disclosure reform on flows to index funds. Panel B reports results on the change in the fee-flow sensitivities in separate subsamples for active funds (columns (1)-(2)) and index funds (columns (3)-(4)), respectively. The observations are at the fund-plan-year level. The sample, control variables and fixed effects are defined as in Tables 3 (as before, Plan*Style*Year FEs are Plan*Year FEs for the domestic equity subsample). *t*-statistics based on standard errors that are robust to heteroskedasticity and two-way clustered by fund and plan are reported in parentheses below the coefficient estimates. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

A. Effect on indexing

	Dependent variable: Flow (to plan assets)					
	All fund styles			Domestic equity only		
	(1)	(2)	(3)	(4)	(5)	(6)
Index Fund * Post	0.405***	0.298***	0.268***	0.383***	0.201***	0.167**
	(5.83)	(5.19)	(4.23)	(4.15)	(2.68)	(2.03)
Minimum fee * Post		0.283***	0.267***		0.333***	0.322***
		(3.44)	(3.19)		(4.22)	(4.00)
Maximum fee * Post			-0.046			-0.056
			(-0.85)			(-1.04)
Expense ratio * Post			-0.098			-0.083
			(-0.81)			(-0.54)
Minimum fee		-0.085	-0.077		-0.067	-0.060
		(-1.17)	(-1.07)		(-0.62)	(-0.55)
Maximum fee			-0.021			0.005
			(-0.42)			(0.10)
Expense ratio			0.024			0.005
			(0.15)			(0.03)
Plan*Fund FE	Yes	Yes	Yes	Yes	Yes	Yes
Size*Year controls	Yes	Yes	Yes	Yes	Yes	Yes
Plan*Style*Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Fund Family*Year FE	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.821	0.821	0.821	0.815	0.816	0.816
N	47,983	47,983	47,634	29,752	29,752	29,545

Table 6, continued

B. Fee-flow sensitivities in subsamples of active funds and index funds

Dependent variable: Flow (to plan assets)

	Only active funds		Only index funds	
	(1)	(2)	(3)	(4)
Expense ratio * Post	-0.195*	-0.258*	-1.520**	-1.415**
	(-1.72)	(-1.76)	(-2.53)	(-2.22)
Expense ratio	-0.021	0.023	0.150	0.536
	(-0.12)	(0.11)	(0.15)	(0.46)
Sample	All fund styles	Domestic equity only	All fund styles	Domestic equity only
Plan*Fund FE	Yes	Yes	Yes	Yes
Size*Year controls	Yes	Yes	Yes	Yes
Plan*Style*Year FE	Yes	Yes	Yes	Yes
Fund Family*Year FE	Yes	Yes	Yes	Yes
R^2	0.841	0.845	0.845	0.852
N	36,359	22,384	5,732	5,142

Table 7 **Placebo periods**

This table replicates the tests in Table 3 but for different four-year rolling windows between 2000 and 2011. *t*-statistics based on standard errors that are robust to heteroskedasticity and two-way clustered by fund and plan are reported in parentheses below the coefficient estimates. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

A. All fund styles

Dependent variable: Flow (to plan assets)

Period:	2000-2003	2001-2004	2002-2005	2003-2006	2004-2007	2005-2008	2006-2009	2007-2010	2008-2011
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Expense ratio * Post	0.022	-0.441*	-0.163	0.011	0.124	-0.128	-0.130	0.144	0.030
	(0.08)	(-1.74)	(-0.70)	(0.05)	(0.71)	(-0.92)	(-1.12)	(1.17)	(0.29)
Expense ratio	0.094	0.502	0.472	0.354	0.383	0.552*	0.482*	0.114	-0.073
	(0.21)	(1.33)	(1.37)	(1.12)	(1.28)	(1.87)	(1.92)	(0.47)	(-0.40)
Plan*Fund FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Size*Year controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Plan*Style*Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fund Family *Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.838	0.840	0.830	0.822	0.824	0.814	0.784	0.791	0.803
N	12,965	18,158	22,445	25,719	26,821	27,396	27,756	28,150	37,231

B. Domestic equity funds only

Dependent variable: Flow (to plan assets)

Period:	2000-2003	2001-2004	2002-2005	2003-2006	2004-2007	2005-2008	2006-2009	2007-2010	2008-2011
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Expense ratio * Post	0.062	-0.400	-0.218	-0.034	0.092	-0.108	-0.046	0.223	0.186*
	(0.17)	(-1.33)	(-0.82)	(-0.13)	(0.43)	(-0.64)	(-0.31)	(1.56)	(1.77)
Expense ratio	-0.492	0.237	0.508	0.299	0.591	0.441	-0.013	-0.324	-0.384
	(-0.76)	(0.50)	(1.14)	(0.74)	(1.63)	(1.38)	(-0.04)	(-1.05)	(-1.60)
Plan*Fund FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Size*Year controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Plan*Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fund Family *Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.833	0.843	0.835	0.832	0.835	0.825	0.788	0.796	0.803
N	8,730	12,347	15,389	17,687	18,604	19,079	19,334	19,582	24,887

Table 8 **Heterogenous effects**

This table reports results on how changes to fee-flow sensitivities around the disclosure reform differ depending on characteristics of the participants and plan features. In Panel A, we study the effects of the contribution rate of plan participants. *Large contributions* is an indicator variable based on whether the annual dollar contribution per participant is above the sample median (measured as of 2009). In Panel B, we examine how changes to fee-flow sensitivities around the disclosure reform differ depending on the number of choices in the plan. We divide the number of plans into three equal terciles: those with few choices, middle (the omitted category in the regression), and many choices in that year. *Few choices* are those plans with fewer than 16 or 17 choices (the cutoff number varies slightly across years); Middle number of choices are plans between around 17 and 24 choices; and *Many choices* are those plans with more than 24 choices. We adjust the expense measure by subtracting the average expense ratio in the plan-year. As in the previous tables, Plan*Style*Year FEs are Plan*Year FEs for the domestic equity subsample. *t*-statistics based on standard errors that are robust to heteroskedasticity and two-way clustered by fund and plan are reported in parentheses below the coefficient estimates. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Participant contribution rate and fee-flow sensitivities

	All fund styles	Domestic equity
	(1)	(2)
Expense ratio (plan-year adj.)	0.133	0.154
	(0.76)	(0.76)
Expense ratio * Post	-0.440***	-0.445***
	(-3.76)	(-3.14)
Expense ratio * Large contributions	0.131	0.063
	(0.50)	(0.20)
Expense ratio * Post * Large contributions	-0.201*	-0.262**
	(-1.91)	(-2.21)
Plan*Fund FE	Yes	Yes
Size*Year controls	Yes	Yes
Plan*Style*Year FE	Yes	Yes
Fund Family*Year FE	Yes	Yes
R^2	0.823	0.816
N	45,948	28,490

Table 8, continued

Panel B. Number of choice categories and fee-flow sensitivities

	All fund styles	Domestic equity
	(1)	(2)
Expense ratio (plan-year adj.)	0.384**	0.382**
	(2.27)	(2.01)
Expense ratio *Post (baseline: middle choices)	-0.805***	-0.768***
	(-6.13)	(-5.12)
Expense ratio * Few choices	0.183	0.117
	(1.14)	(0.67)
Expense ratio * Many choices	-0.369***	-0.387***
	(-3.25)	(-3.18)
Expense ratio * Post * Few choices	0.186	0.082
	(1.20)	(0.49)
Expense ratio * Post * Many choices	0.376***	0.300**
	(3.72)	(2.57)
Plan*Fund FE	Yes	Yes
Size*Year controls	Yes	Yes
Plan*Style*Year FE	Yes	Yes
Fund Family*Year FE	Yes	Yes
R^2	0.821	0.815
N	47,634	29,545

Table 9 **Fund-level effects of the reform**

This table reports fund-level results on the effects of the disclosure reform, excluding target-date funds. The data are at the fund-year level (we aggregate across all share classes within a fund), and the sample period is 2010-2013. *Post*-reform years are 2012 and 2013. Panel A reports summary statistics at the fund-year level. In Panel B, we test whether the flow-sensitivities to fees experience differential changes around the reform for funds that are more or less exposed to flows from defined contribution plans. Flows are measured using the average monthly flows over the fund-year. The expense ratio is measured as the value-weighted expense ratio across a fund's share classes and adjusted by subtracting the average expense ratio in the same fund-style and year. The measures of exposure to DC plans, called *DC intensity*, are based on 1) whether the fund is part of any plan in our sample, 2) the Log(*Number of plans with fund+1),* which is the natural logarithm of one plus the number of defined contribution plans in our sample that include the fund, and 3) the *Percent of fund assets in plans,* which is the fraction of a fund's TNA that can be attributed to these DC plans. These DC intensity measures are measured as of 2009, the year immediately before the sample period. We control for size (log *TNA*) interacted with year indicators, fund fixed effects, fund-style-by-year fixed effects, and family-by-year fixed effects as indicated. *t*-statistics based on standard errors that are robust to heteroskedasticity and clustered by fund are reported in parentheses below the coefficient estimates. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

A. Summary statistics

	mean	sd	p1	p25	p50	p75	p99	N
Flow, monthly average (%)	0.85	6.29	-7.42	-1.29	-0.25	1.20	34.09	27,062
Expense ratio (%)	0.980	0.497	0.13	0.62	0.95	1.30	2.37	27,592
Fund included in any plan	0.338	0.473	0	0	0	1	1	27,592
Number of plans with fund	2.79	15.79	0	0	0	1	51	27,592
Number of plans with fund | >0	8.27	26.31	1	1	2	6	105	9,327
Percent of fund assets in plans (%)	2.43%	9.62%	0.00%	0.00%	0.00%	0.17%	50.69%	27,592
Percent of fund assets in plans | >0 (%)	7.19%	15.48%	0.00%	0.15%	1.50%	6.99%	99.85%	9,327

B. Fund-level evidence of fee sensitivities around the reform

Dependent variable: Fund flow			
		Measure of DC intensity:	
	Fund in any plan	*Log(Number of plans with fund+1)*	*Percent of fund assets in plans*
	(1)	(2)	(3)
Expense ratio (lagged, style adj.)	0.9708	0.8955	0.5523
	(1.36)	(1.30)	(0.83)
Expense ratio * Post	0.0711	0.0639	-0.1071
	(0.22)	(0.21)	(-0.39)
Expense ratio * DC intensity	-1.4932	-0.9764	6.3145
	(-1.03)	(-1.40)	(0.72)
Post * DC intensity	-0.4382**	-0.3415***	-1.5910
	(-2.37)	(-3.69)	(-1.22)
Expense ratio * Post * DC intensity	-0.8840**	-0.6700***	-7.8746***
	(-2.39)	(-3.27)	(-2.77)
Size*Year control	Yes	Yes	Yes
Fund FE	Yes	Yes	Yes
Fund-style * Year FE	Yes	Yes	Yes
Fund Family * Year FE	Yes	Yes	Yes
R^2	0.547	0.547	0.547
N	25,226	25,226	25,226

Table 10 **Return-flow sensitivities and the disclosure reform**

This table reports results on the change in return-flow sensitivities following the 2012 disclosure reform. *Return* is the return of the fund, measured over one, five, and ten years. We measure these past returns as of the start of the plan's fiscal year. For example, the one-year returns for a plan-year that starts in January 2012 are the annualized returns of the mutual fund options between January 2011 and December 2011. If a fund does not have a return over some horizon, that value is set to the average in the same style and year, and controlled for separately with a "missing" indicator. All other measures and controls are the same as in Table 3. *t*-statistics based on standard errors that are robust to heteroskedasticity and two-way clustered by fund and plan are reported in parentheses below the coefficient estimates. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

A. All funds

	Flow (to plan assets)	Flow (change in plan share)	Flow (to option size)	Flow positive (indicator)
	(1)	(2)	(3)	(4)
Return 1-year * Post	2.047***	1.858***	54.626***	0.985***
	(5.20)	(5.84)	(4.44)	(4.99)
Return 5-year * Post	2.275**	0.963	4.870	0.363
	(2.40)	(1.14)	(0.18)	(0.81)
Return 10-year * Post	-1.179	-1.037	-49.072	-1.446***
	(-1.33)	(-1.21)	(-1.63)	(-3.34)
No 1-year Return * Post	-0.543	-1.065***	-67.729***	-0.631**
	(-0.82)	(-7.41)	(-4.47)	(-2.13)
No 5-year Return * Post	0.067	0.138	1.177	0.009
	(0.39)	(0.97)	(0.22)	(0.14)
No 10-year Return * Post	-0.180**	-0.194***	-4.632**	-0.036
	(-2.24)	(-2.82)	(-2.31)	(-1.16)
Return 1-year	0.401**	0.157	4.217	0.161**
	(2.39)	(1.05)	(0.91)	(2.22)
Return 5-year	0.179	0.269	-20.510	-1.119**
	(0.16)	(0.27)	(-0.58)	(-2.34)
Return 10-year	3.364***	2.780***	36.894**	0.598**
	(4.32)	(4.68)	(2.15)	(2.37)
No 1-year Return	-0.255	-0.099	53.120***	0.242*
	(-0.88)	(-0.44)	(5.29)	(1.81)
No 5-year Return	-0.012	-0.039	2.616	0.033
	(-0.10)	(-0.39)	(0.86)	(0.72)
No 10-year Return	0.129**	0.063	5.065**	0.016
	(2.51)	(1.35)	(2.44)	(0.68)
Expense ratio * Post	-0.463***	-0.386***	-2.814	-0.162***
	(-4.24)	(-4.40)	(-1.37)	(-4.63)
Expense ratio	0.076	0.060	3.476	0.130**
	(0.52)	(0.47)	(0.82)	(2.07)
Plan*Fund FE	Yes	Yes	Yes	Yes
Size*Year controls	Yes	Yes	Yes	Yes
Plan*Style*Year FE	Yes	Yes	Yes	Yes
Fund Family*Year FE	Yes	Yes	Yes	Yes
R^2	0.822	0.699	0.767	0.704
N	47,634	47,634	47,634	47,634

Table 10, continued

B. Domestic equity only

	Flow (to plan assets)	Flow (change in plan share)	Flow (to option size)	Flow positive (indicator)
	(1)	(2)	(3)	(4)
Return 1-year * Post	1.326**	1.429***	67.673***	1.161***
	(2.45)	(3.39)	(4.55)	(4.41)
Return 5-year * Post	1.529	0.851	8.142	0.522
	(1.36)	(0.84)	(0.26)	(0.93)
Return 10-year * Post	-2.295**	-2.087**	-61.771**	-1.733***
	(-2.24)	(-2.22)	(-2.02)	(-3.61)
No 1-year Return * Post	-0.845	-0.280	-93.192***	-0.787
	(-0.62)	(-0.16)	(-6.43)	(-1.34)
No 5-year Return * Post	0.106	0.054	-11.965*	-0.139
	(0.41)	(0.26)	(-1.88)	(-1.38)
No 10-year Return * Post	-0.036	-0.096	-0.589	-0.035
	(-0.47)	(-1.39)	(-0.30)	(-0.92)
Return 1-year	0.842***	0.536**	5.306	0.157
	(3.27)	(2.49)	(0.90)	(1.50)
Return 5-year	1.114	0.616	-31.738	-1.132*
	(0.77)	(0.49)	(-0.83)	(-1.81)
Return 10-year	3.403***	2.820***	30.064	0.535**
	(4.23)	(4.74)	(1.64)	(1.98)
No 1-year Return	-0.240	0.054	78.843***	0.072
	(-0.58)	(0.28)	(9.64)	(0.33)
No 5-year Return	0.347***	0.211*	11.604***	0.090
	(2.82)	(1.67)	(3.12)	(1.54)
No 10-year Return	0.157**	0.114*	1.455	0.002
	(2.28)	(1.90)	(0.66)	(0.05)
Expense ratio * Post	-0.391***	-0.347***	-2.832	-0.151***
	(-3.09)	(-3.50)	(-1.07)	(-3.53)
Expense ratio	0.075	0.127	7.552*	0.148*
	(0.44)	(0.88)	(1.68)	(1.90)
Plan*Fund FE	Yes	Yes	Yes	Yes
Size*Year controls	Yes	Yes	Yes	Yes
Plan*Year FE	Yes	Yes	Yes	Yes
Fund Family*Year FE	Yes	Yes	Yes	Yes
R^2	0.817	0.670	0.775	0.692
N	29,545	29,545	29,545	29,545

Table 11 **Plan-level reallocation: Mutual funds vs. employer stock**

This table reports results on how allocations to employer stock are affected by the fee disclosure, depending on the average fees of the available mutual funds in the plan. The dependent variable is the fraction of assets in employer stock to total plan assets. The explanatory variables are the average fee of the available mutual funds in a plan and the return on the employer stock over the prior year, both interacted with the disclosure reform indicator variable. We limit the sample to plans that include both an option to invest in employer stock and in mutual funds. The regressions include plan fixed effects and time fixed effects based on the fiscal year-end month of the plan. *t*-statistics based on standard errors that are robust to heteroskedasticity and clustered by plan are reported in parentheses below the coefficient estimates. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

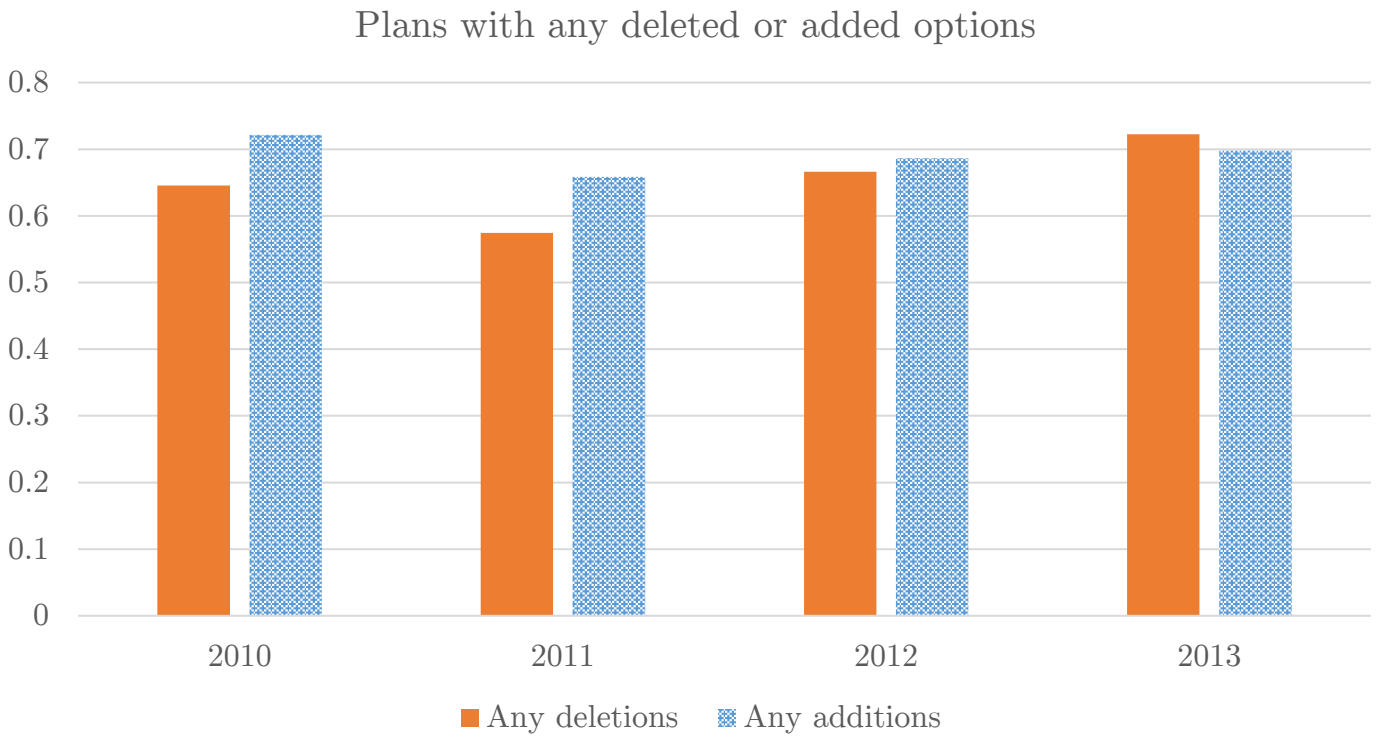
Plan-level reallocation between mutual funds vs. employer stock

	(1)	(2)	(3)
Expense ratio (plan average) * Post	0.013*	0.015**	0.014**
	(1.81)	(2.04)	(2.02)
Expense ratio (plan average)	-0.021*	-0.025**	-0.024**
	(-1.84)	(-2.03)	(-1.99)
Return on employer stock (1-year)		0.006***	0.003**
		(4.66)	(2.45)
Return on employer stock (1-year) * Post			0.019***
			(5.22)
Plan FE	Yes	Yes	Yes
Time FE	Yes	Yes	Yes
R^2	0.969	0.967	0.967
N	3,426	2,978	2,978

INTERNET APPENDIX

Figure A.1 **Reshuffling of funds within plans**

This figure plots the fraction of plans that have any deletions or additions of funds (top panel), as well as the number of deletions and deletions scaled by the lagged number of available funds (bottom panel). We limit the sample to plan-years that have between 3 and 100 funds.



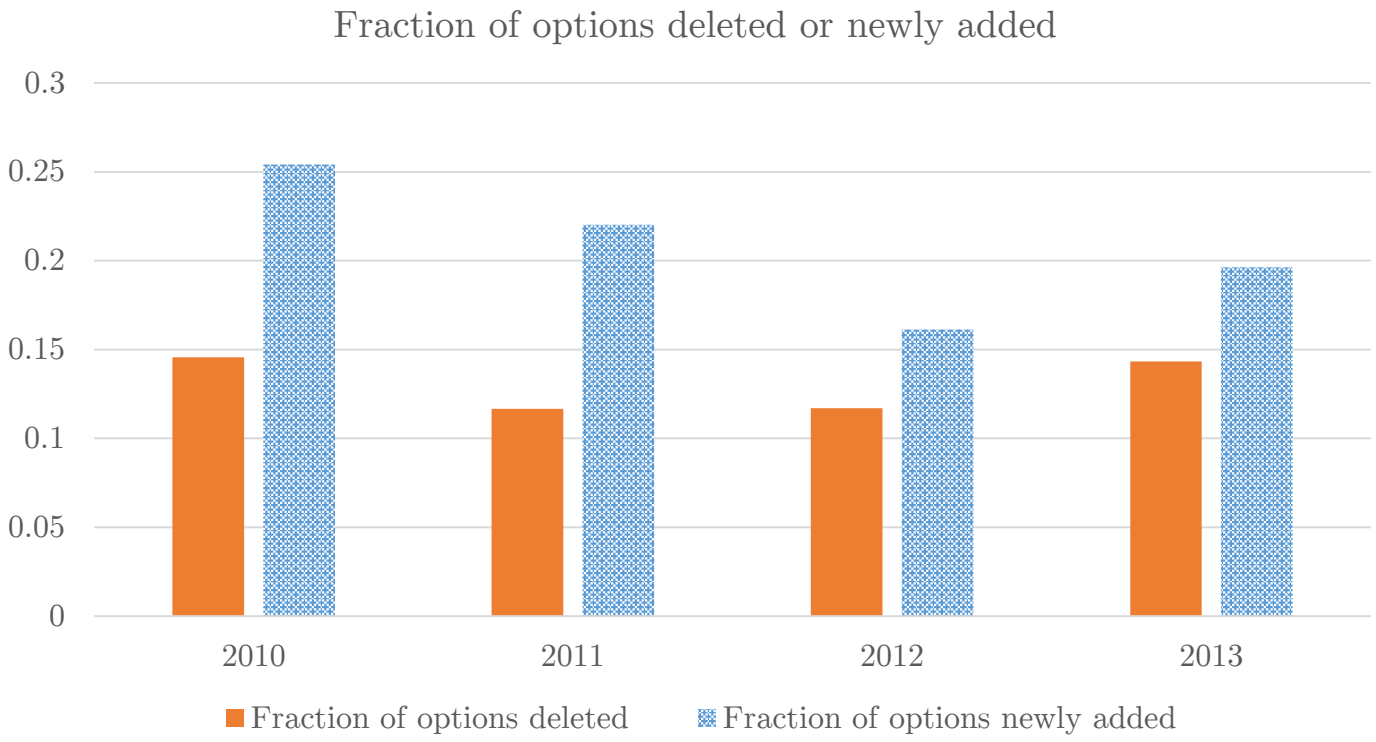


Table A.1 **Summary statistics for target-date funds**
This table describes summary statistics like those in Table 2, but for target-date funds, which were not included in Table 2.

	mean	sd	p1	p25	p50	p75	p99	N
Fund value ($1,000)	11,100	23,800	2	633	2,852	9,931	142,000	32,256
Fund plan share	1.87	2.28	0.00	0.37	1.07	2.50	11.47	32,097
Expense ratio (%)	0.49	0.27	0.16	0.18	0.57	0.73	1.07	31,405
Flow (to plan assets) (%)	0.42	1.38	-2.54	0.01	0.20	0.55	7.89	30,731
Flow (change in plan share) (%)	0.218	0.714	-1.842	-0.002	0.154	0.402	3.027	30,731
Flow (to option size) (%)	23.07	45.89	-100	1.53	15.58	36.14	188.44	30,731
Flow positive (indicator)	0.774	0.418	0	0	1	1	1	30,731
Return 1-year (%)	13.1	10.8	-5.0	5.2	13.9	16.7	39.0	31,596
Return 5-year (%)	2.3	1.4	-0.9	1.3	2.5	3.4	5.0	22,477
Return 10-year (%)	4.4	2.2	0.0	2.7	3.7	6.5	8.4	4,633

Table A.2 **Fees and fund flows, alternative measurement of fees**

This table is similar to Panel A of Table 3, but uses different definition of fees. In Panel A we replace the expense ratio with the fund's fee in 2009, and in Panel B we use the value-weighted fee across all share classes of a fund.

A. Fees measured as of 2009

	Flow (to plan assets)	Flow (change in plan share)	Flow (to option size)	Flow positive (indicator)
	(1)	(2)	(3)	(4)
Expense ratio (2009) * Post	-0.511***	-0.408***	-4.208**	-0.215***
	(-4.43)	(-4.77)	(-2.23)	(-6.24)
Plan*Fund FE	Yes	Yes	Yes	Yes
Size*Year controls	Yes	Yes	Yes	Yes
Plan*Style*Year FE	Yes	Yes	Yes	Yes
Fund Family*Year FE	Yes	Yes	Yes	Yes
R^2	0.821	0.697	0.765	0.702
N	47,462	47,462	47,462	47,462

B. Value-weighted fee for the fund

	Flow (to plan assets)	Flow (change in plan share)	Flow (to option size)	Flow positive (indicator)
	(1)	(2)	(3)	(4)
Expense ratio (value-weighted across share classes) * Post	-0.513***	-0.431***	-5.510***	-0.208***
	(-4.83)	(-5.35)	(-2.84)	(-6.21)
Expense ratio (value-weighted across share classes)	0.412	0.196	2.694	0.128
	(1.59)	(0.95)	(0.40)	(1.34)
Plan*Fund FE	Yes	Yes	Yes	Yes
Size*Year controls	Yes	Yes	Yes	Yes
Plan*Style*Year FE	Yes	Yes	Yes	Yes
Fund Family*Year FE	Yes	Yes	Yes	Yes
R^2	0.821	0.697	0.765	0.702
N	47,627	47,627	47,627	47,627

Table A.3 **Fees and fund flows, 11-K vs. top-1000 samples**
This table is similar to Panel A of Table 3, but limited to the sample based on form 11-K filers (Panel A) or top 1000 largest plans from Form 5500 (Panel B), respectively. These samples overlap for around 15% of plans.

A. 11-K sample only

	Flow (to plan assets)	Flow (change in plan share)	Flow (to option size)	Flow positive (indicator)
	(1)	(2)	(3)	(4)
Expense ratio * Post	-0.572***	-0.477***	-4.434*	-0.202***
	(-4.16)	(-4.81)	(-1.82)	(-4.81)
Expense ratio	0.313*	0.317**	5.517	0.188***
	(1.66)	(2.01)	(1.34)	(2.87)
Plan*Fund FE	Yes	Yes	Yes	Yes
Size*Year controls	Yes	Yes	Yes	Yes
Plan*Style*Year FE	Yes	Yes	Yes	Yes
Fund Family*Year FE	Yes	Yes	Yes	Yes
R^2	0.821	0.703	0.775	0.705
N	30,801	30,801	30,801	30,801

B. Top-1000 sample only

	Flow (to plan assets)	Flow (change in plan share)	Flow (to option size)	Flow positive (indicator)
	(1)	(2)	(3)	(4)
Expense ratio * Post	-0.604***	-0.508***	-8.749***	-0.305***
	(-4.19)	(-4.36)	(-3.00)	(-6.98)
Expense ratio	0.207	0.055	8.516	0.227**
	(1.05)	(0.32)	(1.15)	(2.12)
Plan*Fund FE	Yes	Yes	Yes	Yes
Size*Year controls	Yes	Yes	Yes	Yes
Plan*Style*Year FE	Yes	Yes	Yes	Yes
Fund Family*Year FE	Yes	Yes	Yes	Yes
R^2	0.827	0.692	0.762	0.711
N	24,001	24,001	24,001	24,001

Table A.4 **Fees and fund flows, shorter window (2011-2012)**
This table is similar to Table 3, but limited to the 2011-2012 sample period.

A. All funds

	Flow (to plan assets)	Flow (change in plan share)	Flow (to option size)	Flow positive (indicator)
	(1)	(2)	(3)	(4)
Expense ratio * Post	-0.490***	-0.411***	-4.749**	-0.209***
	(-4.88)	(-4.51)	(-2.08)	(-4.38)
Expense ratio	0.526**	0.731***	12.687*	0.152
	(1.99)	(3.11)	(1.84)	(1.17)
Plan*Fund FE	Yes	Yes	Yes	Yes
Size*Year controls	Yes	Yes	Yes	Yes
Plan*Style*Year FE	Yes	Yes	Yes	Yes
Fund Family*Year FE	Yes	Yes	Yes	Yes
R^2	0.883	0.794	0.826	0.786
N	22,198	22,198	22,198	22,198

B. Domestic equity funds only

	Flow (to plan assets)	Flow (change in plan share)	Flow (to option size)	Flow positive (indicator)
	(1)	(2)	(3)	(4)
Expense ratio * Post	-0.561***	-0.472***	-7.931***	-0.246***
	(-4.31)	(-4.12)	(-2.87)	(-4.14)
Expense ratio	0.562*	1.017***	15.100**	0.099
	(1.67)	(3.59)	(2.33)	(0.67)
Plan*Fund FE	Yes	Yes	Yes	Yes
Size*Year controls	Yes	Yes	Yes	Yes
Plan*Year FE	Yes	Yes	Yes	Yes
Fund Family*Year FE	Yes	Yes	Yes	Yes
R^2	0.883	0.779	0.830	0.776
N	13,722	13,722	13,722	13,722

Table A.5 **Fees and fund flows, longer window (2000-2013)**
This table is similar to Table 3, but for a longer sample period between 2000 and 2013.

A. All funds

	Flow (to plan assets)	Flow (change in plan share)	Flow (to option size)	Flow positive (indicator)
	(1)	(2)	(3)	(4)
Expense ratio * Post	-0.484***	-0.398***	-4.276**	-0.211***
	(-4.58)	(-4.61)	(-2.10)	(-6.12)
Expense ratio	0.375***	0.347***	7.489***	0.078***
	(3.18)	(2.96)	(3.34)	(2.60)
Plan*Fund FE	Yes	Yes	Yes	Yes
Size*Year controls	Yes	Yes	Yes	Yes
Plan*Style*Year FE	Yes	Yes	Yes	Yes
Fund Family*Year FE	Yes	Yes	Yes	Yes
R^2	0.782	0.647	0.736	0.680
N	110,714	110,714	110,714	110,714

B. Domestic equity funds only

	Flow (to plan assets)	Flow (change in plan share)	Flow (to option size)	Flow positive (indicator)
	(1)	(2)	(3)	(4)
Expense ratio * Post	-0.477***	-0.427***	-3.842	-0.202***
	(-3.68)	(-4.25)	(-1.49)	(-4.50)
Expense ratio	0.223	0.293*	8.590***	0.088**
	(1.52)	(1.93)	(3.26)	(2.42)
Plan*Fund FE	Yes	Yes	Yes	Yes
Size*Year controls	Yes	Yes	Yes	Yes
Plan*Year FE	Yes	Yes	Yes	Yes
Fund Family*Year FE	Yes	Yes	Yes	Yes
R^2	0.784	0.634	0.743	0.668
N	72,850	72,850	72,850	72,850

Table A.6 **Alternative levels of clustering standard errors**

This table is similar to Panel A of Table 3 using the first flow measure but employs different levels of clustering. The dependent variable throughout is the flow to plan assets.

Clustering level:	Plan-Fund	Fund-time	Plan-time	Plan-time & Fund-time	Fund	Plan	Fund family	Family & Plan	Family, Plan, Time	Fund, Plan, Time	Base Case: Fund & Plan
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Expense ratio * Post	-0.56***	-0.56***	-0.56***	-0.56***	-0.56***	-0.56***	-0.56***	-0.56***	-0.56***	-0.56***	-0.56***
	(-8.11)	(-5.07)	(-8.15)	(-5.50)	(-4.18)	(-7.99)	(-4.36)	(-5.86)	(-6.03)	(-4.92)	(-4.58)
Expense ratio	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
	(1.63)	(1.41)	(1.61)	(1.44)	(1.29)	(1.59)	(1.39)	(1.64)	(1.72)	(1.34)	(1.33)
Plan*Fund FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Size*Year controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Plan*Style*Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fund Family*Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.821	0.821	0.821	0.821	0.821	0.821	0.821	0.821	0.821	0.821	0.821
N	47,634	47,634	47,634	47,634	47,634	47,634	47,634	47,634	47,634	47,634	47,634

Table A.7 **Alternative flow measures for extreme fee regressions**

This table is similar to Table 5, but using alternative dependent variables.

	Flow (change in plan share)			Flow (to option size)			Flow positive (indicator)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Minimum fee * Post	0.316***	0.315***	0.213***	4.630***	4.611***	3.631**	0.107***	0.106***	0.053**
	(4.72)	(4.71)	(3.23)	(3.07)	(3.06)	(2.07)	(4.08)	(4.06)	(2.04)
Minimum fee	-0.065	-0.064	0.006	-1.505	-1.479	-0.694	-0.064**	-0.063**	-0.024
	(-1.06)	(-1.05)	(0.09)	(-0.92)	(-0.90)	(-0.41)	(-2.51)	(-2.48)	(-0.96)
Maximum fee * Post		-0.073*	0.009		-2.395**	-1.592		-0.082***	-0.039*
		(-1.76)	(0.20)		(-2.03)	(-1.34)		(-3.62)	(-1.74)
Maximum fee		-0.021	-0.061		0.295	-0.328		0.032	0.006
		(-0.46)	(-1.30)		(0.23)	(-0.25)		(1.55)	(0.30)
Expense ratio * Post			-0.364***			-3.382			-0.188***
			(-4.18)			(-1.44)			(-5.15)
Expense ratio			0.172			5.173			0.166**
			(1.29)			(1.18)			(2.56)
Plan*Fund FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Size*Year controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Plan*Style*Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fund family*Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.697	0.697	0.697	0.765	0.765	0.766	0.701	0.701	0.702
N	47,634	47,634	47,634	47,634	47,634	47,634	47,634	47,634	47,634

Table A.8 **Fee-flow sensitivities of target-date vs. non-target date funds around the reform**
This table reports results on fee-flow sensitivities around the disclosure reform for target-date funds relative to non-target date funds. Target-date funds often are default choices and the choice of which target-date fund is likely driven by reasons other than fees. *t*-statistics are reported in parentheses below the coefficient estimates. The standard errors are robust to heteroskedasticity and two-way clustered by fund and plan. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

	Flow (to plan assets)	Flow (change in plan share)	Flow (to option size)	Flow positive (indicator)
	(1)	(2)	(3)	(4)
Expense ratio	0.136	0.138	5.820	0.158***
	(1.05)	(1.20)	(1.39)	(2.61)
Expense ratio * Post	-0.397***	-0.352***	-4.518**	-0.190***
	(-3.39)	(-3.79)	(-2.13)	(-5.18)
Expense ratio * Target-date fund	-0.233	-0.197	-8.131	-0.029
	(-0.81)	(-0.83)	(-0.91)	(-0.27)
Target-date fund * Post	0.084	0.050	3.363	-0.004
	(0.77)	(0.55)	(1.08)	(-0.16)
Expense ratio * Post * Target-date fund	0.271	0.244	-0.490	0.118**
	(1.31)	(1.49)	(-0.09)	(2.38)
Plan*Fund FE	Yes	Yes	Yes	Yes
Size*Year controls	Yes	Yes	Yes	Yes
Plan*Style*Year FE	Yes	Yes	Yes	Yes
Fund Family*Year FE	Yes	Yes	Yes	Yes
R^2	0.822	0.676	0.765	0.701
N	75,814	75,814	75,814	75,814
p-value for coef [2]+[5] = 0	0.5937	0.5580	0.3876	0.2394

Table A.9 **Robustness: Excluding plans with fund deletions or additions**
This table replicates Table 3 but excludes any plan-years where funds were deleted or added during the year. The observations are at the plan-fund-year level. In column (1), we delete all observations where there are deletions of any kind in the plan-year. In column (2), we only delete observations where a deletion takes place in the same fund style (where styles are defined as described in Table 1). Columns (3) and (4) are similar but exclude plans with additions.

	No deleted funds in plan	No deleted funds within style	No added funds	No added funds within style
	(1)	(2)	(3)	(4)
Expense ratio * Post	-0.699***	-0.549***	-0.659***	-0.610***
	(-4.19)	(-4.61)	(-5.13)	(-4.90)
Expense ratio	0.125	0.109	-0.160	0.345*
	(0.41)	(0.52)	(-0.70)	(1.82)
Plan*Fund FE	Yes	Yes	Yes	Yes
Size*Year controls	Yes	Yes	Yes	Yes
Plan*Style*Year FE	Yes	Yes	Yes	Yes
Fund Family*Year FE	Yes	Yes	Yes	Yes
R^2	0.872	0.852	0.887	0.847
N	11,058	25,430	8,640	23,047

Table A.10 **Sensitivity of deletions to fees around disclosure reform**

This table shows results for the sensitivity of plan deletions to expenses. The dependent variable is an indicator for whether a fund is deleted from a plan (i.e., the fund disappeared between the end of the last fiscal year and the current fiscal year). The explanatory variable is the fund's lagged expense ratio interacted with *Post* (the years after the reform). The estimates are based on an OLS regression model. Control variables are the fraction of plan assets invested in the fund, and plan*style*year fixed effects. The standard errors are robust to heteroskedasticity and two-way clustered by fund and plan. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

Dependent variable: Fund deleted (indicator)		
	All funds	Domestic equity
	(1)	(2)
Expense ratio * Post	0.001	0.004
	(0.08)	(0.19)
Expense ratio	0.063***	0.052***
	(4.84)	(3.54)
Option plan share (lag)	-0.541***	-0.371**
	(-4.22)	(-2.52)
Plan*Style*Year FE	Yes	Yes
R^2	0.443	0.389
N	64,026	39,123