# Dominated pension investments: the role of search frictions and unawareness*

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**Abstract**

The market for long-term savings in mutual funds is characterized by high price dispersion between similar funds. We conduct a large-scale field experiment in the Swedish pension system to examine to what extent information and search frictions can explain why savers choose dominated high-fee index funds. Three findings stand out: (i) Overall, information letters that increase awareness of a dominated choice and reduce search costs of finding the dominating alternative improve many savers' real investment choices and can be justified from a cost-benefit analysis. (ii) While the average effects are positive, a majority of previously active investors are unresponsive to information that eliminates search costs. (iii) We estimate that a lack of awareness and search costs account for at most 45 percent of dominated fund choices.

**Keywords:** Dominated choices, financial investments, financial literacy, pensions, search costs

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# 1 Introduction

Recent findings suggest that differences in returns to savings account for a large fraction of wealth inequality.[1] One reason for the heterogeneous returns is that different individuals pay significantly different fees for the same investments. Hortaçsu and Syverson (2004) document that the most expensive S&P500 index fund has almost 30 times the fee of the cheapest fund in the category. In 2007, over 200 million USD could have been saved in expenses on S&P500 index funds alone, if savers had chosen the cheapest fund (Choi et al., 2010). The high price dispersion across comparable mutual funds indicates that there are sizeable frictions affecting the demand side of the fund market: consumers' fund choices.

This paper targets a key puzzle in the household finance literature: why do savers choose high-fee index funds? Understanding why savers fail to minimize fees is crucial to find ways to improve choice systems for financial investments and is an important input when designing pension schemes. Specifically, we examine the role of two prominent suggested causes for dominated fund choices: search and information frictions. We run a large-scale field experiment among people who invest some of their public pension savings in dominated index funds.[2] Using leaflets sent by mail we provide information that reduces information and search frictions to varying degrees. Concretely, we investigate to what extent savers' fund choices are affected by information aimed at i) increasing individuals' awareness of price differences between funds with the same expected holdings, ii) removing search costs for finding a dominating alternative, iii) improving the assessment of the expected monetary implication at retirement from choosing a fund with a lower fee but the same expected holdings. Following the information treatment we observe the savers' real fund choices.

To our knowledge, our study is the first to manipulate search costs in a real pension investment setting, and to investigate how personalized information interventions can affect the fund choice. The paper makes three main contributions. First, we provide evidence that information letters that alleviate search costs and unawareness about the existence of cheaper mutual funds can significantly improve real investment choices, in the sense that they cause a shift in savings from a dominated to a dominating fund. The intervention can also be justified from a cost-benefit criterion.[3] Second, although the

[1] See, e.g., Bach et al. (2017), Fagereng et al. (2020), and Hubmer et al. (2021).

[2] We define a fund to be dominated if the fund states that it is an index fund, and where there exists a cheaper index fund, in terms of fund fee, that follows the same index strategy. Hence, the funds are identical in terms of expected holdings. This is further described in Section 2.2.

[3] See Kaiser et al. (2021) for a meta-analysis of financial education programs on financial behaviors, and their cost effectiveness, and Hastings et al. (2013) for a discussion about alternative policies to improve financial outcomes.

average effects are positive, we find that a majority of formerly active savers, who have opted out from a default fund, are passive with respect to their past fund choice, even when search costs to find a better alternative are eliminated. Third, we estimate that search and information frictions in the fund market can explain at most 45 percent of dominated fund choices.

The experiment was conducted among savers in the Swedish Premium Pension system. The Premium Pension is a defined contribution part of the public pension where households are allowed to choose how their savings are invested. As such, it offers a unique opportunity to study dominated choices in a setting where credit risk considerations can be abstracted from, the contribution rate is exogenously determined, and the investment choice is made on a single platform that provides the same information and choice architecture to everyone. At the time of the experiment, there were over 800 funds from which to choose. Within this set, we selected two index funds that we identified as dominated, i.e., where there exists an identical fund in terms of expected holdings, with a lower fee. Importantly, since the fund choice is administered by the Premium Pension system there are no non-portfolio services offered by the different funds. Moreover, the savers in the dominated funds have actively chosen these funds and opted out of the default fund, hence, the savers are familiar with the switching technology at the Premium Pension website.

Four different treatment letters were randomized to 18 000 savers in the two dominated funds, and in a subset of the letters an incentivized search task to find the dominating fund was given. The first treatment arm informed the savers that they save in a dominated fund and stated the fee difference between the selected fund and the dominating fund. In the second treatment arm the name of the dominating fund was also stated, eliminating search costs. The third treatment arm included an individual-level forecast of the expected monetary implication at retirement if the saver switched its savings from the dominated to the dominating fund, capturing the compound effect of the fee difference. Finally, the fourth treatment arm consisted of the union of treatment arms two and three.

Let us first consider the intention-to-treat effects. Over a three-month period following the intervention, the propensity to switch to the cheapest fund was 1.9 percentage points (19 times) higher among savers who were sent the letter that states that they save in a dominated fund, relative to the control group. When eliminating search costs by providing the name of the dominating fund, the share of switchers increases by an additional 1.2 percentage points. However, providing an estimate of the expected future monetary gain from immediately reallocating the savings to the dominating fund does not influence the investment decision beyond what information on fee differences alone accomplishes. Thus, we do not find support for an exponential-growth bias among the savers, although we

cannot rule it out.[4] In terms of heterogeneous treatment effects, we find that individuals with relatively high earnings are more likely to respond to our treatments and switch funds. Hence, this type of information treatment may not contribute to a reduced wealth inequality, given the positive correlation between earnings and wealth. We find no significant differences in treatment effects across age or future expected gain from switching funds.

We conclude that information interventions that alleviate search costs and unawareness about cheaper, comparable mutual funds, significantly improve many people's real investment choices, i.e., they switch to the dominating fund. To put the size of the treatment effects in perspective we can compare our findings to other papers, and we can consider the expected savings over time relative to the cost of the intervention. In the paper most closely related to ours, Choi et al. (2010) find that the share of people who minimize fund fees increases by 6 - 11 percentage points when search costs are reduced, whereas we find that an increased awareness and removed search costs increase the switching probability to the cheapest fund by 3.1 percentage points. However, they provide information in a high-attention setting of a laboratory experiment with staff and students at Harvard University, and the fee differential between the funds is over 2.5 percent, whereas it is 0.20 and 0.25 percent in our setting. Although disclosure policies are relatively cheap and non-controversial, there is likely low attention of households to information letters. In fact, we find that only 11 percent of the letter recipients read the letters. Despite this low take-up rate of the treatments, a back-of-the-envelope calculation suggests a present-value gain of approximately 6 SEK (0.7 USD) per letter. Hence, this type of intervention can be justified based on a cost-benefit analysis.

In order to quantify to what extent search costs and unawareness contribute to dominated investments we turn to the treatment-on-the-treated effects, and focus on the probability of savers reducing their savings in the dominated funds. In a subset of the treatments the recipients were offered a payment if they confirmed with us that they had read the letter. By scaling the intention-to-treat effects by the confirmed reading share we approximate an upper bound of the treatment effects on the treated.[5] Using this approach we find that the share of savers that reduce their dominated investments is almost 35 percent among savers who were informed that they save in a dominated fund, as compared to 1.8 percent in the control group. When eliminating search costs by providing the name of the dominating fund, the probability that savers decrease their investments in the dominated funds is 45 percentage points higher than in the control

[4]The exponential-growth bias is found in, e.g., Levy and Tasoff (2016); Stango and Zinman (2009); Wagenaar and Sagaria (1975).

[5]The reading share can be considered a lower bound, and thus the treatment effects scaled by this share provide upper bounds.

group. An alternative approach to proxy for the treatment-on-the-treated effects is to compute the treatment effects of those who actually confirmed reading the letter relative to those who did not. Among those who read the letter that informs the saver that they invest in a dominated fund and the letter that removes search costs, the probability that savers reduce their holdings in the dominated funds is approximately 33 percentage points higher, as compared to those who did not confirm reading the letter. Taken together, our estimates of the treatment effects on the treated suggest that search costs and lack of awareness account for a substantial share, but at most 45 percent, of dominated fund choices.

Although our findings show that information and search frictions can explain a large share of dominated fund choices, we note that a majority of the savers do not reduce their investments in the dominated funds, even when made aware of their dominated choice and when search costs for identifying the dominating alternative are eliminated. Hence, our results also show that savers who have actively opted out of a default fund still exhibit a large degree of inertia in their investments. Savers who have been relatively active in the past can still be passive with respect to their past fund choices, which is particularly alarming if those choices are poor. These results highlight that a well-selected default option in a pension plan is not sufficient to handle problems associated with inertia in investments. To prevent savers from persisting with poor investment choices, one stark policy implication is to require savers to regularly confirm a fund choice if it is different from the default.

There is a rich literature on inactivity and inertia in investments with a specific focus on the tendency to stay with default alternatives; see Beshears et al. (2009) and Beshears et al. (2018) for an overview. Inertia is a feature that is inherently difficult to study in a laboratory, and therefore studies that aim to measure it are often observational. Papers that utilize changes in default contribution rates and investment allocations in 401(k) accounts typically find that there is strong inertia in the default choice (Madrian and Shea (2001), Choi et al. (2004), Choi et al. (2006)).[6] Since our sampling frame consists of investors who have opted out of the pension system's default fund, we can rule out suggested explanatory factors of inertia related to the default alternative, such as the default being perceived as a financial advice. In addition, completely inert investors who never change their portfolios are excluded.[7] Moreover, since we study people who save

[6] Samuelson and Zeckhauser (1988) document a significant status-quo bias in general, in a series of experiments; and Kempf and Ruenzi (2006) find that the status-quo bias is positively related to the number of available alternatives. Kronlund et al. (2021), on the other hand, find that an increased salience of fund fees in 401(k) plans leads to a reduction in the plan share of more expensive funds, despite the common perception that savers are largely passive in their investments.

[7] A large share of savers in the Premium Pension system chose to opt out of the default fund at the inception of the system in 2000, when a "pro-choice" campaign was run, but have been inactive ever since

in index funds where there exists a cheaper fund with the same index strategy, we can reject causes for inactivity related to differences in returns between alternatives, such as anchoring and anticipated regrets. We contribute to the literature on inertia in investments by showing that there is a high degree of inertia even when search costs are eliminated, and among previously active investors.

There is also an extensive literature focusing on dominated products in the financial industry. Carlin (2009) refers to studies that discuss the potential failure of the law of one price in many different markets: S&P500 index funds, money market funds, mutual funds, retail municipal bonds, credit cards, conventional fixed-rate mortgages, life annuities, and term life insurance.[8] A commonly suggested cause for dominated choices is search costs, see Egan (2019) for an example in the bond market and Handel and Schwartzstein (2018) for a discussion about search costs versus other psychological frictions. On the theory side, Salop and Stiglitz (1977) show that costly search of information can cause the equilibrium price to be non-competitive. Elton et al. (2004) discuss that in a market where there are uninformed investors and no arbitrage possibilities the law of one price does not need to hold, and Hastings et al. (2017) highlight the role of advertising and brand value. We provide experimental evidence that at most 45 percent of dominated fund choices can be explained by information frictions and search costs. That search frictions cannot fully account for dominated fund choices is consistent with findings in Choi et al. (2010), but we quantify an upper bound in a field experiment involving people's real investment choices and where the return is paid out in the future. Adams et al. (2021) find high inattention to savings account options, some of which are dominating, in a field experiment among depositors of UK banks. As our setting involves an index-fund choice, the financial decision is arguably more involved. Moreover, the fee difference in our experiment is an order of magnitude smaller as compared to their return differences. Nonetheless, we find that the information disclosure is worthwhile in the aggregate. The overall low attention to information is in line with their findings, and we highlight that this is also the case among investors who have made an active fund choice in the past. Regarding other suggested explanations for dominated choices, we can in our setting rule out formal switching costs when savers alter investments, differences in the display of historical returns, non-portfolio services, and differences in credit risk or trustworthiness between financial institutions (Hortaçsu and Syverson (2004) and Agnew and Szykman

(Cronqvist and Thaler (2004), Dahlquist et al. (2017)). However, in our sample, most of the savers made an active investment choice after the launch of the Premium Pension system, as seen in Figure 7.

[8]See Ayres and Curtis (2015) for a discussion of the problem with dominated funds in 401(k) plans; and Bhargava et al. (2017) and Sinaiko and Hirth (2011) for examinations of dominated choices in health insurance plans; and Johnson et al. (2015) and Bhutta et al. (2021) regarding failures in mortgage financing.

(2005)).[9] Moreover, the information letters clarified where the provided information could be verified, in order to overcome investors' potential lack of trust in the information or over-confidence in their choices.

A full account of why people choose dominated funds is beyond the scope of this paper, however, in our setting many of the previously proposed causes for inertia and dominated choices can either be ruled out or fail to explain why a majority of the savers remain with the dominated funds. Our findings indicate support of economic models that depart from more standard frameworks where individuals are assumed to make their fund choices based on a careful weighing of perceived costs and benefits.[10] Suggested explanations that would be beneficial to explore further in future work include different psychological frictions such as bounded rationality, or limited financial literacy in the sense that the savers may not fully comprehend the index-fund concept. Moreover, if savers have a low belief in their own ability to understand and evaluate information regarding financial investments, it could explain a low responsiveness to such information.

The remainder of the paper proceeds as follows. In Section 2 we describe the institutional setting, the sample, and the data. Section 3 presents the methodology including the treatments, the treatment assignment, and the hypotheses that are tested. The main results are presented in Section 4. In Section 5 we show exploratory analysis, and Section 6 concludes the paper. In Appendix A we discuss how the paper relates to our published pre-analysis plan.

# 2 Background and sample

## 2.1 The Premium Pension

The Swedish pension system was reformed in 1999. Citizens were then given the opportunity to choose funds for part of their public pension savings: the Premium Pension. As of January 2018, the choice set was 846 funds (Pensionsmyndigheten, 2018b). Everyone who has ever had taxable labor income in Sweden and was born after 1937 is part of

[9] There are no explicit switching costs in the Premium Pension system. Moreover, since the savers in our sample have actively chosen funds, they are familiar with the website where the fund switch is made. In our sample of funds, the funds are ranked in the same order based on net returns, regardless of the historical period considered. Furthermore, there are no significant non-portfolio services offered by the funds or differences in credit risk, since the fund choice is administrated by the Premium Pension system. In one of the two funds, the fund argues that it actively participates at shareholders' general meetings. We study heterogeneous treatment effects between the two funds in our sample and find, if anything, a stronger treatment effect for the savers in this fund, see Figure 5.

[10] We find indicative support of the information-overload hypothesis, suggested in Agnew and Szykman (2005). When we added a possibility to confirm the name of the dominating fund, this resulted in fewer switches. See the comparison of treatment A and A-certain in Section 5.1.

the Premium Pension system (Pensionsmyndigheten, 2018a). The employer pays 2.5 percent of each employee's labor income to that individual's Premium Pension account (Pensionsmyndigheten, 2018a).[11] As the contribution rate is specified in the system, a pension saver is only concerned with the investment decision. This enables us to study the fund choice in isolation from the inter-temporal savings decision. By the end of 2017, the fund volume managed in the Premium Pension system surpassed 1 137 billion SEK (approximately 125 billion USD) (Pensionsmyndigheten, 2018c).

## 2.2 Sample selection

We define a fund as dominated if it is an index fund that has a higher fund fee than another index fund that follows an equivalent index, i.e., the funds have the same investment strategy and expected holdings. In the Premium Pension system we identified (at least) two large dominated index funds, denoted Fund$^h$ (high fee) and Fund$^m$(medium fee). The dominating index fund is denoted Fund$^l$ (low fee). Fund$^m$, Fund$^l$, and Fund$^h$ were introduced in the Premium Pension system in 2000, 2006, and 2013, respectively. At all times, the funds have been ordered in the same way in terms of fund fees, as illustrated in Figure 1. Although all savers in Fund$^m$ and Fund$^h$ currently save in dominated funds, those who selected Fund$^m$ before Fund$^l$ was introduced (before 2006) did not make a dominated fund choice at the time of the choice. Importantly, we have data on the dates of fund choices, thus, we can study heterogeneous treatment effects along this dimension. A description of the three funds and their historical performance is presented in Appendix B.1. The indices that the three funds follow track the performance of the 30 most traded shares listed on the Stockholm Stock Exchange. Two of the indices differ in terms of whether dividends are reinvested or not. However, when saving in these funds through the pension system, dividends are reinvested regardless. As a result, the expected investment allocation for savings in the three funds is the same. The historical correlation between the return of the two dominated funds and Fund$^l$ is very close to, but not exactly equal to, one, since the timing of the inflow and outflow of money in the three funds can differ. Importantly though, these differences do not affect the expected allocation in individual stocks of the three funds.

The sample in this study consists of people aged 25–64 who save in either of the dominated funds, Fund$^h$ or Fund$^m$, for their Premium Pension. For administrative purposes, the people in the sample have to be registered residents in Sweden. To keep the research design clean, individuals who save in both of the dominated funds, Fund$^m$ and Fund$^h$, are dropped from the sample.[12]

[11] The contribution rate is capped when the labor income exceeds 7.5 income base amounts.

[12] 888 people save in both of the dominated funds. Furthermore, observations are dropped in case any

The final sample size is 29 662 people in the two funds combined, where about 60 percent save in Fund$^m$ and 40 percent in Fund$^h$. Approximately five percent of the sample have allocated some Premium Pension savings to the dominating fund in addition to saving in one of the dominated funds. For a comparison of the individual characteristics of the savers in the two dominated funds with the Swedish population, see Appendix B.2. Overall, the mean earnings of the savers in the two dominated funds is higher compared to the mean earnings of the working age population in Sweden, a larger share is married, and the share of men is higher. We also present age and gender distributions and historical investment activity levels for savers who have all of their Premium Pension savings in the default fund, those who have opted out from the default, and savers in our two dominated funds; see Figure 15 and Figures 16 in Appendix B.2. Our sample appears similar to other savers who have opted out from the default fund, along these dimensions, whereas savers in the default fund tend to be younger and less active. A comparison of the Premium Pension savings and shares allocated to the dominating and the dominated funds is provided in Table 8 in Appendix B.2. The average share of the individuals' Premium Pension savings that savers in the dominating fund allocate to this fund, is higher than the average share that savers in Fund$^m$ allocate to Fund$^m$, which is higher than the average share that savers in Fund$^h$ allocate to Fund$^h$.

## 2.3 Data

We use public data of fund characteristics, and administrative data on individual-level Premium Pension savings, investments, and background characteristics. The fund data on monthly historical gross returns and fees from 2000 to 2018, for the selected dominated and dominating funds, is obtained from the Swedish Pensions Agency and from Morningstar Direct. From the Swedish Pensions Agency we also obtain data on individual Premium Pension fund choices and Premium Pension fund balances for the sample, before and after the experiment; as well as individual-level data on labor income, gender, year of birth, marital status, and residential municipality; see Table 1, and Table 2.[13]

of the main variables are missing: year of birth, labor income, or the fund choice information. These amount to 423 individuals. We also drop observations with missing or protected addresses since we are unable to treat these people (send them letters). In order to not keep observations with missing addresses in the control group, we exclude observations where the permanent residence municipality is missing. A total of 43 letters were returned to us by the postal services. These individuals are also dropped from the analysis. In addition, 23 individuals contacted us and asked to be removed from the study.

[13] An identification key of social security numbers was used to match names and addresses from the Swedish Tax Agency, when posting the letters.

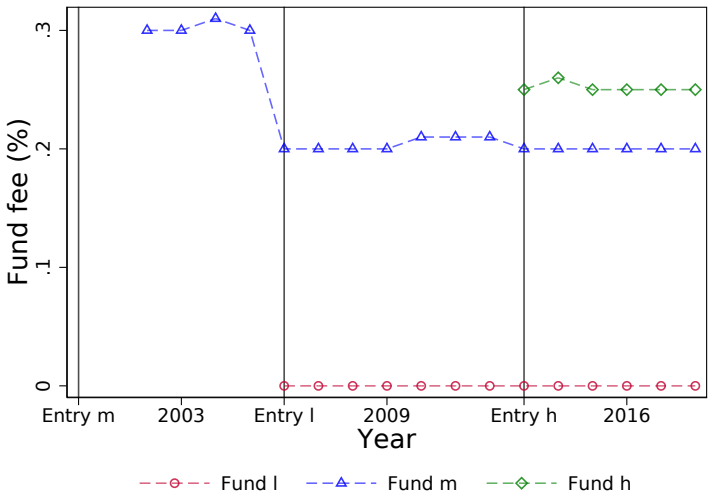



Figure 1: Historical fund fees

*Note*: Historical fund fees since the three funds entered the Premium Pension system. Fees denote net fees after the Premium Pension discount. The vertical lines marked by Entry m, Entry l, and Entry h, indicate when Fund$^m$, Fund$^l$, and Fund$^h$, respectively, were introduced in the Premium Pension system. The data is retrieved from the Swedish Pensions Agency in November 2018.

| Variable | Range | Observation time | Data level |
|---|---|---|---|
| Savings share | [0,1] | Jun & Oct, 2018 | Individual |
| Savings amount (SEK) | $[0, \infty)$ | Jun & Oct, 2018 | Individual |
| Investment date | [29 Sep 2000, 17 Oct 2018] | Jun & Oct, 2018 | Individual |

Table 1: Premium Pension investment data

*Note*: Premium Pension investment data for each of the funds $Fund^l, Fund^m, Fund^h$. Savings share refers to the share of the Premium Pension savings that is allocated to each of the three funds $Fund^l, Fund^m, Fund^h$ (where 1 implies that all Premium Pension savings are saved in that fund). Investment date refers to the date of the most recent change of the Premium Pension portfolio. These variables are observed both before and after the information treatment. The data is retrieved from the Swedish Pensions Agency.

# 3 Experimental design

In this section we first describe the treatments, the treatment assignment, and the relevant outcome variables. We then present a theoretical framework of the decision to switch funds, followed by the hypotheses that are tested in the empirical analysis.

## 3.1 Treatments

We use four different treatment letters, denoted: A, AN, AI, and ANI. In addition, there is a control group that receives no letter. A summary of the information that is provided in each letter follows and an illustration is provided in Figure 2.

| Variable | Range | Observation time | Data level |
|---|---|---|---|
| Annual labor income in 2016 (SEK) | $[0, \infty)$ | 2018 | Individual |
| Year of birth | $\{1953 \text{ .. } 1993\}$ | 2018 | Individual |
| Gender | $\{Female, Male\}$ | 2018 | Individual |
| Marital status | $\{S, M, D, W\}$ | 2018 | Individual |
| Municipality | $\{1 \text{ .. } 290\}$ | 2018 | Individual |

Table 2: Individual background characteristics

*Note*: The table describes the data on individual-level background characteristics. In 2018, the most recent available income data was for 2016. Annual income above the maximum annual PGI level (pension based income) is in 10 000 SEK intervals. The marital statuses $S, M, D, W$ refer to single, married, divorced, widow/widower, respectively. Municipality refers to the municipality of registered residence. The data is retrieved from the Swedish Pensions Agency.

- **A** (Aware): A reminder of the name of the individual's current choice of fund (the dominated fund) and information that it is not the cheapest index fund with that investment strategy. The fees of the current fund and the cheapest index fund with the selected investment strategy are stated. In addition, there is a short guide that describes how a fund selection is implemented and how one can categorize funds.

- **AN** (Aware+Name): The same content as letter A, plus information about the name of the cheapest index fund that follows the same investment strategy as the currently chosen index fund.

- **AI**$_a$ (Aware+Impl): The same content as letter A, plus a statement that clarifies the expected gain in the Premium Pension account balance at age 65, if the saver immediately reallocates the savings in the dominated fund to the dominating fund (the cheapest index fund in the chosen index fund category). This expected gain shows the monetary implication of the compound effect of the fee difference. Furthermore, the saver receives an immediate search reward $a \in \{0, L, M, H\}$ if reporting the name of the dominating fund to us.[14]

- **ANI** (Aware+Name+Impl): The same content as letter AN, plus a statement that clarifies the expected gain in the Premium Pension account balance at age 65, if the saver immediately reallocates the savings in the dominated fund to the dominating fund (the cheapest index fund in the chosen index fund category).

The treatment letters are used to test three main hypotheses regarding *Awareness*, *Search costs*, and *Monetary implication*, as described in Section 3.5. A copy of treatment letter A (Aware) is included in Appendix C.

[14]The low, medium, and high amounts correspond to 50, 250, and 700 SEK, respectively, which was approximately equivalent to 6, 29, and 80 USD at the time of the experiment in July 2018. The savers can report the name of the dominating fund on a project website.

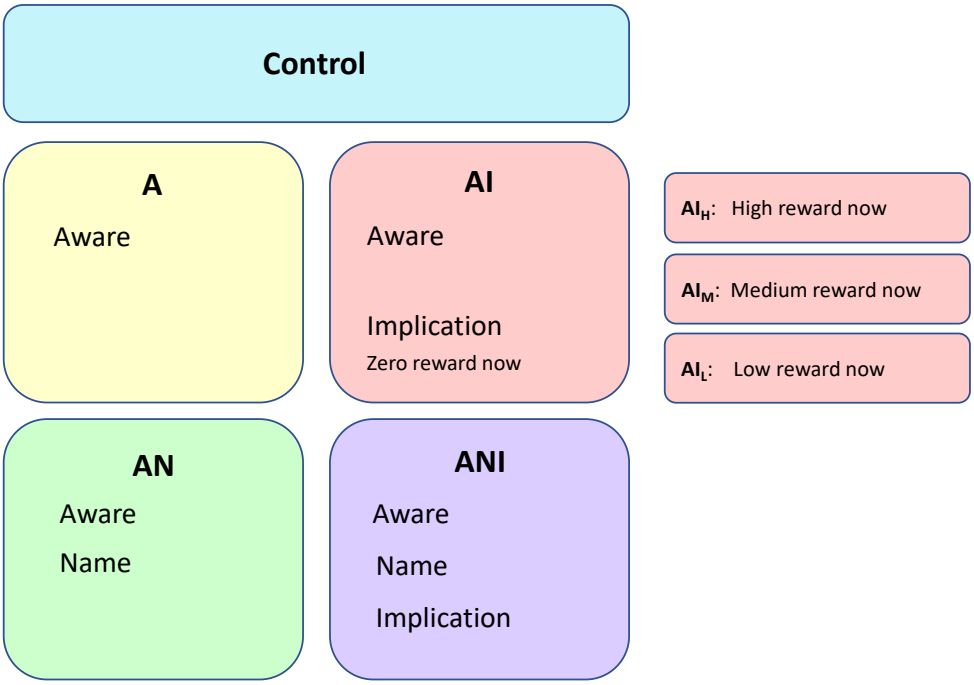



Figure 2: Illustration of the treatment groups

### Treatment compliance

We control that the treatment letters are sent to the savers. However, we do not observe whether the recipients actually read the treatment letters. In order to test the compliance, we add a section to a randomly drawn sub-sample of treatment letters A (Aware) and AN (Aware+Name), where the respondents receive an immediate reward if they confirm to us that they have read the letter.[15] An assessment of the share of recipients who read the letters enables us to estimate the size of the treatment effects conditional on taking part of the information in the treatment letters.

## 3.2 Treatment assignment

The treatment groups are randomly assigned within strata. We stratify based on covariates that we believe could be correlated with the outcome variables, in order to increase the estimation efficiency. The observations are divided into strata as follows, year of birth (two groups, split by the midpoint of the age range), labor income (two quantiles), fund choice (Fund$^m$, Fund$^h$), and fund share (two quantiles). If individual $i$ belongs to strata $s$ this is represented by the dummy variable $S_{is} = 1$. A fraction of the individuals who receive treatment A (Aware) and treatment AN (Aware+Name) are randomly assigned the

[15]The recipients are offered 200 SEK, which is equivalent to about 23 USD.

reading task that is described above. Conditional on strata $S_{is}$, treatment $k$ is independent of all other variables, including any potential outcomes.

Approximately 18 000 (17 960) individuals are sent treatment letters and roughly 4 800 individuals are left as controls.[16] The sample sizes by treatments are as follows.

- Control: 4 791
- A: 3 980, where 199 are sent the reading task
- AN: 3 986, where 199 are sent the reading task
- $\text{AI}_0$: 3 974
- $\text{AI}_{L,M,H}$: 2 006 (669, 669, 668 for each reward level, respectively)
- ANI: 3 991

An assessment of the treatment assignment is presented in Table 9 in Appendix B.3, where pre-treatment characteristics across the treatment groups are compared. Figure 17 in Appendix B.3 presents a comparison between the treatment groups and the control group in terms of the distributions of expected gains, savings in the funds, labor income, and age.

## 3.3 Outcome variables

The outcome variables for individual $i$, receiving treatment $k \in \{A, AN, AI_a, ANI\}$, are observed three months after the treatment. The outcome variables of interest include:

- $Y_{ik}^{switch} \in \{0, 1\}$, an indicator variable that equals one if the individual switches from the dominated to the dominating fund;[17]
- $Y_{ik}^{l} \in \{0, 1\}$, an indicator variable that equals one if the individual increases their portfolio share invested in the dominating fund, $\text{Fund}^l$;
- $Y_{ik}^{mh} \in \{0, 1\}$, an indicator variable that equals one if the individual decreases their portfolio share invested in the dominated funds, $\text{Fund}^m$ and $\text{Fund}^h$;
- $Y_{ik}^{any} \in \{0, 1\}$, an indicator variable that equals one if the individual makes any investment change to their Premium Pension portfolio;
- $Y_{iAI_a}^{search} \in \{0, 1\}$, an indicator variable that equals one if the individual completes the search task in treatment $\text{AI}_a$ (we study both those who successfully complete the task, and those who complete the task but provide an answer that is incorrect);

[16] A total of 23 people withdrew from the study, thus, the total sample size of treated individuals is 17 937.

[17] We define a switch as an observed reduction in the share of the Premium Pension portfolio invested in one of the dominated funds ($\text{Fund}^m$ or $\text{Fund}^h$) and an increase in the portfolio share invested in the dominating fund ($\text{Fund}^l$).

- $Y_{ik}^{read} \in \{0, 1\}$, an indicator variable that equals one if the individual confirms reading a letter.

The main outcome of interest is switches from the dominated to the dominating fund $Y_{ik}^{switch}$ (hereafter referred to as *switch funds*). When we observe changes in the outcome variables we also observe the date at which a change was made. In addition, we observe logins at the Pensions Agency's website.[18]

### Future reward from switching

We construct the variable *future reward from switching* $R_{it}^{switch}$, which is the additional amount in the Premium Pension account that individual $i$ can expect to have at age 65, from immediately switching all of their savings in the dominated fund to the dominating fund.[19] This expected gain shows the monetary implication of the compound effect of the fee difference. The number of years an individual has left until age 65 is denoted $t$.

The Swedish standard for pension forecasts is applied to construct the variable $R_{it}^{switch}$. The forecast depends on age, expected labor income, the fund balance in the dominated fund, the portfolio share in the dominated fund, the expected savings rate, the expected administrative fee of the Swedish Pensions Agency, and the expected fund fees and returns of the funds. The computed forecast is rounded to the nearest 100 SEK, which is the practice for forecasts by the Swedish Pensions Agency. For a detailed description of how the forecast is computed and information about the distribution of forecasts, see Appendix D.[20] We denote individual $i$'s expectation of this future reward from an immediate switch by $E_i[R_{it}^{switch}]$.

## 3.4 Framework – the investment choice

In the setting of this study, awareness refers to being aware of that there exists a dominating fund to a currently chosen fund, i.e., that there exists a cheaper fund with the same expected holdings as a currently chosen fund. Our definition of search costs is the perceived cost of making a fund selection from the choice set in the Premium Pension system. For the main outcome variable (*switch funds*), the search cost is the effort to find the funds with the same investment strategy and to compare their fund fees. We refer to the effort

[18] This data is only available at the treatment-group level.

[19] Age 65 was the mean age for starting to withdraw from the national public pension system, each year 2005–2016 (Carneck et al., 2017). Although there is no official pension age in Sweden, there is a norm for retiring at age 65, for example, the default retirement age in the public pension forecast is 65.

[20] One could consider this forecast to be a lower bound of the expected future reward associated with the information about the dominated and the dominating funds. Each individual could realize some additional benefit from the provided information, e.g., if the person adjusts other investments beyond the Premium Pension savings.

of executing the choice, in the online Premium Pension account, as an administrative switch cost that is separate from the search cost.

To structure our thoughts about how the decision to switch from a dominated to a dominating fund is made, we consider the following framework. The choice depends on: individual $i$'s discount factor of the future reward that is realized $t$ years into the future $\beta_{it}$; the individual expectation of the future reward from immediately switching funds $E_i[R_{it}^{switch}]$; the size of any immediate search reward $R_i^{search}$; the individual perception of the immediate search cost associated with finding the dominating fund $C_i^{search}$; and the individual perception of the immediate cost associated with performing the switch $C_i^{admin}$.[21] Furthermore, we assume that the decision to switch from the dominated to the dominating fund requires that an individual is aware of the fact that there exists a dominating fund to the currently chosen fund. We model this as a binary state captured by the indicator variable $I_i^{aware} \in \{0, 1\}$. Being aware does not necessarily imply that a person will switch funds, as some people may perceive the benefits to be too low compared to the costs. The outcome variable that equals one if a person switches funds is described by

$$Y_i^{switch} = f(\beta_{it}, E_i[R_{it}^{switch}], R_i^{search}, C_i^{admin}, C_i^{search}, I_i^{aware}) + \varepsilon_i.$$

The function $f(\cdot)$ is weakly increasing in $\beta_{it}, E_i[R_{it}^{switch}], R_i^{search}, I_i^{aware}$, and weakly decreasing in $C_i^{admin}, C_i^{search}$. Whether or not to switch from the dominated to the dominating fund can be modeled with the following decision rule,

$$Y_i^{switch} = I_i^{aware} \times 1[Z_{it} > 0], \tag{1}$$

where

$$Z_{it} = u(R_i^{search} - C_i^{admin} - C_i^{search}) + \beta_{it} u(E_i[R_{it}^{switch}]).$$

In our setting, reading treatment letter A (Aware) increases the probability of becoming aware that a dominating fund exists, $I_i^{aware}$. The immediate rewards that we provide in treatment $\text{AI}_a$ (Aware+Impl) control the level of immediate search rewards $R_i^{search}$. Providing the name of the dominating fund, in treatment AN and ANI, eliminates the search cost of finding the dominating fund, $C_i^{search}$. Finally, the information about the expected monetary implication of a fund switch, in treatment AI and ANI, leads to an update of the expected gain from a switch, $E_i[R_{it}^{switch}]$.

[21] We provide the immediate search rewards $R_i^{search}$ in the $\text{AI}_a$ (Aware+Impl) treatment arm.

## 3.5 Hypotheses

We are primarily interested in testing the following hypotheses.[22] The hypotheses are described for the main outcome variable switch funds $Y_{ik}^{switch}$, but comparable hypotheses for the alternative outcome variables are also tested.

**H1** *Awareness*
We test the null hypothesis that information about saving in a dominated fund does not increase the probability of a fund switch. This is tested by comparing the probability of switching funds between treatment groups A (Aware) and Control (no letter):

$$\begin{aligned} H_0: \ & E[Y_{i,A}^*|S_{is}] - E[Y_{i,Control}^*|S_{is}] = 0, \\ H_1: \ & E[Y_{i,A}^*|S_{is}] - E[Y_{i,Control}^*|S_{is}] > 0. \end{aligned} \tag{2}$$

**H2** *Search costs*
We test the null hypothesis that a removed search cost, through information about the name of a dominating fund, does not increase the probability of a fund switch. This is tested by comparing the probability of switching funds between treatment groups AN (Aware+Name) and A (Aware), as well as between treatment groups ANI (Aware+Name+Impl) and $AI_0$ (Aware+Impl):

$$\begin{aligned} H_0: \ & E[Y_{i,AN}^*|S_{is}] - E[Y_{i,A}^*|S_{is}] = 0, \\ H_1: \ & E[Y_{i,AN}^*|S_{is}] - E[Y_{i,A}^*|S_{is}] > 0, \end{aligned} \tag{3}$$

and

$$\begin{aligned} H_0: \ & E[Y_{i,ANI}^*|S_{is}] - E[Y_{i,AI_0}^*|S_{is}] = 0, \\ H_1: \ & E[Y_{i,ANI}^*|S_{is}] - E[Y_{i,AI_0}^*|S_{is}] > 0. \end{aligned} \tag{4}$$

Both hypothesis tests for search cost, (3) and (4), identify the effect of including information about the name of the dominating fund. In contrast to the hypothesis test in (3), both information letters in the hypothesis test in (4) include the expected monetary implication of a fund switch. This difference enables us to test whether the effect of removed search costs depends on if a saver is also informed about the expected monetary implication of a fund switch, i.e., a complementary effect.

**H3** *Monetary implication*

[22] Since treatments are randomized within strata, we condition on stratum dummies.

We test the null hypothesis that information about the expected future monetary implication of a fund switch does not increase the probability of a fund switch. This is tested by comparing the probability of switching funds between treatment groups $AI_0$ (Aware+Impl) and A (Aware), as well as between treatment groups ANI (Aware+Name+Impl) and AN (Aware+Name):

$$\begin{aligned} H_0: &\ E[Y^*_{i,AI_0}|S_{is}] - E[Y^*_{i,A}|S_{is}] = 0, \\ H_1: &\ E[Y^*_{i,AI_0}|S_{is}] - E[Y^*_{i,A}|S_{is}] > 0, \end{aligned} \tag{5}$$

and

$$\begin{aligned} H_0: &\ E[Y^*_{i,ANI}|S_{is}] - E[Y^*_{i,AN}|S_{is}] = 0, \\ H_1: &\ E[Y^*_{i,ANI}|S_{is}] - E[Y^*_{i,AN}|S_{is}] > 0. \end{aligned} \tag{6}$$

Similar to the two hypothesis tests related to search costs, the difference between (5) and (6) allows us to test for complementary effects between removed search costs and information about the expected monetary implication of a fund switch.

**Implementation**

All treatment letters were sent to the savers at the same point in time (July 19, 2018). The outcome variables $Y^*_{ik}$ ($* \in \{switch, mh, l, any, search, read\}$) were observed three months after the treatment date, and the exact date of any change in the outcome variables was also noted. The search task and the reading task were to be completed within a given time period (22 days) following the treatment date in order to receive the immediate rewards. Participants completed the reading task and the search task on a project website. The task rewards consisted of general coupons that are valid in common stores in Sweden. The coupons were distributed to the participants at the project website. To ensure that the savers trust the information, the letters included references to the Swedish Pensions Agency's website where the information could be verified. Moreover, the sender of the letters was Stockholm University (SU) and the letters contained contact information to us researchers, an administrative office at SU, and a data protection officer at SU.

# 4 Results

Ordinary least square (OLS) regressions are used to estimate the treatment effects. Let $T_{ik}$ be a dummy variable that takes the value one if individual $i$ is sent treatment letter $k$, and zero otherwise. The main regression is given by

$$Y^*_{isk} = \gamma_k T_{ik} + \delta_s S_{is} + \varepsilon_{isk}, \tag{7}$$

where $k \in \{A, AN, AI_a, ANI\}$ and $\gamma_k$ are the coefficients of interest. $S_{is}$ are strata dummy variables, and $\varepsilon_{isk}$ is an error term. Our primary tests use robust standard errors.[23] Unless otherwise stated, the data was retrieved from the Swedish Pensions Agency in October 2018, three months after the treatment date.[24]

## 4.1 Treatment effects

We begin by considering the intention-to-treat effects. From regression (7) with the outcome variable $Y^{switch}$, we conclude the following. Information letters that make the savers aware that there exists a cheaper index fund in the chosen category increases the probability of switching from the dominated to the dominating fund by 1.9 percentage points (0.1 percent makes the fund switch in the control group). Letters that eliminate the search costs of finding the dominating fund, by providing its name, increases the probability of switching by an additional 1.2 percentage points. However, information about the expected monetary implication at retirement, of immediately switching to the cheapest fund, does not increase the probability of switching funds, beyond what information about the fee difference (in percent of fund balance) alone achieves. The results are illustrated in Figure 3, which shows the coefficient estimates with 95 percent confidence intervals. Table 3 displays the treatment effects with respect to our hypotheses listed in Section 3.5.

In addition to the outcome variable that states if a saver switches from the dominated to the dominating fund ($Y^{switch}$), we also investigate the outcome variables that indicate if a saver increases the share in the dominating fund ($Y^{l}$), decreases the share in the dominated funds ($Y^{mh}$), as well as any change in the portfolio ($Y^{any}$). The treatment effects on these outcome variables across treatment groups are documented in Table 4 and illustrated in Figure 4. The ordering of the treatment effects is similar for all outcome

[23] For robustness, we also calculate randomization inference p-values. The randomization inference p-values are simulated for other possible randomizations given the design, using Monte Carlo simulations. We use 100 repetitions, respecting strata.

[24] After three months there seem to be small differences in switching behavior between the treatment and the control group, see Figure 29.

| Hypothesis | Treatments compared | Coef. diff. | P-value |
|---|---|---|---|
| **H1** *Awareness* | A - Control | 0.019 | 0.000 |
| **H2** *Search costs* | AN - A | 0.012 | 0.001 |
| | ANI - $AI_0$ | 0.020 | 0.000 |
| **H3** *Monetary implication* | $AI_0$ - A | -0.010 | 0.000 |
| | ANI - AN | -0.003 | 0.476 |

Table 3: Hypothesis tests

*Note*: The outcome variable is the indicator variable for switching from the dominated to the dominating fund $Y^{switch}$. The equality in switches across treatment groups is assessed with Wald-tests. P-values from these tests are presented in column four.

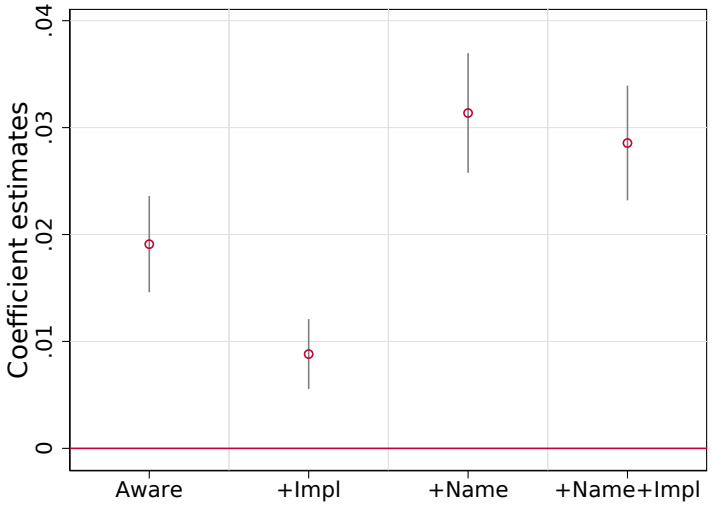



Figure 3: Treatment effects across treatment groups

*Note*: Regression coefficients $\gamma_k$ from equation (7). The outcome variable is the indicator variable for switching from the dominated to the dominating fund $Y^{switch}$. The treatment effects are for treatments A, $AI_0$, AN, and ANI. The control group is the reference and has a mean of 0.001. The 95 percent confidence intervals are depicted around the coefficient estimates.

variables. The largest treatment effect is observed for the outcome variable that indicates a decrease of the share invested in one of the dominated funds. The probability of reducing the share invested in a dominated fund increases by 3.8 percentage points from making the savers aware of the fact that a dominating fund exists (Aware), and by an additional 1.1 percentage point when also providing the name of the dominating fund (Aware+Name). We also note that the treatment effects are insensitive to if we exclude the people who received the reading task.

To study the intensive margin of the treatment effects, we look at *how much* people change the portfolio share invested in the dominated funds. Further, we investigate the change in the portfolio share invested in the dominating fund for those who increase the share in this fund. The change in shares is measured relative to the initial share invested in $\text{Fund}^m$ or $\text{Fund}^h$. In Figure 23 in Appendix E, the distributions of these relative share

changes are displayed. We note that most of the people who reduce the share invested in one of the dominated funds leave these funds completely. Among those who increase the share allocated to the dominating fund there is a larger dispersion in the relative share change, but the distribution is centered around 100 percent of what they had previously invested in the dominated fund. Appendix E also presents the fractions of people that change their behavior in all treatment groups combined, compared to the control group, for different outcome variables.

| | Outcomes | | | |
|---|---|---|---|---|
| Treatments | Switch | Increase L | Decrease M/H | Any change |
| Aware | 0.019*** | 0.020*** | 0.038*** | 0.036*** |
| | (0.002) | (0.002) | (0.004) | (0.005) |
| +Impl | 0.009*** | 0.009*** | 0.023*** | 0.021*** |
| | (0.002) | (0.002) | (0.004) | (0.005) |
| +Impl+Task Reward | 0.018*** | 0.018*** | 0.033*** | 0.030*** |
| | (0.003) | (0.003) | (0.005) | (0.006) |
| +Name | 0.031*** | 0.032*** | 0.049*** | 0.046*** |
| | (0.003) | (0.003) | (0.004) | (0.005) |
| +Name+Impl | 0.029*** | 0.029*** | 0.040*** | 0.038*** |
| | (0.003) | (0.003) | (0.004) | (0.005) |
| Observations | 22,728 | 22,728 | 22,728 | 22,728 |
| $R^2$ | 0.011 | 0.011 | 0.012 | 0.010 |

Table 4: Treatment effects

*Note*: Regression coefficients $\gamma_k$ from regression (7), separately for each outcome variable. The control group is the reference and has a mean of 0.001, 0.002, 0.018, and 0.036, for the respective outcome variables. Robust standard errors are in parentheses, and the corresponding p-values are denoted by: *** p<0.01, ** p<0.05, * p<0.1. P-values from randomization inference are $< 0.000$ in all regressions.

### Awareness and search costs

Our findings show that both a lack of awareness that a selected mutual fund is dominated, and search costs to find a dominating alternative, contribute to dominated financial investments. The results also highlight that providing relatively simple information that compares mutual funds can improve many savers' investment choices. We reject both the null hypothesis related to awareness (H1) and search costs (H2) at a one percent significance level.

We note that the treatment effects from both the letter that increases awareness (A compared to Control) and the letters that eliminate search costs (AN and ANI compared to A and $\text{AI}_0$, respectively) are statistically and economically significant. However, it is likely the case that more savers are not aware of that there exists a cheaper fund with the same index strategy, than what is indicated by the treatment effect. Similarly, the

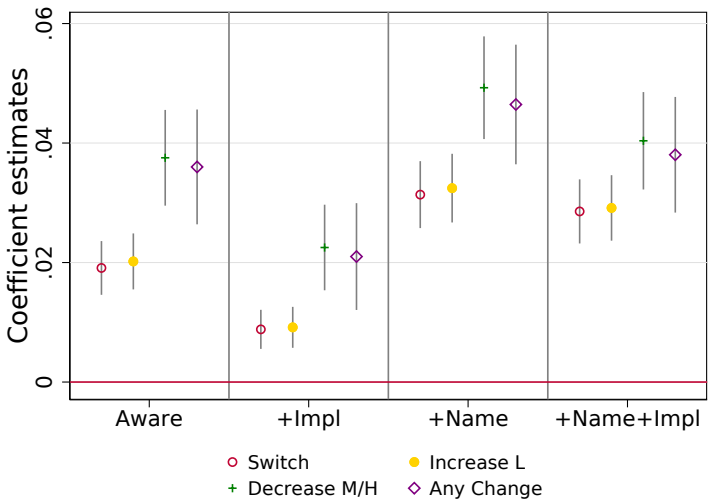



Figure 4: Treatment effects across treatment groups - several outcome variables

*Note*: Regression coefficients $\gamma_k$ from regression (7), with $* \in \{switch, l, mh, any\}$. The control group is the reference and has a mean of 0.001, 0.002, 0.018, and 0.036, for the respective outcome variables. The markers show the point estimates and the vertical lines indicate the 95 percent confidence intervals.

share of savers who find it too costly to search for the cheaper comparable fund is likely larger than suggested by the share of savers who switch to the dominating fund after receiving the treatments that remove search costs. One reason for this discrepancy is a low take-up rate of the information treatments. In fact, the share of savers who confirm with us that they read the letter, among those who received the reading task, indicates that only 11 percent of the people in the treatment groups read the letter that was sent to them. To quantify the role of information and search frictions for dominated fund choices we therefore turn to an assessment of the treatment-on-the-treated effects in Section 4.3.

### Do people exhibit exponential-growth bias?

There is a documented tendency that people underestimate the effect of compound interest, i.e., many people exhibit an exponential-growth bias; see Goda et al. (2015), Levy and Tasoff (2016), and Stango and Zinman (2009). They find that the exponential-growth bias reduces savings. In the monetary implication hypothesis (H3), we test if an exponential-growth bias also influences the investment decision by lowering the perceived future benefit of a lower fee. We compare the treatments where the expected future reward of switching funds is stated (ANI and $AI_0$), to the treatments where only the fund fee difference (in percent of fund balance) between the dominated and the dominating fund is presented (AN and A).

In Figure 3 and Table 3 we see that information about the expected future gain at retirement, of switching to the dominating fund, does not increase the probability of

switching funds, beyond what information about the fee difference alone achieves. In fact, there is a statistically significant negative treatment effect from providing information about the expected financial implication in addition to the information in treatment A (Aware). This finding could suggest that the prior of savers was that the potential gain from a fund switch was instead larger than the stated forecast. When we compute the forecasts for the expected future reward from switching we have to make a number of assumptions related to, for example, the future growth rate of labor income and the returns of the funds (see Appendix D). The growth rate and the returns in our calculations could be lower than what people expect, thereby counteracting a potential exponential-growth bias. Our finding could also be consistent with that some savers become passive as a result of too much information, in line with the information overload hypothesis in, e.g., Agnew and Szykman (2005). Hence, our result does not provide support of previous findings that people tend to underestimate the effect of compound interest, although we can also not rule out an exponential-growth bias among the savers.

In terms of the search cost hypothesis (H2) we note that the treatment effect is larger for the group that also receives the future monetary implication information (the coefficient difference between ANI and $\text{AI}_0$ is 0.020, and the coefficient difference between AN and A is 0.012). We conclude that even though the information about the expected monetary implication alone does not increase the probability of switching funds, it has complementary effects with the treatment that removes search costs. Notably, there is an asymmetry in the complementary effect. When the future monetary implication of a switch is known, additional information that eliminates search costs increases the likelihood of switching funds. However, if the name of the dominating fund is known, additional information about the future monetary implication does not have an impact on the probability of switching funds.

### Heterogeneous treatment effects

How do the treatment effects vary with covariates? We are mainly interested in how treatment effects may differ by gender, age, labor income, and future reward ($R_{it}^{switch}$). For the continuous covariates, we primarily estimate heterogeneity across two quantiles. We also test for a heterogeneous treatment effect across the degree of urbanization of the residential region and between savers in the two dominated funds ($\text{Fund}^m$ and $\text{Fund}^h$). Let $\mathbf{X}_{ij}$ denote covariate $j$ of which we investigate heterogeneous treatment effects. The heterogeneous treatment effects are tested using the following regression, estimated with OLS, where we interact the treatment dummies with the covariates $\mathbf{X}_{ij}$,

$$Y_{isk}^{switch} = \gamma_k T_{ik} + \eta_{kj} T_{ik} \mathbf{X}_{ij} + \rho_l \mathbf{X}_{ij} + \delta_s S_{is} + \varepsilon_{isk}, \tag{8}$$

where $k \in \{A, AN, AI_0, ANI\}$. The coefficients of interest are $\eta_{kj}$.

People with lower labor income and those who reside in relatively rural regions respond significantly less to almost all treatments. People with a lower income have previously been found to be less financially literate (Lusardi and Mitchell, 2007).[25] We also see that people who save in Fund$^m$ react more than savers in Fund$^h$.[26] There are no heterogeneous treatment effects across gender, age, or the expected future reward from switching funds. The estimates from the heterogeneous treatment effect regression, for our main outcome variable switch of funds $Y^{switch}$, are displayed in Figure 5. The results look similar when we investigate heterogeneous treatment effects for the outcome variable $Y^l$. The effects are less pronounced and are in general not significantly different from zero for the outcome variables $Y^{mh}$ and $Y^{any}$. In Figure 6, the heterogeneous treatment effect across labor income is illustrated over earnings quintiles. It appears that the differences stem from the whole labor income distribution.

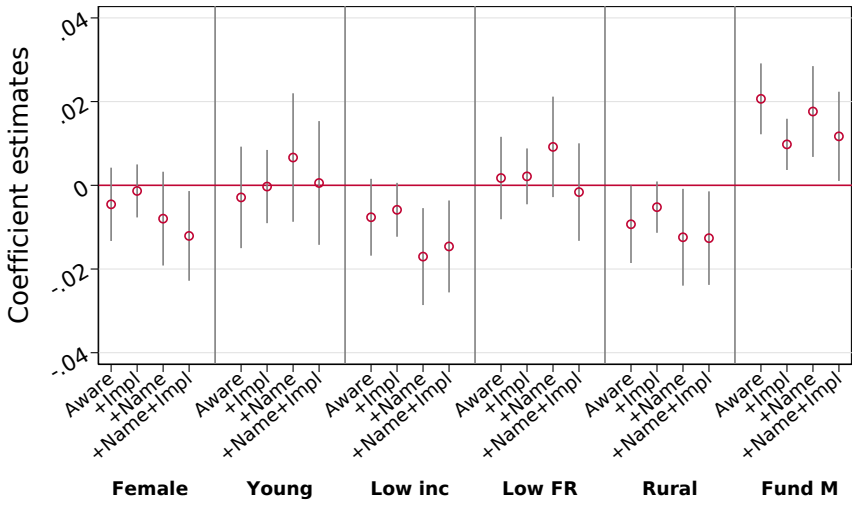



Figure 5: Heterogeneous treatment effects

*Note*: Heterogeneous treatment effects across gender, age, labor income, the expected future reward from a switch, residential region, and fund. Age, labor income, and the expected future reward are each separated into two quantiles; gender is divided into male and female, residential region is divided into urban and rural, and Fund$^m$ is shown relative to Fund$^h$. The coefficient estimates show the relative differences in treatment effects to the other partition of the sample. The outcome variable is the indicator variable for switching from the dominated to the dominating fund $Y^{switch}$. The 95 percent confidence intervals are depicted around the coefficient estimates.

Since one of the main aspects of this study is to analyze frictions and responsiveness to information of savers who were previously active in the fund market, it is informative

[25] Lusardi and Mitchell (2007) and Lusardi and Mitchell (2011) also find that more educated individuals are more financially literate. Since we do not have any information on educational background, we consider labor income to be a proxy for education.

[26] This also holds when restricting the sample to savers who made their fund choice after the introduction of Fund$^l$, i.e., when only considering individuals who made a dominated choice at the time of the choice.

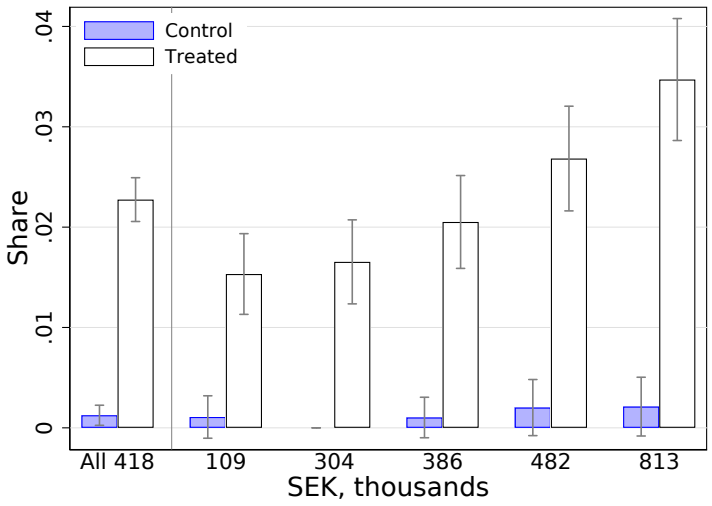



Figure 6: Treatment effects across labor income

*Note*: Shares who switch from the dominated to the dominating fund in all treatment groups combined versus the control group, across labor income quintiles. The vertical lines indicate the 95 percent confidence intervals. Mean earnings in each quintile are depicted under the corresponding bars. 1 SEK is approximately 0.11 USD. The two bars furthest to the left show the average shares.

to consider to what extent treatment effects vary across trading intensity. Figure 7 shows the distribution of the time of the most recent investment choice for the treated sample, and compares those who switched funds to those who did not. In general, the savers who switched funds have made an investment change more recently, although the difference is relatively small. The distributions look similar for the other outcome variables ($Y^l$, $Y^{mh}$, $Y^{any}$). Table 5 shows that the average time since the most recent investment choice is approximately a year longer among those who did not switch funds as compared to those who did. See Appendix E.1 for additional analysis of heterogeneous treatment effects.

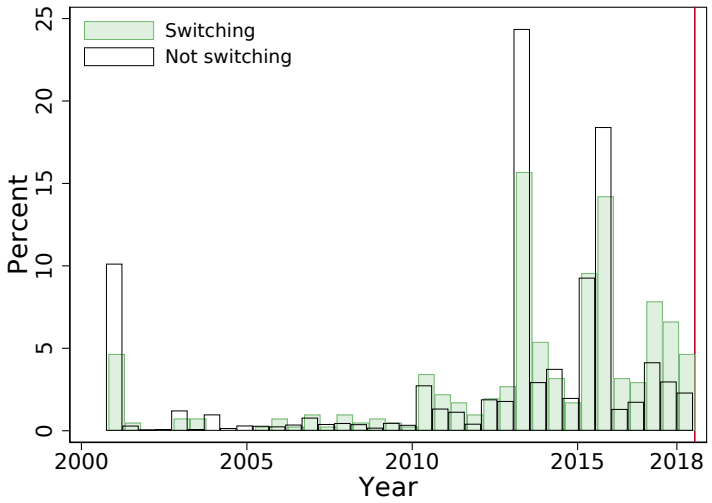



Figure 7: Time of most recent investment change

*Note*: Distribution of the time of the most recent investment change for the treated sample, separated into those who switched funds and those who did not switch funds. The red vertical line shows the treatment date.

| | Control | Treated |
|---|---|---|
| No switch | 6.27 | 6.23 |
| Switch | 4.84 | 5.13 |

Table 5: Years since most recent investment change

*Note*: Means of years since the most recent investment change before treatment, for the control group, and all treatment groups combined, separately for those who switched and those who did not. The data is retrieved from the Swedish Pensions Agency in October 2018.

## 4.2 Information as a policy tool

Although a vast majority of savers do not respond to the information treatments, there are still many savers who improve their investment choices by switching from the dominated to the dominating fund. A full normative analysis of the information treatments is beyond the scope of this paper, but we can evaluate if this type of intervention is justifiable from a cost-benefit perspective. To assess the net consumer gain from the information letters, we consider the cost of the information intervention and the discounted expected gains stemming from the lower fees paid by savers who switch funds. Using exponential discounting with an annual discount rate of 10 percent, the sum of the present values of the expected future rewards that are saved by the people who switched all or parts

of their savings from the dominated to the dominating fund amounts to 287 000 SEK.[27] The distribution of the expected discounted future rewards is displayed in Figure 8. The savings can be compared to the cost of producing and sending all the letters. If we use a conservative estimate of 10 SEK per letter for printing and postal services, the cost of the treatment letters amounts to 180 000 SEK. This implies a present-value net gain of approximately 6 SEK (0.7 USD) per letter, despite the low take-up rate of the treatments of 11 percent, and when considering all the treatment letters combined, including those with smaller estimated effects. Thus, even though the intention-to-treat effects may appear relatively small in magnitude, an information intervention of this kind can still be motivated from a consumer cost-benefit criterion.

There are potential additional gains of these types of information treatments that we do not capture in this simple computation. In particular, the savers could also adjust their fund choices outside of the Premium Pension system. There may be spillover effects on people in the network of the individuals who receive the letters. Furthermore, additional benefits may occur through general-equilibrium effects of increased competition in the fund market, if funds respond by decreasing their fees.[28] This effect would have an impact on all savers in the funds, not only those who switch to the cheaper fund. However, we should also note that this analysis does not consider how the people who benefit from dominated fund choices are affected, i.e., the stakeholders of the fund companies of the dominated funds.

Overall, the fees that can be saved if people switch from dominated to dominating funds are substantial. As noted in Choi et al. (2010), over 200 million USD in expenses on S&P500 index funds alone could have been saved if all savers had chosen the cheapest fund, in 2007. In our setting, the total discounted future reward if all the people in our sample switched all of their savings in the dominated funds to the dominating fund, all else equal, amounts to almost 18 million SEK (approximately 2 million USD). The potential gains are of course even larger if considering all the savings in all the dominated funds in the fund market, and if also considering closet index funds that charge a higher fee than comparable index funds. Thus, the welfare gains to be made for consumers by providing information that facilitates a comparison of similar funds are potentially large.

[27] In the control group, only 0.1 percent switched funds, compared to 2.3 percent in the treatment groups. We adjust for the fees saved by the control group.

[28] However, there could also be adverse effects on fund fees. Importantly, Premium Pension savers are always informed of any increase in fees among the funds they save in.

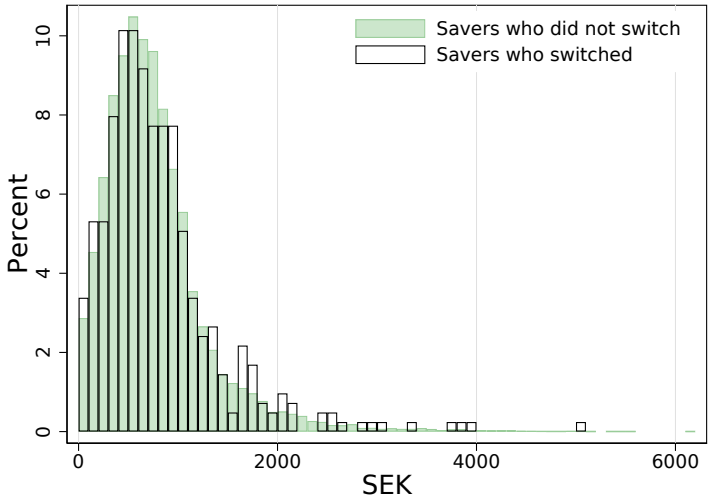



Figure 8: Discounted expected future rewards

*Note*: Distribution of the expected discounted future rewards, separately for those who did and did not switch from the dominated fund to the dominating fund. 1 SEK is approximately 0.11 USD. In total, 414 people switched and 22 314 people did not switch funds.

## 4.3 The role of information and search frictions

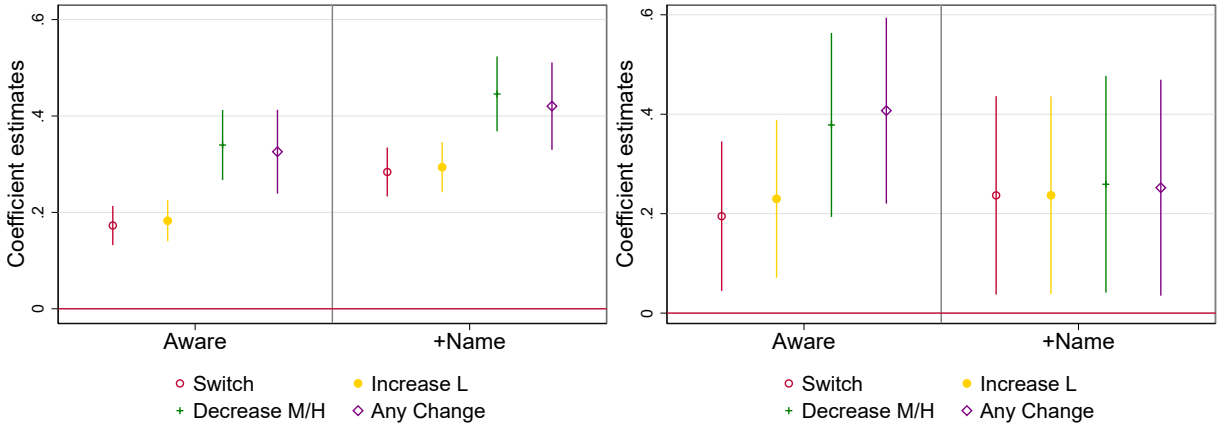
In order to evaluate how effective information letters are as a policy tool, the relevant measures are the intention-to-treat effects presented in the previous sections, i.e., the effects on people who were sent a letter. However, to analyze the role of search and information frictions for dominated fund holdings, we turn to the treatment effects on the treated and focus on how the probability to reduce the holdings in the dominated funds is affected. The treatment-on-the-treated effects can also be relevant for policy makers who have more channels through which they can reach out to citizens.[29] The policy maker can, for example, easily increase the attention state of investors by providing information at the platform when an investor decides to switch funds. To approximate the treatment effects on the treated, i.e., for those who read the letter, we use two approaches. First, we scale the intention-to-treat effects by the reading-confirmation share. Second, we examine the fund choices among the individuals who confirmed with us that they read the treatment letter.

In the first approach to approximate the treatment effects on the treated, we scale the intention-to-treat effects by the reading-confirmation share of 11 percent.[30] This share

[29]The Swedish Pensions Agency estimates that 57 percent of people read their pension forecast letters in 2018 (Pensionsmyndigheten, 2019). The Pensions Agency finds that 83 percent received the letter, 78 percent of those who received it opened it, and 88 percent of those who opened it read it.

[30]11 percent of those who received the reading task, confirmed reading the letter. 13.5 percent confirmed reading the letter in treatment A, and 8.5 percent confirmed reading the letter in treatment AN. These point estimates are not significantly different from each other.

can be viewed as a lower bound for the share that actually read the letters, as there may be individuals who read the letter but who chose to not confirm this with us. Those who did confirm, on the other hand, had definitely read the letter. Hence, the scaled estimates provide upper bounds for the treatment-on-the-treated effects. Importantly, the main treatment effects remain the same if excluding the people who received the reading task. Hence, it is not a problem for the scaled treatment estimates that receiving the reading task can be considered a treatment. The upper-bound estimates are presented in Figure 9a.[31] The scaled effect of the awareness letter for the outcome variable *switch funds* $Y^{switch}$ is 17 percentage points (0.019/0.11). This letter increases the probability that savers lower their share invested in the dominated funds by 35 percentage points (0.038/0.11). For treatments AN (Aware+Name), where the search frictions to identify the dominating fund are eliminated, the scaled effect indicates that the probability of switching to the dominating fund is 28 percentage points higher than for the control group. The largest estimate for the treatment-on-the-treated effect is obtained from treatment AN (Aware+Name), for outcome variable $Y^{mh}$ (decrease in $Fund^m, Fund^h$). Here we find that the probability that a saver decreases the share invested in a dominated fund is 45 percentage points higher than for the control group.




(a) Upper-bound estimates

(b) Those who confirmed reading

Figure 9: Treatment-on-the-treated effects - several outcome variables

*Note*: Regression coefficients $\gamma_k$ from regression (7), with $* \in \{switch, l, mh, any\}$. The markers show the point estimates and the vertical lines indicate the 95 percent confidence intervals. (a) Treatment A and AN, where the coefficients are scaled by the reading-confirmation share. The control group is the reference and has a mean of 0.001, 0.002, 0.018, and 0.036, for the respective outcome variables. (b) Those who received the reading task (subsets of treatment A and AN). The control groups consist of the individuals who received the reading task but who did not confirm reading the letter and have means of 0, 0, 0.029, 0.047 for treatment A, and 0, 0, 0.017, 0.017 for treatment AN, for the respective outcome variables.

[31] The confidence intervals are also scaled and do not reflect that the reading share is only approximated.

In the second approach, we study the treatment effects of only the individuals who were sent the reading task, which is a subset of the people receiving treatment A (Aware) and treatment AN (Aware+Name). Among these individuals we differentiate between those who confirmed to us that they read the letter and those who did not, and compare their fund choices. As noted, it is possible that more people read the letters but chose to not confirm this with us. Hence, the control group may contain compliers, which could cause our estimates to be biased downwards. On the other hand, the individuals who confirmed reading the letter could also be different from those who read the letter but did not confirm this. In particular, since they chose to respond to us it could indicate that they are more likely to also adjust their fund holdings, making the estimates biased upwards.[32] Moreover, one could be worried that receiving the reading task is affecting the treatment. Given these three limitations we have to be cautious in our interpretation of the estimates. Figure 9b shows the treatment effects for the four main outcome variables for those who confirmed to us that they read the letter relative to those who did not. Information that makes savers aware that there exists a cheaper index fund in the chosen category increases the probability of switching to the dominating fund by 20 percentage points, and it increases the probability that savers decrease their savings in the dominated funds by 38 percentage points. When savers also receive information about the name of the dominating fund these point estimates are 23 and 27 percentage points, respectively. These results are largely in line with the upper-bound estimates of the treatment-on-the-treated effects.

The analysis of the treatment effects on the treated suggests that search and information frictions in the fund market are substantial. However, the results also show that unawareness and search costs account for at most 45 percent of dominated fund choices. This finding highlights that a majority of historically active savers remain with their dominated choice, even when search frictions are eliminated.

# 5 Exploratory analysis

In this section, we describe additional analyses regarding uncertainty, time preferences, and search costs. All these factors potentially influence the decision of whether or not to look for improvements in investments.[33]

[32] We do not find any differences in observables between those who confirmed reading the letter as compared to those who did not, as displayed in Table 11 in Appendix E.

[33] See Appendix E.2 for a brief discussion about potential procrastination and the duration of the treatment effects.

## 5.1 Does search uncertainty matter?

A saver that attempts to find a dominating fund may feel uncertain regarding whether he or she has actually found it. A fear of future regret could then contribute to a reluctance to switch funds. To test the importance of this uncertainty for fund choices, we include an additional sub-treatment to treatment letter A (Aware). A subset of treatment letters, denoted A-certain, include a one-attempt offer to verify the name of the dominating fund of the selected investment strategy, at the project website. Figure 27 in Appendix E.2 provides screen shots of the project website, where the savers are first asked to fill out the number of the letter that they received and then the name of the fund.

By comparing treatment Aware and Aware-certain, we test for the importance of the uncertainty with respect to knowing if a fund is the dominating fund, for investment decisions. Our results indicate that this additional benefit does not improve investments, in the sense that more savers switch from the dominated to the dominating fund. Rather, we see significantly smaller treatment effects when the option to verify the name of the dominating fund is given, see Figure 10 and Table 13 in Appendix E. This provides indicative support for the information overload hypothesis in, e.g., Agnew and Szykman (2005). Another reason may be that the opportunity to verify the dominating fund signals that finding it may be difficult.

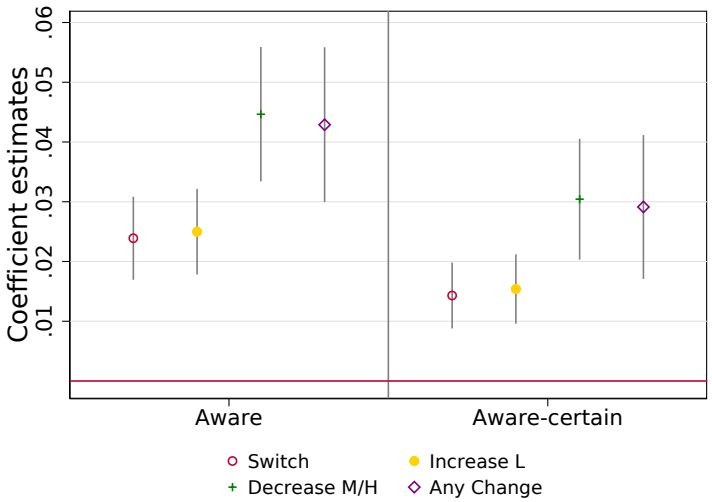



Figure 10: Treatment effects - uncertainty

*Note*: Regression coefficients $\gamma_k$ from regression (7), with $* \in \{switch, l, mh, any\}$, reporting $k \in \{$A, A-certain$\}$. The control group is the reference and has a mean of 0.001, 0.002, 0.018, and 0.036, for the respective outcome variables. The markers show the point estimates and the lines indicate the 95 percent confidence intervals.

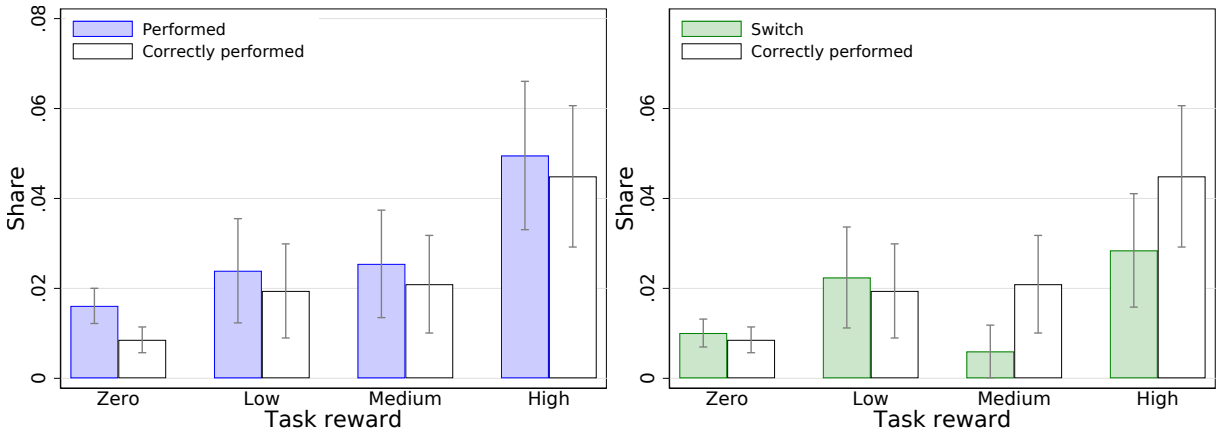
## 5.2 Present bias and mental accounting

Two potential contributing factors to savers not responding to the treatments are that people exhibit a present bias or that they discount future rewards heavily. O'Donoghue and Rabin (1999) discuss how a present bias or self-control problems can lead to procrastination of tasks that involve immediate costs and future rewards. Dahlquist and Martinez (2015) argue that savers may discount locked-in pension savings more than other savings, and that people may use a separate mental account for retirement savings. To fully examine a potential present bias among the savers or the use of separate mental accounts for pension savings, we would like to exogenously vary both the future and the immediate rewards. The different levels of immediate search rewards in treatment $AI_a$ are randomly assigned. However, we are not able to influence the future rewards. To compare how savers respond to increases in immediate rewards versus future rewards we therefore have to rely on that some of the variation in future rewards is arguably unrelated to preferences.[34] The plausibly exogenous variation in expected future rewards stems from differences in the fund fees of the dominated funds, the shares of the Premium Pension account balance allocated to the funds, the timing of historical investment choices, and the cap of contributions to the Premium Pension. We believe that these variations are not related to search costs nor time preferences.

Let us first examine how immediate rewards impact the probability of searching for the dominating fund and switching funds. We find that compensating for the cost of searching for the dominating fund increases the probability of attempting to find this fund as well as correctly identifying it, as shown in Figure 11a. However, the larger share that correctly identifies the dominating fund does not directly translate into fund switches, as illustrated in Figure 11b, and Table 12 in Appendix E. The search rewards increase the probability that a saver searches and switches from the dominated to the dominating fund in general, but for the higher search rewards, there appears to be a greater discrepancy between the fraction of people who correctly identify the dominating fund and the share who actually switches funds. That people are able to identify the dominating fund but choose to not switch to it could indicate that they may not fully comprehend the provided information or the index-fund concept.

Next, how do differences in expected future rewards affect the probability of switching funds? Figure 12 presents the share of savers switching funds across discounted future reward levels, for people receiving treatment ANI (Aware+Name+Impl), which removes search costs and clarifies the expected future reward from a fund switch. Again, we use exponential discounting to compute the present value of the expected future reward from

[34] Some of the variation in expected future rewards could clearly be correlated with time preferences, for example the variation coming from differences in age and labor income.




(a) Search task

(b) Search task and switches

Figure 11: Completing the search task and switching funds

*Note*: (a) Shares that perform the search task and shares that correctly perform the search task, across search-task reward levels, for treatment AI (Aware+Impl). The vertical lines indicate the 95 percent confidence intervals.
(b) Shares that correctly perform the search task and shares that switch from the dominated to the dominating fund, across search-task reward levels, for treatment AI (Aware+Impl). The vertical lines indicate the 95 percent confidence intervals.

switching, for each individual. Given the findings in Dahlquist and Martinez (2015), that people discount pension savings more than other savings, we choose the relatively low yearly discount factor of 0.9. The given variation in discounted future rewards across savers appears to have a low predictive power for the probability of switching funds. This is also true if considering other treatments and different discount rates of the future rewards, as displayed in Figure 25 in Appendix E. Hence, we document that the probability of switching funds increases in immediate rewards, but appears unrelated to future rewards.

That savers use a separate mental account for retirement savings, meaning a heavy discounting of a future reward, fails to explain the relatively low but stable activity level across all discounted future reward levels. The same reasoning applies to present bias. However, we cannot reject that present bias and mental accounting are present, in particular among the subset of savers who choose to not switch funds. Liquidity concerns could potentially explain the relatively strong responsiveness to immediate rewards as compared to future rewards, but are also inconsistent with the stable activity level across future rewards.

## 5.3 How costly is the search for a dominating fund?

We are also interested in how costly people perceive a pension investment decision to be. To shed some light on this, we estimate a cumulative distribution of the search costs

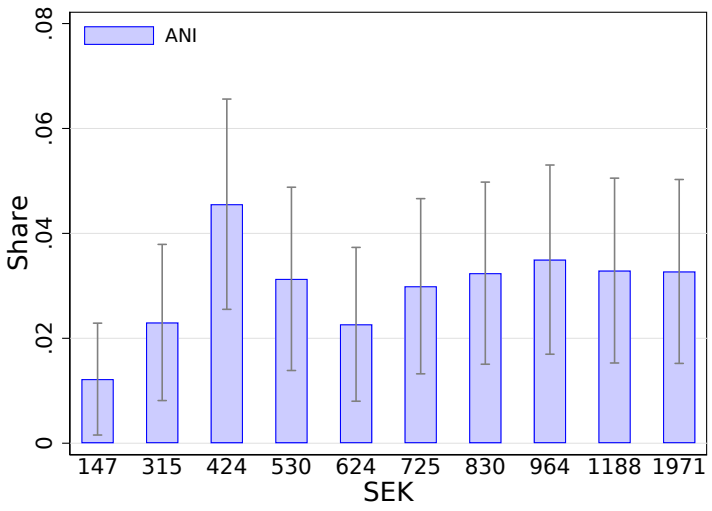



Figure 12: Switches across discounted future rewards

*Note*: Shares that switch funds, across deciles of discounted future rewards, for treatment ANI. The mean discounted future reward of each decile is depicted under the corresponding bar. 1 SEK is approximately 0.11 USD. The vertical lines indicate 95 percent confidence intervals.

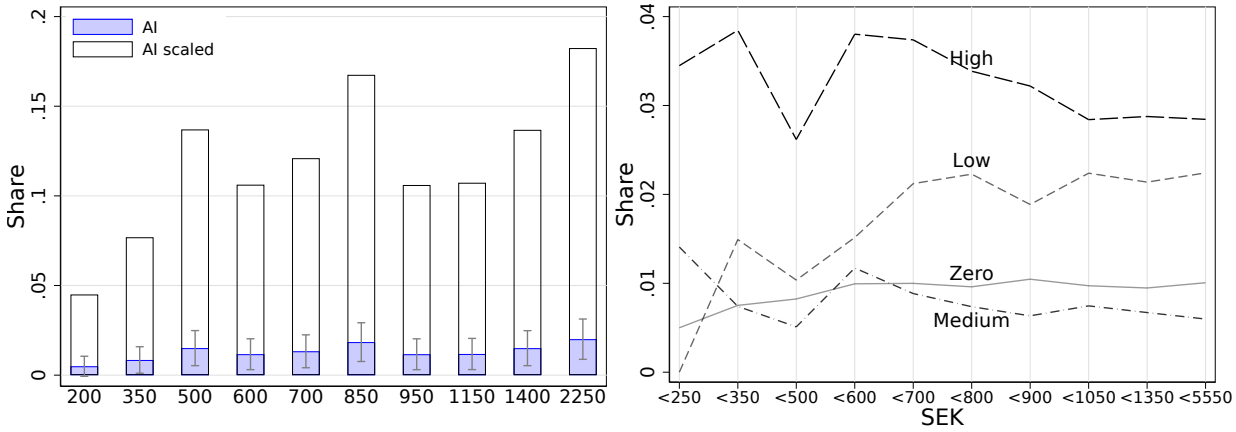
for finding a dominating fund. To estimate a search cost distribution, we make use of how the probability of switching funds varies with different immediate and discounted expected future rewards. For people who complete the search task and switch funds, we assume that the utility from the total present value of the rewards (the immediate search reward and the discounted expected future reward from switching) exceeds the disutility of searching.[35] Thus, for a given present value of the sum of the immediate and expected future reward, the estimated share of people switching funds provides an estimate for the share of people with search costs smaller than this amount. Again, we use exponential discounting to compute the present value of the expected future reward from switching, with a yearly discount factor of 0.9. This is a conservative choice, since it provides relatively low estimates of search costs.[36]

There is likely variation in future rewards that is correlated with search costs, e.g., through variation in labor income and age. However, as discussed in the previous section, some variation in future rewards can be considered as good as random. Regardless, we have to be cautious to interpret our estimated shares of switchers for different reward levels as a true cumulative distribution of search costs.

In Figure 13a, we see that only 18 percent of people are estimated to have search costs

[35]Since the expected future reward is stated in the $AI_a$ (Aware+Impl) letters, we find it reasonable to assume that the individual expectation of the future reward is equal to this amount, i.e., $E_i[R_{it}^{switch}] = R_{it}^{switch}$.

[36]The shape of the estimated cumulative distribution is similar for different values of the discount factor.




(a) Total discounted rewards (SEK)

(b) Discounted future rewards (SEK)

Figure 13: Switches across discounted rewards

*Note*: (a) The share of people who switch funds, across deciles of total discounted rewards from switching (immediate and discounted expected future rewards), for treatment AI (Aware+Impl). The taller bars are scaled by the share who confirmed reading (0.11). The mean total discounted reward of each decile is depicted under each bar. 1 SEK is approximately 0.11 USD. The vertical lines indicate the 95 percent confidence intervals.
(b) The share of people who switch funds, among savers with less than the indicated discounted expected future rewards on the x-axis (not including the immediate rewards). The shares are depicted separately for groups with different immediate rewards from switching, for treatment AI (Aware+Impl), and are not scaled by the share who confirmed reading. The numbers on the x-axis show the highest discounted future reward from switching in each decile of the sample.

smaller than approximately 2 250 SEK.[37] The figure presents the shares of savers switching from the dominated to the dominating fund over quantiles of the present values of rewards. The figure displays the findings for treatment group AI (Aware+Impl), where immediate search rewards are varied. The shares are presented both in terms of the fraction of switches among those who were sent a letter, and scaled by the reading-confirmation share. The scaled shares provide a more conservative assessment of search costs, since it increases the share of savers that can be assumed to have search costs lower than the values on the x-axis. Worth noting, for search costs to fully explain inactivity, the cost for searching for the dominating fund appears large. More than 80 percent of the savers find it more costly than approximately 2 250 SEK (about 250 USD) to search and switch to the dominating fund, as indicated by the rightmost bar with the scaled share. This finding is in line with the results from the treatment letters that remove search costs (AN and ANI), where we conclude that search frictions can account for a substantial share, but not all, of dominated fund holdings. In Figure 13b, we also see that it is mainly the variation in immediate rewards that generates the differences in shares of switchers. As

[37] If we instead use a discount factor of 0.95 (0.85), 17 (23) percent of people are estimated to have search costs smaller than approximately 5 150 (1 300) SEK.

discussed in the previous section, there is no or little variation in switch behavior across levels of discounted future rewards.

To summarize, our results show that information that increases awareness of a dominated fund choice significantly increases the probability of switching funds, and the treatment effects increase in immediate reward levels but are relatively stable across all discounted future reward levels. These findings suggest that alternative economic models that include different psychological frictions may be suitable to explain some savers' behavior. Another hypothesis to investigate in future work is if savers prefer to take a comprehensive approach to their financial investments rather than consider one decision in isolation, despite that this decision could resolve a dominated choice. The cost of reconsidering the whole financial portfolio is likely much larger than deciding on one fund choice, and could hence explain why some savers do not respond to the treatments. Moreover, such an approach could potentially justify the increasing switching rate in immediate rewards but relatively flat switching rate in future rewards, if the cost of assessing the whole portfolio is higher for those with more savings and larger future gains.

# 6 Concluding remarks

This paper studies a long-standing puzzle in household finance: why do savers choose high-fee index funds? An increased understanding of the information and search frictions that contribute to dominated fund choices is beneficial when considering what information and choice architecture can support the decision making process of savers. Refining the choice environment by making relevant information more salient can be a cheap way to not only increase consumer utility but also the competition in the fund market.

The purpose of this paper is twofold. First, we provide an evaluation of an information intervention that alleviates search costs and unawareness about the existence of cheaper, comparable mutual funds. Second, we investigate the role of information and search frictions for dominated fund holdings. To do so, we conducted a large-scale field experiment in the Swedish public pension system. Information letters were sent to people who save in dominated funds, where we tested hypotheses regarding lack of awareness of price dispersion, search costs, and exponential-growth bias. Savers' real pension fund choices were observed and compared across treatment arms, following the letter treatments. By studying a real investment choice among savers who have actively opted out from the default fund and who have chosen a dominated fund, we are able to analyze reasons for dominated choices as well as investment mobility among previously active investors.

Our results show that information letters that inform savers about the existence of a

dominating fund, and remove search costs for identifying this fund, significantly increase the probability that savers switch from the dominated to the dominating fund. Thus, our findings highlight that providing relatively simple information that compares mutual funds can improve investments of many savers. Moreover, our results suggest that a lack of awareness and search costs account for a large share, but at most 45 percent, of dominated fund choices.

Although search and information frictions can explain a large fraction of dominated fund choices, our findings also demonstrate that a majority of savers do not minimize fund fees even when search costs are eliminated. We propose that future studies examine potential causes of the high degree of inertia in dominated pension investments, among previously active investors, when search frictions are removed. Suggested reasons to be explored include a lack of understanding the concept of index funds and/or a disbelief in the own ability to comprehend and evaluate information regarding financial investments, and thus a low willingness to act upon it.

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# Appendices

## A Comments on the pre-analysis plan

This section contains information about differences between the published pre-analysis plan, and the conducted study and the analysis undertaken in this paper. Let us first highlight some changes in notation. The title of the paper is changed from: "The Choice of Pension Funds – An Information Experiment", in the pre-analysis plan. We also renamed the treatment letters to make them more closely connected to their contents.

| Previous name | New name |
|---|---|
| Basic1 | A (Aware) |
| Basic2 | A-certain (Aware-certain) |
| A | AN (Aware+Name) |
| B | $AI_a$ (Aware+Impl) |
| C | ANI (Aware+Name+Impl) |

Further, we renamed the hypothesis *Asymmetric Information* to *Awareness* and the hypothesis *Financial Illiteracy* to *Monetary implication*. The link between the awareness treatment letter and the conceptual framework is also clarified in the paper. In addition, we have in the paper highlighted the relation between the monetary implication and exponential-growth bias.

### Implementation

The experiment was conducted in one round only.[38]

### Data

We did not apply for additional individual data from Statistics Sweden, as we mentioned that we would consider.

### Analysis

In the pre-analysis plan, we stated that we would estimate discount factors. Below, we outline the approach. Unfortunately, the analysis is uninformative due to too little

[38] We pre-specified the possibility of conducting a second round, in order to adjust the total sample size and to get an observation at a different point in time.

variation in the probability of switching funds across different levels of expected future rewards.

In addition to the pre-specified heterogeneity analysis, we analyze heterogeneity across levels of residential urbanization. We also include in the paper some calculations of consumers' net gain of the treatments, which were not pre-specified.

**Do older people pay more attention to pension investments?**

Is there age-dependent attention to pension investments? To attempt to answer this question, we estimate average implied discount factors for cohorts of people, with a different time $t$ until retirement. The variation in the immediate search reward $R^{search}$ and the future reward from switching $R_t^{switch}$ is used in the following regression analysis, where we estimate different coefficients for different cohorts (implied by $t$),

$$Pr(Y^{switch} = 1)_i = \gamma_{0t} + \gamma_{1t} R_i^{search} + \gamma_{2t} R_{it}^{switch} + \gamma_{3t} \mathbf{X}_i + \varepsilon_i, \tag{9}$$

where $\mathbf{X}_i$ are individual covariates, and $t$ denotes years left until retirement. How the probability of switching is affected by future and immediate rewards tells us about how rewards occurring at different points in time are valued, i.e., about time preferences.

The present value (PV) of a reward that is realized $t$ years into the future is given by $\text{PV}(R_t^{switch}) = \beta_t R_t^{switch}$. From equation (9) we have a coefficient $\gamma_{1t}$ that captures how the probability of switching funds varies with the immediate rewards ($R^{search}$), for a cohort with $t$ years until retirement. We define the average implied discount factor $\bar{\beta}_t$ as the factor that equates the average responsiveness in switches from changes in future rewards to that from changes in immediate rewards. The above regression can then be written as

$$Pr(Y^{switch} = 1)_i = \gamma_{0t} + \gamma_{1t} R_i^{search} + \gamma_{1t} \bar{\beta}_t R_{it}^{switch} + \gamma_{3t} \mathbf{X}_i + \varepsilon_i.$$

From the estimation of equation (9), we infer the average implied discount factor, for the age group with $t$ years until retirement, as follows,

$$\hat{\bar{\beta}}_t = \frac{\hat{\gamma}_{2t}}{\hat{\gamma}_{1t}}.$$

To handle the likely endogeneity problem of expected future rewards, we run instrumental variable regressions where we utilize the variation in future rewards that we argue to be exogenous of time preferences and search costs.[39]

[39]Specifically, we use the variation in the expected future reward due to differences in the fund fees of the dominated funds and the shares of the Premium Pension account balance allocated to the dominated

Unfortunately, there is too little variation in the dependent variable, switching funds, across different levels of expected future rewards from switching. However, we see some signs of age-dependent attention when we examine heterogeneous treatment effects across age, see Appendix E.1. Individuals who are closer to retirement tend to react more strongly to the treatments, but the differences are not statistically significant.

# B Descriptive analysis of funds, sample, population, and treatments

## B.1 The funds

| Fund | Index name | No. savers | Fee | Correlation |
|---|---|---|---|---|
| Fund$^m$ | OMXS30 | 31 281 | 0.20 | 0.9982 |
| Fund$^h$ | SIX30 | 19 462 | 0.25 | 0.9960 |
| Fund$^l$ | SIX30RX | 75 858 | 0.00 | 1 |

Table 6: Characteristics of funds

*Note*: Characteristics of the dominated funds, Fund$^m$ and Fund$^h$, and the dominating fund, Fund$^l$. The three indices all track the performance of the 30 most traded shares listed on the Stockholm Stock Exchange. The data is retrieved from the Swedish Pensions Agency. The number of savers only include Premium Pension savers. Fee refers to the net fee after Premium Pension rebates and is stated as a share of the savings in the fund. Correlation refers to the monthly historical correlation with Fund$^l$, since the funds became available for the Premium Pension.

funds.

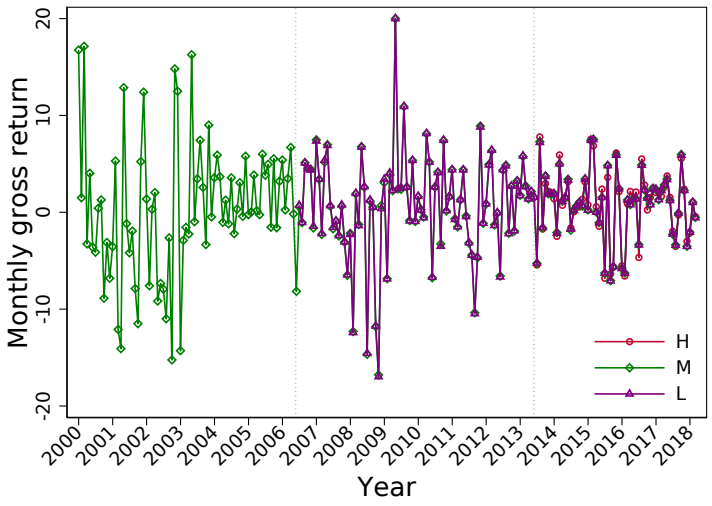



Figure 14: Historical monthly gross returns for the three funds

*Note*: The monthly gross return for the three funds Fund$^l$, Fund$^m$, and Fund$^h$. The gross return shows the return that investors would have received had they not paid any expenses. The gray vertical lines mark the entry of Fund$^l$ and Fund$^h$, respectively. The data is from Morningstar Direct.

## B.2 Sample and population comparison

| | Sample | | | | Population |
|---|---|---|---|---|---|
| Variable | Mean | Std. Dev. | Min | Max | Mean |
| Labor income (SEK) | 416,718 | 376,614 | 0 | $2.82e+07$ | 314,000 |
| Year of birth | 1967 | 7.6 | 1954 | 1993 | |
| Female | 0.46 | 0.50 | 0 | 1 | 0.50 |
| Married | 0.54 | 0.50 | 0 | 1 | 0.44 |
| Future Reward | 4,442 | 4,427 | 0 | 57,500 | |

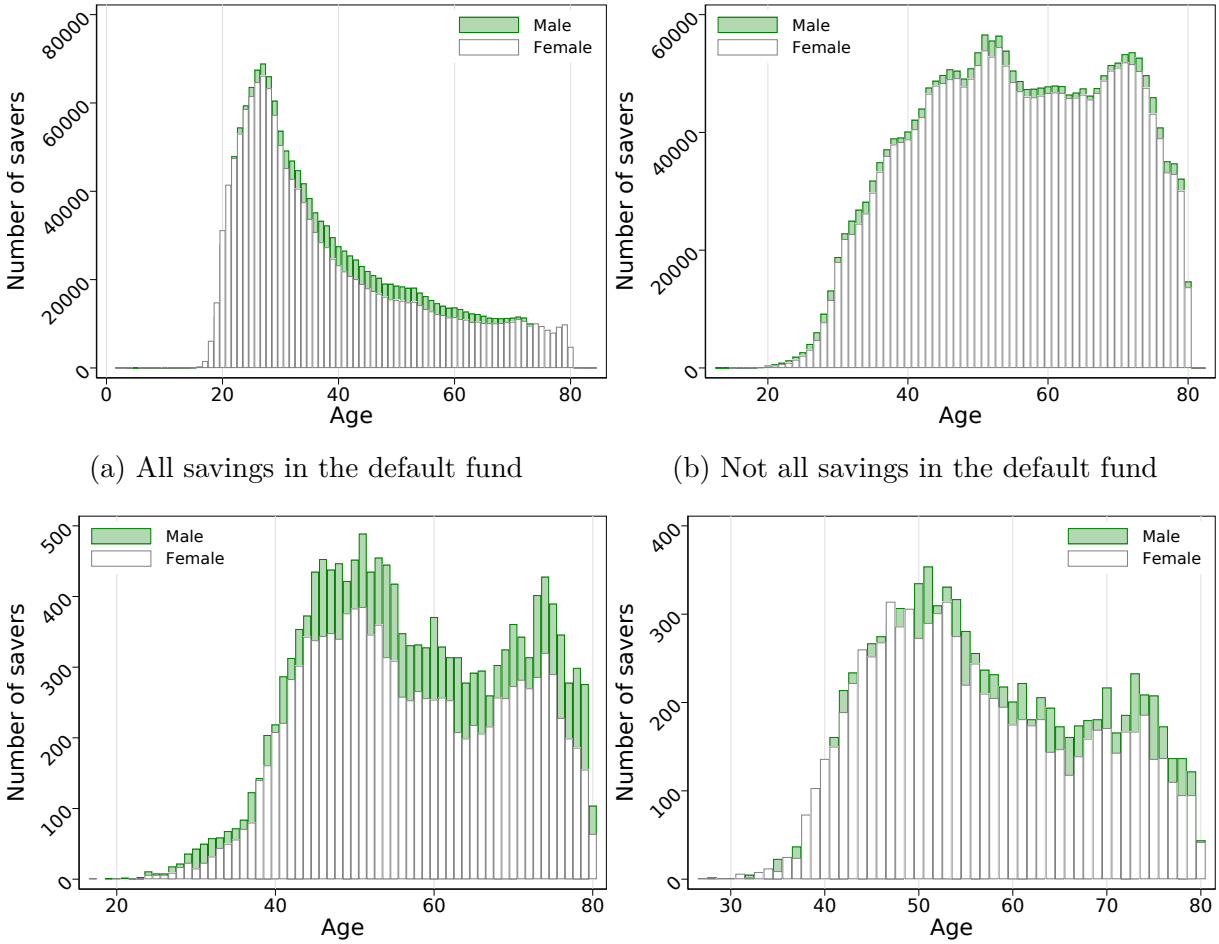
Table 7: Characteristics of the sample vs the Swedish population

*Note*: Characteristics of the sample, savers in Fund$^m$ and Fund$^h$, and a comparison with the Swedish population. The data for the savers in the two dominated funds is retrieved from the Swedish Pensions Agency in June 2018. Labor income refers to the annual labor income in 2016. The labor income in the population refers to the annual labor income in 2016 for the working age population in Sweden: age 20-64 (SCB). 1 SEK is approximately 0.11 USD. The fraction married in the population corresponds to people aged above 20 in Sweden in 2013 (Eurostat).

| Variable | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|
| Savings Fund$^m$ | 49,383 | 60,323 | 0 | 654,782 |
| Savings Fund$^h$ | 30,904 | 48,420 | 0 | 487,706 |
| Savings Fund$^l$ | 70,839 | 47,140 | 0 | 389,969 |
| Fund share, Fund$^m$ | 0.18 | 0.20 | 0 | 1 |
| Fund share, Fund$^h$ | 0.10 | 0.16 | 0 | 1 |
| Fund share, Fund$^l$ | 0.28 | 0.14 | 0 | 0.97 |

Table 8: Savings characteristics

*Note*: Savings (SEK) and fund shares for savers in Fund$^m$, Fund$^h$, and Fund$^l$. Savers in Fund$^l$ are not part of the sample in this study, but are shown for comparison. 1 SEK is approximately 0.11 USD. The data is retrieved from the Swedish Pensions Agency in June 2018.




(a) All savings in the default fund

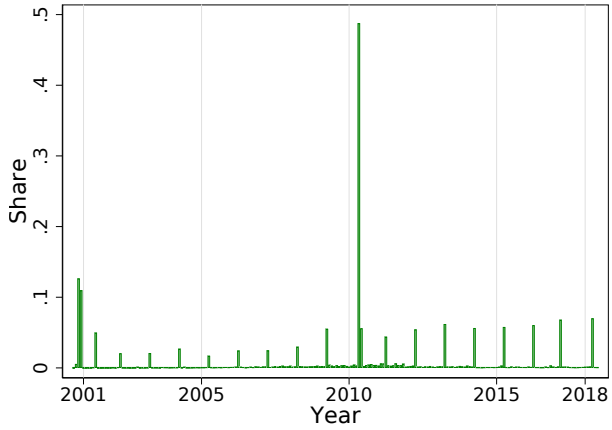
(b) Not all savings in the default fund

(c) Some savings in Fund$^m$

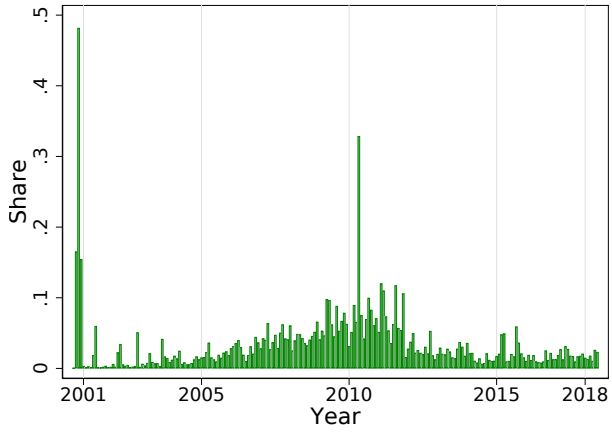
(d) Some savings in Fund$^h$

Figure 15: Age and gender distributions

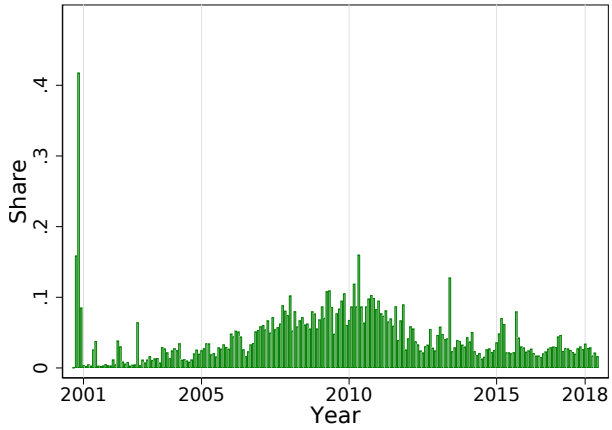
*Note*: Age and gender distributions for all Premium Pension savers, displayed separately for those who save exclusively in the default fund, those who have actively chosen another fund than the default, and for savers in the two dominated funds. The data is retrieved from the Swedish Pensions Agency in November 2018, and shows the cross sections for June 18, 2018.




(a) All savings in the default fund




(b) Not all savings in the default fund




(c) Some savings in Fund$^l$, Fund$^m$, or Fund$^h$

Figure 16: Historical investment activity level

*Note*: Historical presentation of the fraction of savers who make an investment change for the Premium Pension savings, aggregated monthly and displayed separately for those who in June 18, 2018 save exclusively in the default fund, have actively chosen another fund than the default, and savers in Fund$^l$, Fund$^m$, or Fund$^h$. The periodic spikes that occur in December each year correspond to the inflow of new savings for the given year. If there is no change in the investment allocation, the new savings are allocated according to the previously chosen investment shares. In 2010, consultancy firms were allowed to perform automatic switches on behalf of Premium Pension savers, resulting in the significant spike of switches in that year. The data is retrieved from the Swedish Pensions Agency in November 2018.

## B.3 Balance across treatments

Table 9 presents the mean values of pre-treatment characteristics across treatment groups. Distributions of future rewards, fund values in the dominated funds, labor income, and year of birth in the treatment as compared to the control group are displayed in Figure 17.

| | Female | Year of birth | Married | Income | Share in Fund M/H | Years since last change |
|---|---|---|---|---|---|---|
| Aware | 0.46 | 1967 | 0.56 | 421,635 | 0.28 | 6.3 |
| +Name | 0.47 | 1967 | 0.54 | 419,714 | 0.28 | 6.2 |
| +Impl | 0.46 | 1967 | 0.54 | 414,891 | 0.28 | 6.2 |
| +Name+Impl | 0.47 | 1967 | 0.54 | 418,511 | 0.28 | 6.1 |
| Control | 0.44 | 1967 | 0.55 | 415,116 | 0.28 | 6.3 |

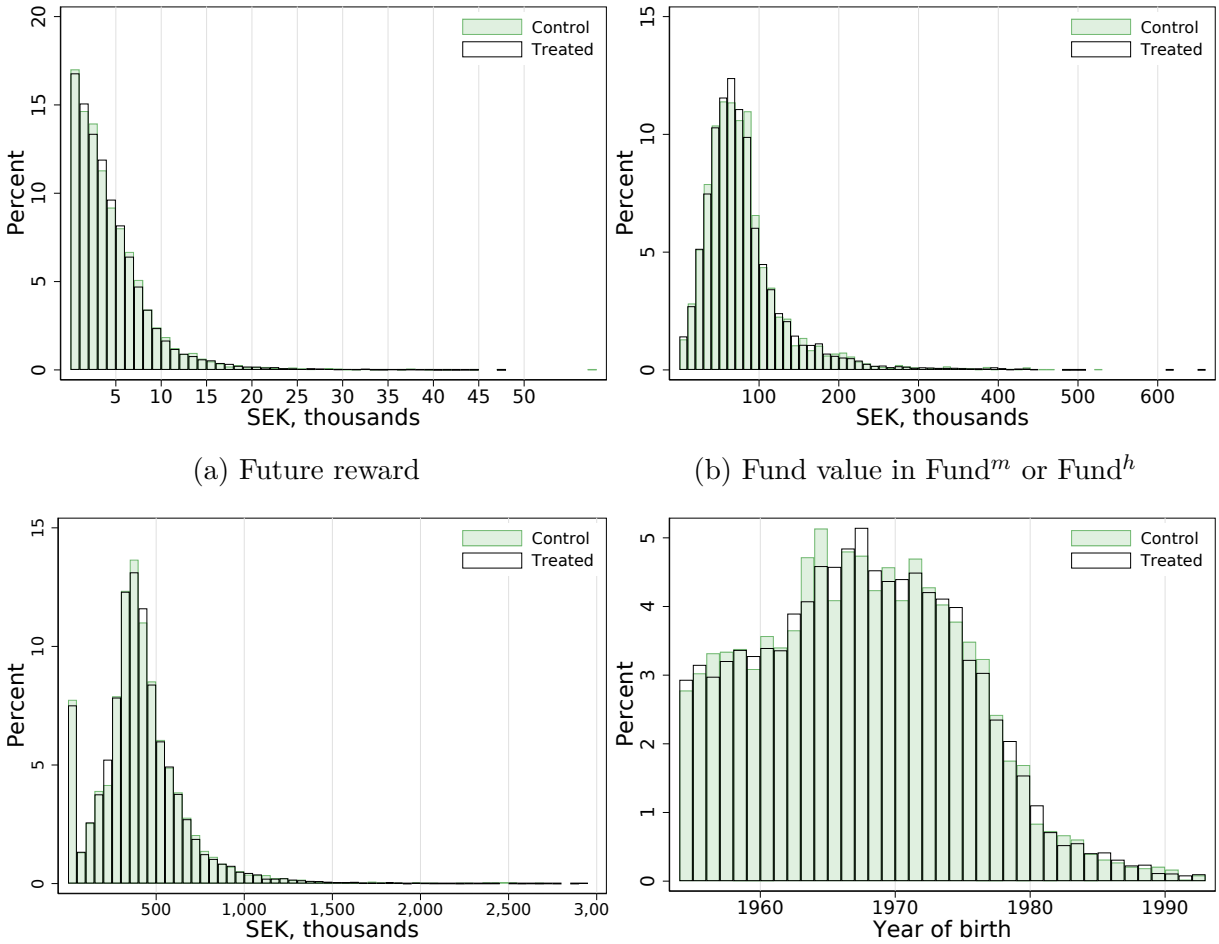
Table 9: Pre-treatment characteristics across treatment groups

*Note*: The table shows mean values of covariates across treatment groups. The covariates Female and Married are in shares. Income refers to the mean annual labor income (in SEK) in 2016. 1 SEK is approximately 0.11 USD. Share in Fund M/H is the portfolio share saved in $Fund^m$ and $Fund^h$. The right-most column shows the average time in years since the most recent investment change. The data is retrieved from the Swedish Pensions Agency in June 2018.

| | Control | Treatment |
|---|---|---|
| Annual income | 415,116 | 418,265 |
| Future reward | 4,464 | 4,436 |
| Savings in fund M/H | 80,682 | 80,181 |
| Year of birth | 1967 | 1967 |
| Share in fund M/H | 0.28 | 0.28 |
| Female | 0.44 | 0.46 |
| Married | 0.55 | 0.54 |

Table 10: Balance of characteristics

*Note*: Mean values of pre-treatment characteristics across the control group, and the treatment groups combined. "Savings in fund M/H" is the value in the dominated fund. The variables Annual income, Future reward, and Savings in fund M/H are presented in SEK. 1 SEK is approximately 0.11 USD.




(a) Future reward

(b) Fund value in Fund$^m$ or Fund$^h$

(c) Labor income

(d) Year of birth

Figure 17: Balance across treatment and control groups

*Note*: Distributions of savers in the treatment groups vs the control group, over (a) Expected future reward from a fund switch, (b) Fund value in the dominated fund, (c) Labor income, and (d) Year of birth. 1 SEK is approximately 0.11 USD. The data is retrieved from the Swedish Pensions Agency in June 2018.

# C Information letter: Aware

All the treatment letters, also fully translated to English, are available upon request.

Information om studien

Stockholms universitet

Det här brevet ingår i en akademisk studie som undersöker olika aspekter kring fondval. Syftet med studien är att ge ökad förståelse kring hur olika typer av information kan påverka fondval. Förhoppningen är att studien ska bidra till förbättrad information kring pensionsinvesteringar. Studien genomförs av forskare vid Stockholms universitet.

Personer som sparar sin premiepension i vissa utvalda fonder är med i denna studie. Vi som forskare använder pseudonymiserade uppgifter från Pensionsmyndigheten i vår analys. Eftersom uppgifterna är pseudonymiserade behandlar vi som forskare varken ditt personnummer, ditt namn eller din adress när vi analyserar uppgifterna. Dessa uppgifter används enbart för att administrera utskick. Uppgifterna som vi analyserar inkluderar fondval för premiepensionen, andel av premiepensionen som placeras i de utvalda fonderna, premiepensionssaldo i fonderna, datum då någon av fonderna valts, ålder, kön, civilstånd, inkomst samt bostadskommun. Den rättsliga grunden för behandling av personuppgifter är att forskning som bedrivs vid svenska lärosäten definieras som allmänt intresse. Vi behandlar din information så att obehöriga inte kan ta del av den. Studiens resultat kommer presenteras i en akademisk artikel. Resultaten och artikeln kommer inte att innehålla några personuppgifter. Den akademiska artikeln kommer att vara tillgänglig vid Stockholms universitet. Pseudonymiserade personuppgifter kopplade till studien bevaras hos forskarna tillsvidare, dock i minst tio år efter det att forskningsresultatet är färdigställt i syfte att kunna göra fortsatta analyser samt för eventuell kontroll av studien.

Du har rätt att inge klagomål till tillsynsmyndigheten Datainspektionen/ Integritetsskyddsmyndigheten. Du har också enligt dataskyddsförordningen (EU 2016/679) rätt att i tillämpliga fall vända dig till Stockholms universitet och begära tillgång till personuppgifter som behandlas om dig och att begära rättelse eller radering av dessa personuppgifter i enlighet med artiklarna 15- 17. Du har rätt att begära begränsning av behandling av personuppgifter som rör dig (art 18) och att invända mot en sådan behandling (art 21). Du har även rätt att begära dataportabilitet i enlighet med artikel 20.

Du har härmed informerats om studien och har du frågor är du välkommen att kontakta oss.

| | |
|---|---|
| Forskningshuvudman: | Stockholms universitet |
| Adress: | Universitetsvägen 10A<br>SE-106 91 Stockholm |
| Tele: | 08-16 20 00 |
| Huvudansvarig forskare: | Per Petterson Lidbom |
| Personuppgiftsansvarig: | Stockholms universitet |
| Dataskyddsombud: | Benita Falenius |
| E-mail: | gdpr@su.se |
| Kontaktpersoner/forskare: | Karin Kinnerud och Louise Lorentzon |
| E-mail: | studie.pension@su.se |

**General information about the letter.**

The information describes that the letter is part of an academic study, the data is analyzed anonymously, it is possible to withdraw from the study, and it contains the contact information of the researcher and relevant people at Stockholm University.

Figure 18: Letter, page 1

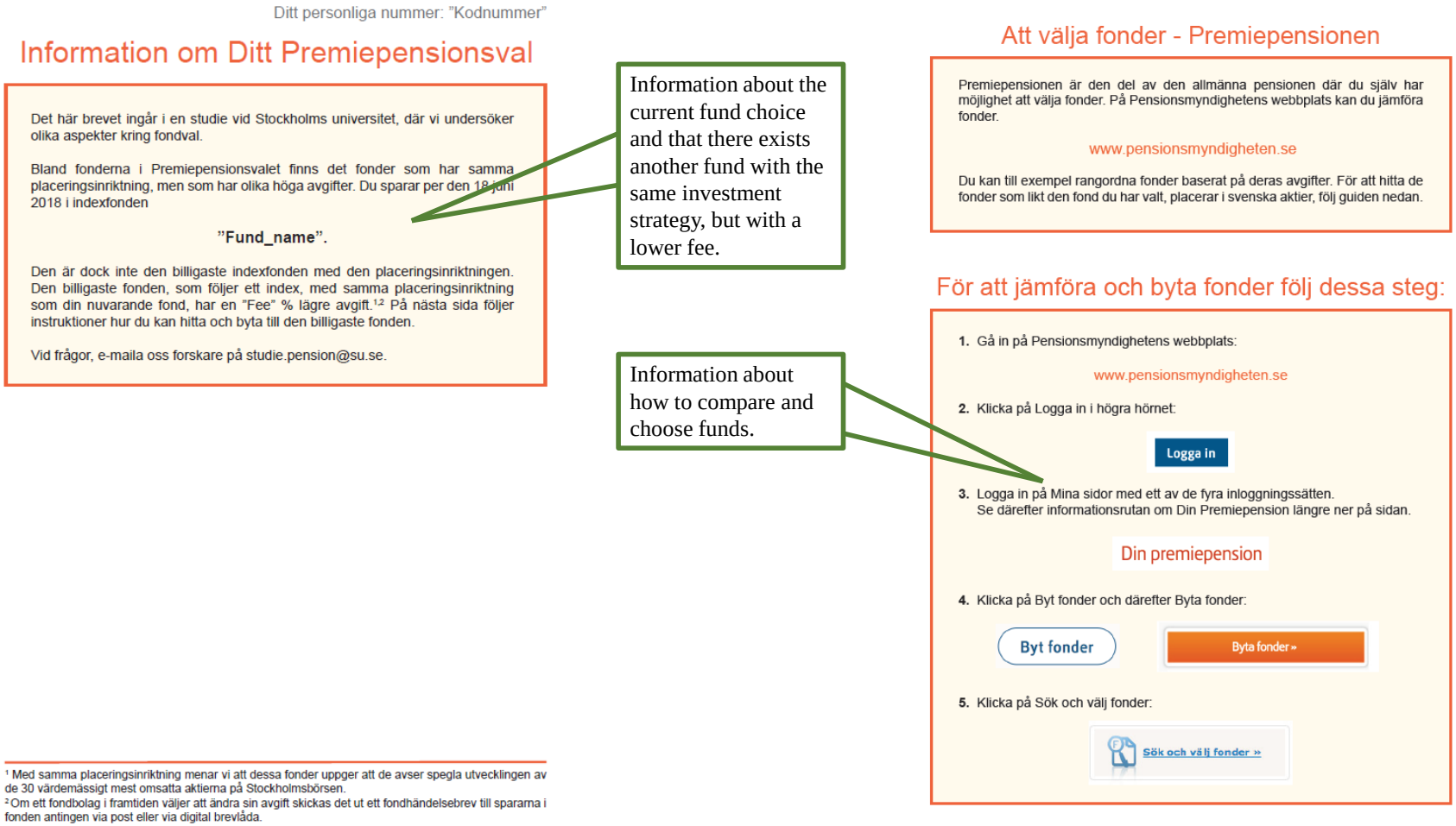



Figure 19: Letter, page 2 and 3

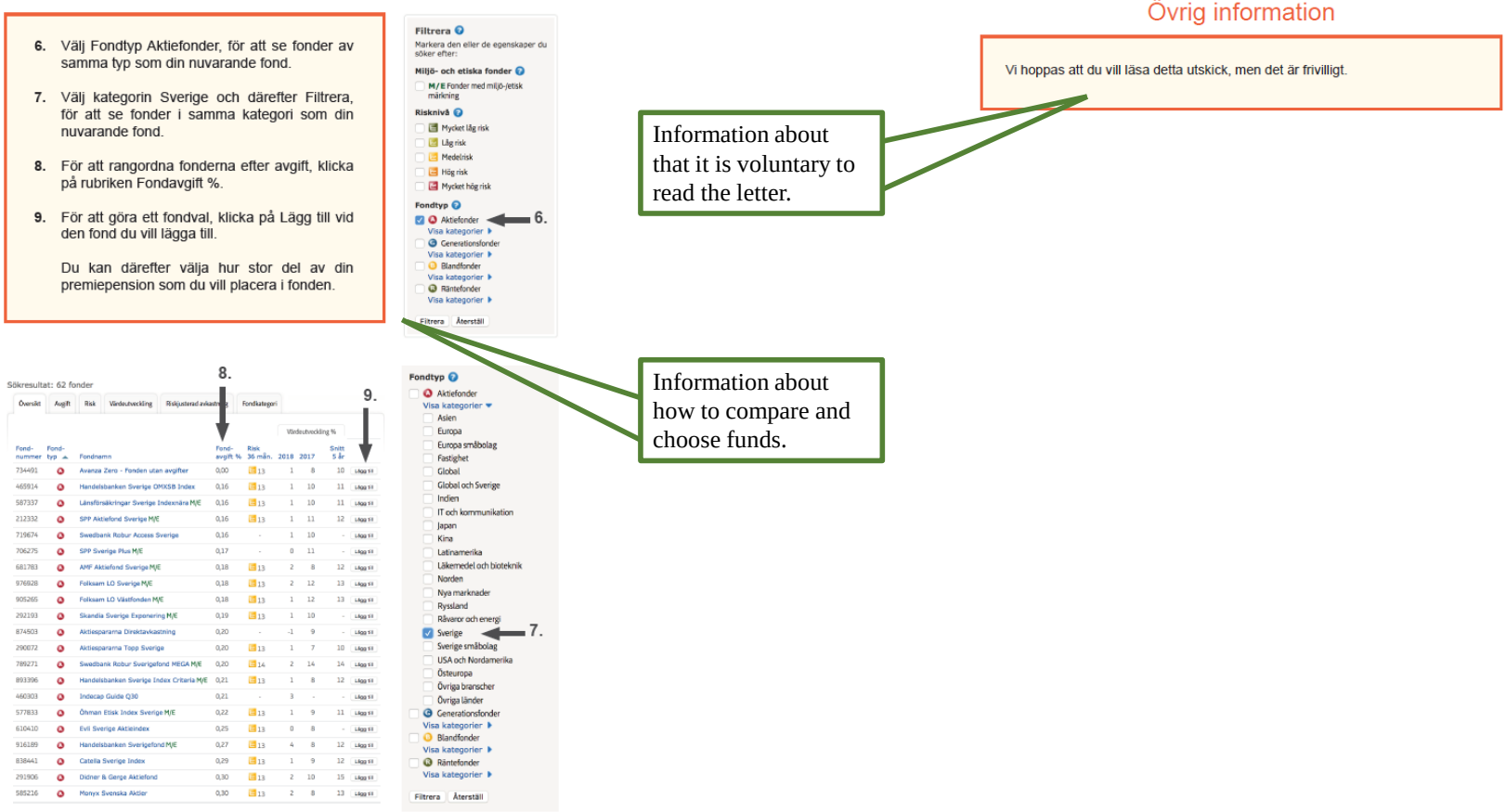



Figure 20: Letter, page 4 and 5

# D Premium Pension forecasts and the expected future reward from a fund switch

In this section, the method and assumptions made to compute the expected future reward at age 65 from an immediate switch is described. We calculate the expected difference in pension savings, between saving in one of the dominated funds and saving in the dominating fund. First, we forecast individual Premium Pension account balances at age 65 under the two scenarios. Second, we compute the difference between the two forecasts. To compute the forecasts, we use individual level data on: age, labor income, fund balance in the dominated fund, portfolio share in the fund, savings rate, as well as data on the Swedish Pensions Agency's administrative fee, fund fees, and fund returns.

The forecasts are based on the following assumptions, from the standard for Swedish pension forecasts, where applicable. The frequency of timing is yearly.

### Income

The yearly labor income for individual $i$, set at time $t$ and paid at time $t+1$, is denoted $y_{it}$. The real labor income growth is assumed to be zero and thus, $y_{it} = y_i \, \forall t$.

### Fund balance

The individual Premium Pension fund balance in one of the dominated funds, at time t, is denoted $k_{it}$. $k_{it}$ corresponds to the fund balance at the beginning of year $t$, when the contribution from the previous year has just been added to the account.

For the forecasts, we assume that the portfolio shares in the chosen funds for the Premium Pension are constant over time. We also assume that the current fund balance in the dominated fund corresponds to the share of the Premium Pension account allocated to that particular fund.[40]

### Savings rate

The savings rate for the Premium Pension is a share $s$ of labor income, up to an earnings cap $y^{cap}$. The savings rate and the cap are assumed to be constant for all future time periods. Thus, for individual $i$, at time $t$, the savings rate as a share of labor income is

[40] If the chosen funds have realized different net returns since the allocation choice was made, this assumption may be violated. However, this assumption only has an impacts when the cap of the administrative fee is reached, and how much of the administrative fee is paid from the considered fund, as discussed below. The administrative fee is small relative to expected fund returns and fund fees, and hence its impact on the forecast is low.

provided by

$$s_{it} = \min\{s, s \cdot y^{cap}/y_{it}\}.$$

Given the assumption of zero real labor income growth, the savings rate is constant over time for a given individual, i.e., $s_{it} = s_i \, \forall t$.

### Administrative fee

The Swedish Pensions Agency's administrative fee is a share $a$ of the total portfolio balance, up to an account balance cap $AB^{cap}$. The administrative fee is assumed to be constant for all future time periods. To compute if and for what time periods the administrative fee cap applies, we assume that the current share $\theta_i$, of the Premium Pension account balance that is allocated to the dominated fund, remains the same in the future. In other words, we assume that the funds in the current portfolio have the same net return.[41] Thus, for individual $i$, at the end of year $t$, the administrative fee, as a share of the fund balance in the fund considered, is given by

$$a_{it} = \min\left\{a, a \cdot \frac{\theta_i \cdot AB^{cap}}{k_{it}(1+R)}\right\},$$

where $R$ denotes the gross real rate of return of the fund.

### Fund fees

The fund fee $f$ is a yearly rate of the fund balance. We assume that the fund fees of the three funds are constant over time, $f \in \{f^h, f^m, f^l\}$.

### Fund return

The expected gross real rate of return of the funds is denoted $R$, and is assumed to be constant over time. The expected net real rate of return of a fund in year $t$ is given by the gross real rate of return minus the fund fee and the administrative fee expressed as a share of the fund balance, i.e., $r_{it} = R - f - a_{it}$.

[41] The assumption of constant portfolio shares only affects when the cap of the administrative fee is reached, and how much of the administrative fee is paid from savings in the considered fund.

## D.1 Premium Pension savings forecast computation

The expected fund balance, $q$ years into the future, at year $t$, is given by

$$k_{i,t+q}(f) = k_{it} \prod_{n=0}^{q-1} (1 + r_{i,t+n}(f)) + \sum_{j=0}^{q-1} \left[ s_i \theta_i y_i \prod_{n=q-j}^{q-1} (1 + r_{i,t+n}(f)) \right]$$

where

$$\begin{aligned}
&\prod_{n=q}^{q-1} (1 + r_{i,t+n}(f)) = 1 \\
&\prod_{n=q-1}^{q-1} (1 + r_{i,t+n}(f)) = (1 + r_{i,t+q-1}(f)) \\
&r_{it}(f) = R - f - a_{it} \\
&f \in \{f^h, f^m, f^l\}.
\end{aligned}$$

The current ($t = 0$) expected difference in pension savings, $q$ years into the future, based on fund fee differences, is

$$\begin{aligned}
R_{iq}^{lh} &= k_{i,q}(f^l) - k_{i,q}(f^h), \\
R_{iq}^{lm} &= k_{i,q}(f^l) - k_{i,q}(f^m),
\end{aligned}$$

where $R_{iq}^{lh}$ and $R_{iq}^{lm}$ denote the differences generated by the high and medium fees compared to the low fee, respectively. These variables are what we refer to as $R_{it}^{switch}$, the future reward from switching, in the paper.

## D.2 Data

The individual labor income level is the most current yearly labor income available (2016). The individual fund balance in a dominated fund is retrieved in June, 2018. All new contributions are allocated in accordance with the reported portfolio shares as of June 2018.

A savings rate of $s = 2.5\%$ is based on the savings rate in 2018 and is assumed to be constant in all future time periods. With the 2016 labor income data, the savings rate cap applies when the earnings exceed $y^{cap} = 444\,750$ SEK (2016), based on

$$\begin{aligned}
y^{cap} &= 7.5 \cdot 2016 \text{ income base amounts} \\
&= 7.5 \cdot 59\,300 \text{ SEK} \\
&= 444\,750 \text{ SEK}.
\end{aligned}$$

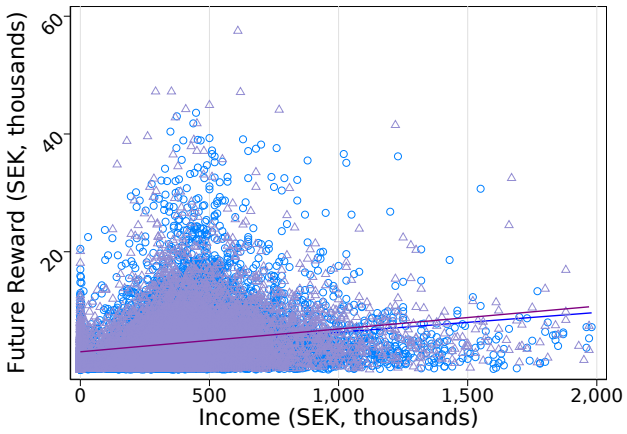
The administrative fee in 2016 was $a = 0.11\%$ of the total portfolio balance up to a fee cap of 120 SEK. Thus, the fee cap applies when the total portfolio balance exceeds $AB^{cap} = 120/0.0011 = 109\,091$ SEK. For the yearly gross real rate of return of the funds, we use the Swedish Pensions Agency's assumption for stocks of $R = 2.7\%$.[42]

The forecast is stated in constant 2018 SEK. Data on labor income and the Pensions Agency's administrative fee cap are from the end of 2016. The letters with the forecasts were sent in July, 2018. We adjust the 2016 SEK data for inflation, using the Consumer Price Index (CPI) in January 2017 and May 2018 (the most current CPI level as of July 5, 2018). The inflation adjustment is given by

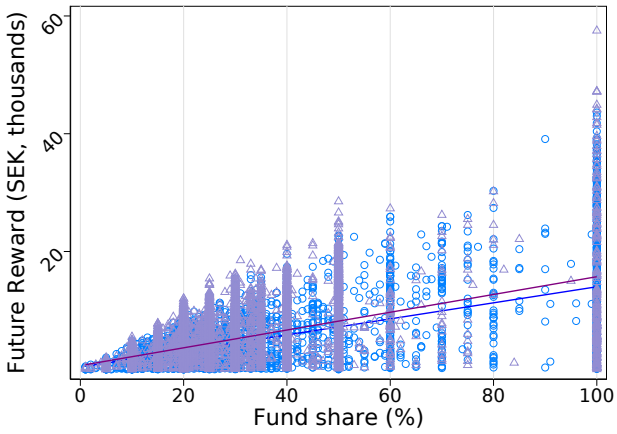
$$\pi_{adj} = \frac{I^{2018}_{May}}{I^{2017}_{Jan}} \approx 1.0325.$$

## D.3 Distributions of expected future rewards

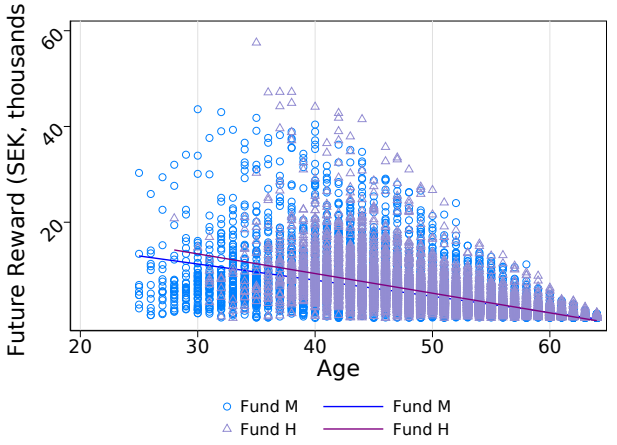
[42]The Swedish Pensions Agency's assumption of fund returns in general is $R = 2.1\%$, but since the funds we consider only contain stocks, we use their specific assumption for stocks.




(a)




(b)




(c)

Figure 21: Expected future reward distributions

*Note*: Distributions of the expected future reward at age 65 from immediately switching from the dominated to the dominating fund, over current labor income (a), fund share allocated to the dominated fund (b), and age (c). The data is retrieved from the Swedish Pensions Agency in June 2018. Labor income in graph (a) is capped at 2 million SEK.

# E Additional results and robustness checks

Unless otherwise stated, the data is retrieved from the Swedish Pensions Agency in October 2018. Figure 22 presents the shares of households, unconditional on strata, that change their behavior in terms of different outcome variables, for all treatment groups combined, compared to the control group.

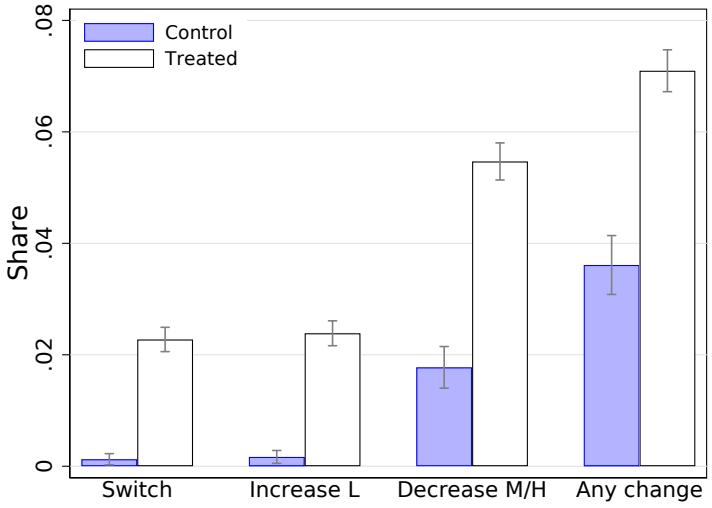



Figure 22: Outcomes across all treatment groups and the control

*Note*: Shares of changes across the different outcome variables ($Y^{switch}$, $Y^{l}$, $Y^{mh}$, $Y^{any}$), for all treatment groups combined compared to the control group. The lines indicate the 95 percent confidence intervals.

| | Did not confirm | Did confirm | P-value |
|---|---|---|---|
| Annual income | 410,207 | 429,654 | 0.47 |
| Future reward | 4,509 | 4,232 | 0.48 |
| Savings in fund M/H | 85,215 | 79,193 | 0.30 |
| Year of birth | 1967 | 1967 | 0.75 |
| Share in fund M/H | 0.28 | 0.27 | 0.52 |
| Female | 0.44 | 0.45 | 0.92 |
| Married | 0.58 | 0.63 | 0.31 |

Table 11: Characteristics across reading confirmation

*Note*: Mean values of characteristics for those who did not confirm, and those who did confirm reading the letter. P-values are from t-tests of equality of means. "Savings in fund M/H" is the value in the dominated fund. The variables Annual income, Future reward, and Savings in fund M/H, are presented in SEK. 1 SEK is approximately 0.11 USD.

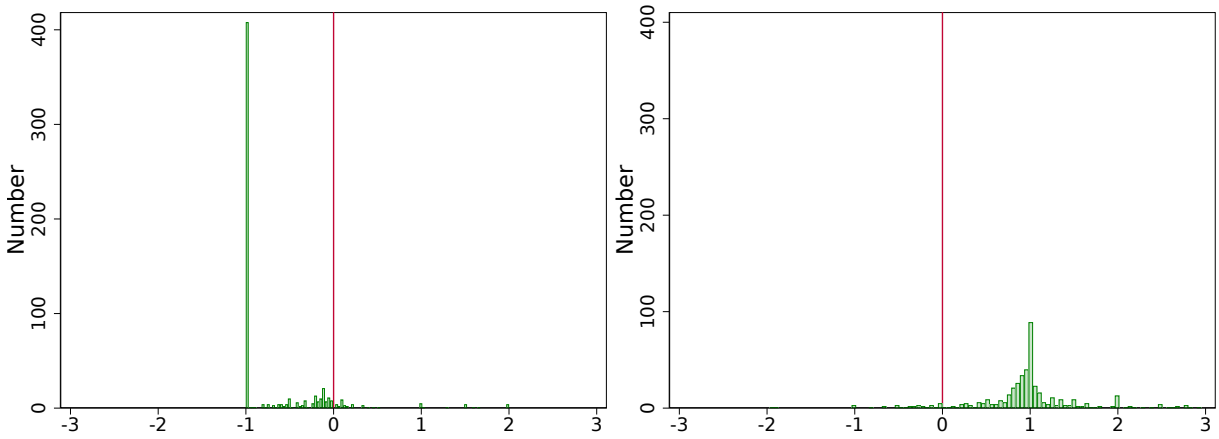
| Reward comparison | Correct search | | Switch | |
|---|---|---|---|---|
| | Coef. diff. | P-value | Coef. diff. | P-value |
| Low-Zero | 0.011 | 0.05 | 0.019 | 0.04 |
| Medium-Zero | 0.012 | 0.03 | -0.014 | 0.23 |
| High-Zero | 0.036 | 0.00 | 0.018 | 0.01 |

Table 12: Coefficient differences - search rewards

*Note*: The table shows the differences in coefficients across reward levels, separately for the outcomes correctly completing the search task, and for switching funds. The p-values are from Wald tests, testing the equality of the coefficients.

Figure 23 shows the changes in fund shares relative to the initial shares invested in Fund$^m$ or Fund$^h$. The outcome variables for fund share changes are defined as follows,

- $Y_{ik}^{share,mh} \in [-1, 100]$, the change in the portfolio share invested in the dominated fund relative to the initial share;
- $Y_{ik}^{share,l} \in [-99, 100]$, the change in the portfolio share invested in the dominating fund, relative to the initial share invested in the dominated fund.[43]




(a) Relative fund share changes: Fund$^{mh}$ (b) Relative fund share changes: Fund$^l$

Figure 23: Relative fund share changes

*Note*: Fund share changes relative to the initial share invested in Fund$^m$ or Fund$^h$. The distributions show only those who made the relevant fund share change. For visual purposes, the x-axes are cut at -3 and +3.

[43]The fund share is chosen in increments of 0.01.

| | Aware | Aware-certain | P-values |
|---|---|---|---|
| Switch | 0.024 | 0.014 | 0.032 |
| Increase L | 0.025 | 0.015 | 0.038 |
| Any change | 0.043 | 0.029 | 0.093 |
| Decrease M/H | 0.045 | 0.030 | 0.049 |

Table 13: Treatment effects - uncertainty

*Note*: Treatment effects for Aware and Aware-certain. The p-values are from Wald tests of the coefficient equality between the treatment groups Aware and Aware-certain.

## E.1 Heterogeneous treatment effects

### Year of birth

Heterogeneous treatment effects for the outcome variable switching funds over year of birth quintiles are presented in Figure 24. The tendency that the oldest quintile responds relatively strongly is present also for the other outcome variables ($Y^l$, $Y^{mh}$, $Y^{any}$). However, how the youngest group responds relative to the other quintiles varies depending on the outcome variable.

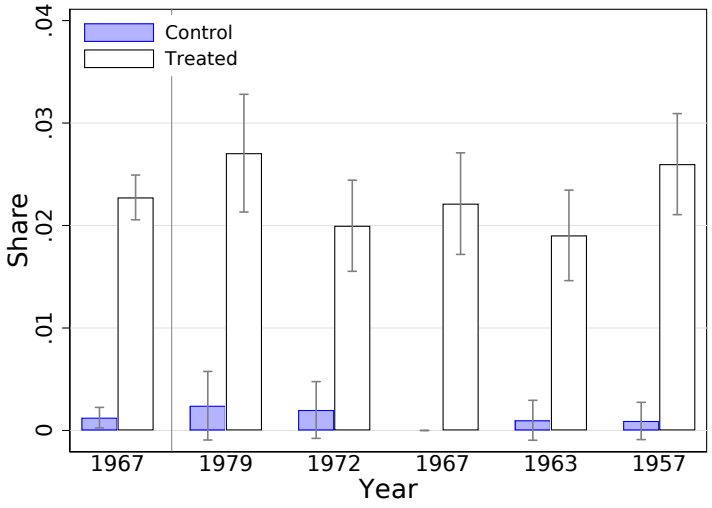


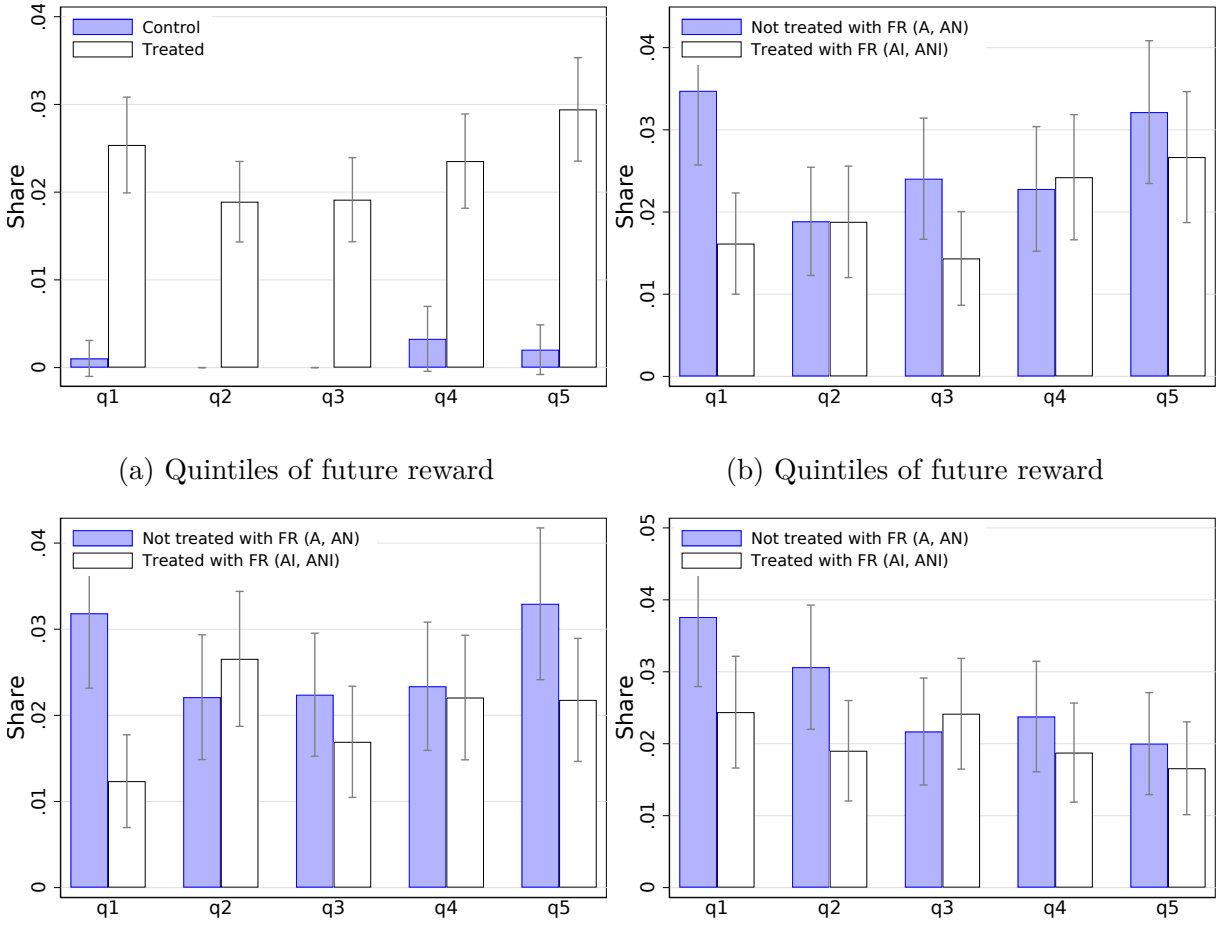

Figure 24: Heterogeneous treatment effect across year of birth

*Note*: Shares of people switching funds, by year of birth quintile, separate for the control group and all treatment groups combined. The mean year of birth in each quintile is shown below the corresponding bars. The left most bars show the averages for all.

### Expected future reward from switching

Figure 25 displays heterogeneous treatment effects across quantiles of different specifications of the expected future reward from switching. We conclude that there are small

differences between treatment groups where the expected future reward is explicitly stated versus those where only the fee difference between the dominated and dominating funds is presented. In general, there appear to be small differences in responses across expected (discounted) future reward quintiles. This is evident also for the other outcome variables ($Y^l$, $Y^{mh}$, $Y^{share}$). When we normalize the discounted future reward by current labor income, we see that the higher quintiles respond less.




(a) Quintiles of future reward

(b) Quintiles of future reward

(c) Quintiles of discounted future reward

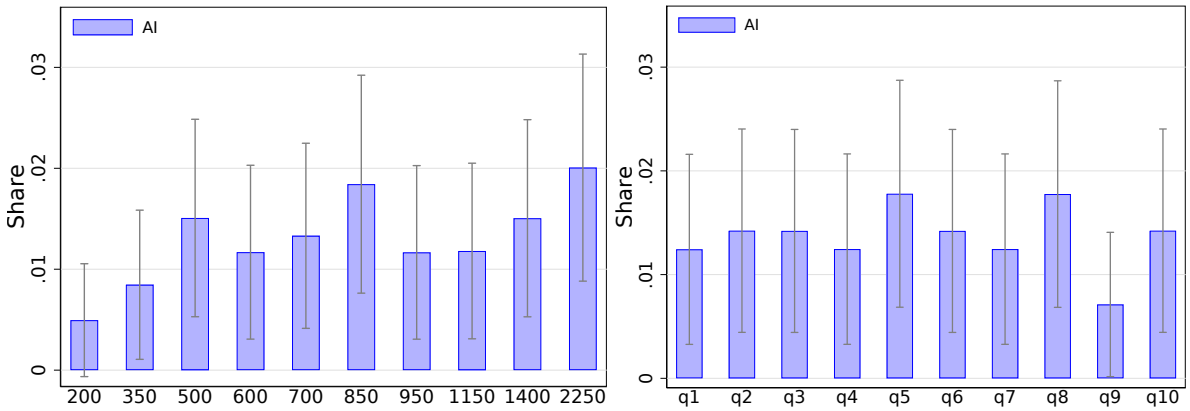
(d) Quintiles of discounted future reward over labor income

Figure 25: Heterogeneous treatment effects across future rewards

*Note*: Shares of savers switching from the dominated to the dominating fund, across (a) quantiles of the expected future reward from switching, all treatment groups vs the control (b) quantiles of the expected future reward from switching, for groups treated with information about the expected reward from switching ($AI_0$, ANI) vs groups that were not treated with this information (A, AN) (c) quantiles of the discounted expected future reward from switching, for groups treated with information about the expected reward from switching ($AI_0$, ANI) vs groups that were not treated with this information (A, AN) (d) quantiles of the discounted expected future reward from switching divided by labor income, for groups treated with information about the expected reward from switching ($AI_a$, ANI) vs groups that were not treated with this information (A, AN). The lines indicate the 95 percent confidence intervals.

### Expected total reward from switching

Figure 26 presents heterogeneous treatment effects for different quantiles of the total expected discounted future reward from switching, and in the second panel, this measure is normalized by labor income. The total reward amount includes both the expected discounted future reward and the immediate search reward. The figure displays the shares of savers switching funds in treatment group AI, where immediate search rewards are offered.




(a) Deciles of total discounted rewards

(b) Deciles of total discounted rewards over labor income

Figure 26: Heterogeneous treatment effects across total discounted rewards

*Note*: Shares of savers switching from the dominated to the dominating fund, across (a) deciles of the total expected discounted future reward from switching, treatment AI (the mean within each decile is displayed below in SEK, 1 SEK is approximately 0.11 USD) (b) deciles of the total expected discounted future reward from switching over labor income, treatment AI. The vertical lines indicate the 95 percent confidence intervals.

## E.2 Additional analyses and results

### Uncertainty


Figure 27: Screenshots of the project website

*Note*: (a) Please fill out the number that is printed in the top-right corner of your letter. (b) Please fill out the fund number of the fund we asked about. (c) Unfortunately, incorrect answer. Thank you for participating! (d) Correct answer! You have found the cheapest fund that follows this index.

### Procrastination and task completeness

We observe the dates when people complete the search task, the reading confirmation, and the verification of the dominating fund name, and *switch funds*. As seen in Figure 28 we find no direct signs of procrastination.

### Duration of treatment effects

A distribution over the dates of fund switches from the dominated to the dominating fund, following the treatment date is displayed in Figure 29. The distributions look similar for the other outcome variables ($Y^l$, $Y^{mh}$, $Y^{any}$). In Figure 30, we observe the share of savers that log into their Premium Pension accounts at the Pensions Agency's website, for the treated versus the control group.

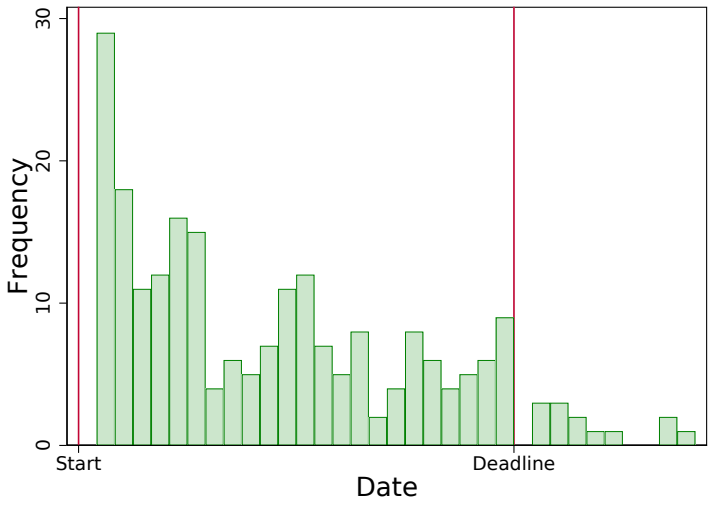



Figure 28: Time of task completeness *Note*: Distribution of the time when the search task, the reading confirmation, or the verification of the dominating fund name, was performed, for the people who completed these tasks. The vertical red lines indicate the treatment date, and the deadline to receive the immediate search reward, the reading confirmation compensation, and to perform the name verification. The time from the start to the deadline was 22 days.

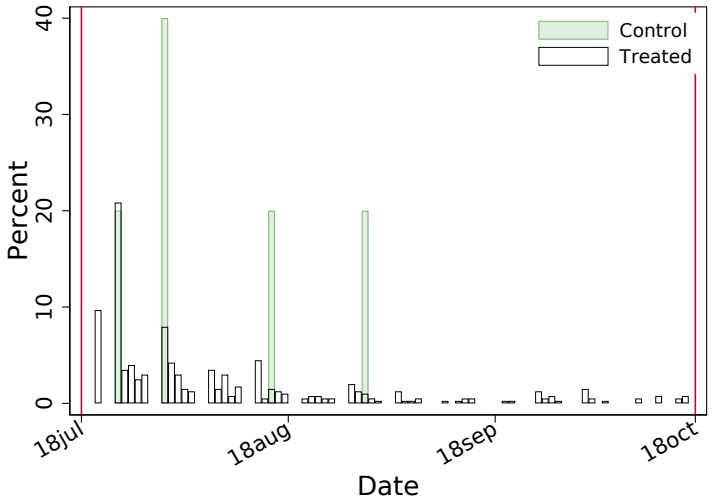
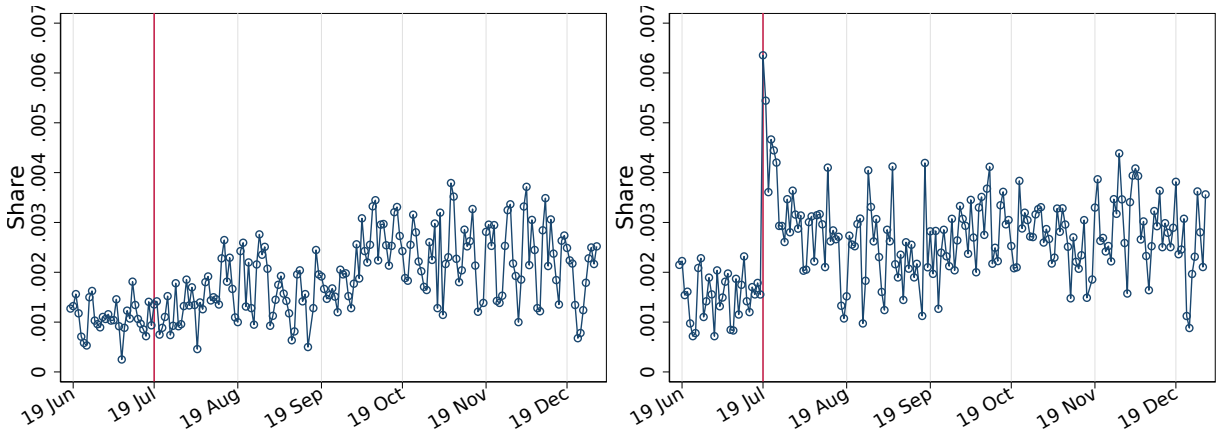



Figure 29: Time of fund switches

*Note*: Distribution of the time of fund switches, following the treatment, shown separately for the control group and all treatment groups combined. The vertical red lines indicate the treatment date, and the date when we collected the data, respectively. Fund changes made during weekends are registered on the following weekday.




(a) Control group

(b) All treatment groups

Figure 30: Logins at the Premium Pension website

*Note*: Shares of savers that each day log into their accounts at the Pensions Agency's website, over time. The vertical red line indicates the treatment date. The data is retrieved from the Swedish Pensions Agency in January 2019.