Dominated pension investments:
the role of search frictions and unawareness

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We conduct a large-scale field experiment in the Swedish pension system to examine to what extent information and search frictions explain dominated high-fee index fund choices. Three findings stand out: (i) Letters that increase awareness of a dominated choice and reduce search costs of finding the dominating alternative improve savers' investment choices. (ii) While the average effects are positive, a majority of investors are unresponsive to information that essentially removes search costs. The inertia holds across expected gains, rejecting models with fixed adjustment costs. (iii) Lack of awareness and search costs account for at most 45 percent of dominated choices.
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The mutual fund market is characterized by high price dispersion between comparable funds. 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 savers could have avoided over 200 million USD in fees on S&P500 index funds alone, if they had chosen the cheapest alternative (Choi, Laibson and Madrian, 2010). The high price dispersion indicates that there are sizable 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. As the responsibility for pension investments is shifting towards individuals, this concern becomes increasingly important.[1] We examine the role of two prominent suggested causes for dominated fund choices: search and information frictions. We conduct a large-scale field experiment among people who have actively chosen to invest some of their public pension savings in index funds that are dominated.[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) reducing search costs for finding a dominating alternative, and iii) improving the assessment of the expected monetary implication at retirement from choosing a fund with the same expected holdings but a lower fee. Following the information treatment we observe the savers' real fund choices.

To our knowledge, our study is the first to manipulate search costs and investigate how personalized information interventions affect *real* fund choices. 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 improve real investment choices, in the sense that they cause a shift in savings from a dominated to a dominating fund.[3] Second, although the average effects are positive, we find that a majority of the savers do not respond to the treatment. Thus, these formerly active savers are passive with respect to their past fund choice. The inertia in investments holds even when search costs to find a better alternative are virtually removed, and regardless of the size of the expected gain from switching, ruling out models with fixed adjustment costs. Third, even under conservative assumptions we estimate that search and information frictions can explain at most 45 percent of dominated fund choices in a real investment setting.

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

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[1]Across countries, there has been a shift from defined benefit towards defined contribution savings plans, where the individual chooses the investments (Beshears et al., 2009; Barker and Jones, 2024).

[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 that follows the same index strategy. Hence, the funds are identical in terms of expected holdings.

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

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.

It is not unlikely that savers in the dominated funds are unaware that a cheaper fund is available. The indices that the funds follow have different providers and hence different names, despite having the same investment strategy. The information about the indices is publicly available, but it requires some effort from the savers to access the information and make the fund comparison. A such, this setting provides a close to ideal environment for disentangling how important unawareness and search frictions are for dominated choices.

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, essentially removing search costs. The third treatment arm included an individual-level forecast of the expected monetary gain at retirement if the saver reallocates the savings from the dominated to the dominating fund, capturing the compound effect of the fee difference. Finally, the fourth treatment arm consisted of the information in treatment arms two and three combined.

Over a three-month period following the intervention, the propensity to switch to the cheapest fund was 1.9 percentage points higher among savers in the first treatment group, i.e., those who were sent the letter that states that they save in a dominated fund, relative to the control group.[4] When reducing 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.[5]

In order to quantify to what extent search costs and unawareness contribute to dominated investments we turn to the treatment effects on the treated (TOT), 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 (ITT) effects by the confirmed reading share we approximate an upper bound

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[4]Almost no one in the control group switched funds, hence, we can rule out sizable spillover effects that would attenuate the results.

[5]The exponential-growth bias is found in, e.g., Levy and Tasoff (2016); Stango and Zinman (2009); Wagenaar and Sagaria (71975).

of the TOT. Using this approach we find that the share of savers that reduce their dominated investments is at most 45 percentage points higher among those who were informed of the name of the dominating fund, relative to the control group. The point estimate among those who actually confirmed reading the letter is 26 percentage points. Hence, our results suggest that at most 45 percent of dominated fund choices can be explained by search costs and lack of awareness, which have been discussed as leading explanations in the literature.

Our findings highlight 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 informed about the name of the dominating alternative. These results 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. Our findings suggest that simply providing information about better fund choices does not solve these problems associated with inertia in investments.

There are a number of theories that can help explain a large degree of inertia in investments. To understand what behavioral models are consistent with our findings we examine heterogeneous treatment effects across a range of household characteristics. We find that individuals with relatively high earnings are more likely to respond to the treatments and switch funds. While low-income individuals are the least responsive, they likely have the most to gain from improved investments, highlighting the need for other policy instruments beyond information provisions that better target this group. We also find that the response rates are remarkably insensitive to the individuals' expected gain from switching funds. Based on these findings, we reject models with fixed adjustment cost in favor of models where the perceived adjustment cost is increasing in potential gains. In future work it would be beneficial to explore the extent to which a status-quo bias contributes to the inertia in dominated investments. The tendency to persist with a past choice can be justified by loss aversion and regret avoidance, which may be stronger when the stakes are higher.

RELATED LITERATURE. — This paper is among the first to conduct an information intervention in the context of real investments decisions, where people's fund choices for retirement are observed. We highlight that inertia in investments is substantial among previously active investors even when information about better fund choices is provided. 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, 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] We contribute to the literature on inertia in investments by showing that there is a high degree of inertia even when dominating alternatives are identified, 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, Gruber and Busse (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, Hortaçsu and Syverson (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 laboratory findings in Choi, Laibson and Madrian (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. The overall low attention to information is in line with their results, and we show 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

[6]Samuelson and Zeckhauser (1988) document status-quo bias 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 (Cronqvist and Thaler, 2004; Dahlquist, Martinez and Söderlind, 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 Appendix Figure E.2.

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

Syverson, 2004; Agnew and Szykman, 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 can either be ruled out or fail to explain why a majority of the savers remain with the dominated funds. Since our results indicate that adjustment costs are increasing in potential gains from switching funds, it would be worthwhile in future research to explore frictions that are consistent with this finding.

The remainder of the paper proceeds as follows. In Section I we describe the institutional setting, the sample, and the data. Section II presents the methodology including the treatments and the treatment assignment. The main results are presented in Section III. In Section IV we analyze heterogeneity and discuss behavioral models. Section V concludes the paper. In the Supplemental Appendix we discuss how the paper relates to our published pre-analysis plan.

I. Background and sample

A. 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. Since the inception of the system any fund company could list their funds in the Premium Pension system, as long as they complied with the general Swedish rules for financial markets (Berglöf et al., 2019). The reasoning was that the available funds should reflect the general fund market, and there was no evaluation or procurement of the listed funds.[10] In January 2018 the choice set was 846 funds (Pensionsmyndigheten, 2018c).

A saver can choose up to five funds and select the share of the Premium Pension allocated to each. Everyone who has ever had taxable labor income in Sweden and was born after 1937 is part of the Premium Pension system (Pensionsmyndigheten, 2018a). The employer pays 2.5 percent of each employee's labor income

[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 (Figure 7).

[10]In 2016 adjustments were made such that funds that conduct criminal activities can be excluded from the system. Our experiment was run in July 2018. In 2019 there was an official investigation of the Premium Pension System ordered by the Swedish government. One of the purposes of the investigation was to suggest procurement procedures for the funds available for the Premium Pension. Procurement procedures were implemented in 2024.

to that individual's Premium Pension account (Pensionsmyndigheten, 2018a).[11] As the contribution rate is prespecified, a pension saver is only concerned with the investment decision. Thus, we can study the fund choice in isolation from the inter-temporal saving 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, 2018d).

B. Sample selection

THE FUNDS. — We define a fund as dominated if it is an index fund that has a higher 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 two dominated index funds, denoted $Fund^h$ (high fee) and $Fund^m$ (medium fee). The dominating index fund is denoted $Fund^l$ (low fee). The three funds are all relatively large. Approximately 2.7, 0.7, and 0.5 percent of working-age savers who had made an active investment choice for their Premium Pension savings were saving in $Fund^l$, $Fund^m$, and $Fund^h$, respectively, in June, 2018 (Pensionsmyndigheten, 2018b). As of October 31, 2024 the sizes of $Fund^l$, $Fund^m$, and $Fund^h$ were approximately 52.1, 4.9, and 2.8 billion SEK, respectively (Morningstar, 2024). These numbers can be compared with the total market value of fund investments traded on a regulated market in Sweden, which was around 8,000 billion SEK in October 2024 (SCB, 2024c).[12] Approximately 600 billion SEK was allocated to domestic mutual funds, which is the fund category of the three funds, and 300 billion SEK to foreign mutual funds. Around 22 percent of all assets invested in equity funds were allocated to index funds, at the end of 2023 (Scholtzé, Pettersson and Hård, 2024).

The dominating fund, $Fund^l$, is managed by a subsidiary to a well-known Swedish bank. The bank was founded in 1999 with the aim to reduce prices in financial markets by offering low-cost digital solutions. The bank had 7.5 percent of the Swedish market for savings in 2024 and had the most satisfied customers in the saving segment between 2010 and 2023. The bank uses a slogan for $Fund^l$: "the fund without fees". Since this fund has a fee of zero it is particularly salient, and it always shows up on top if ranking funds based on fee on the Premium Pension website. The dominated fund with the medium fee, $Fund^m$, is managed by a Swedish fund company that was founded in 1990. The dominated fund with the high fee, $Fund^h$, is managed by the third largest Finnish fund company, which was founded in 1985.

The indices that the three funds follow track the performance of the 30 most traded shares listed on the Stockholm Stock Exchange. The indices are weighted by market capitalization and are rebalanced twice a year. The rebalancing is

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[11]The contribution rate is capped for labor income above 7.5 income base amounts.

[12]The largest investment categories are shares, interest-bearing securities, and long-term securities, with market values of approximately 5,600, 1,300, and 1,200 billion SEK, respectively (SCB, 2024c).

based on the last trading day in May and November, and is implemented on the first trading day in January and July. The indices have different providers and hence different names, despite having the same investment strategy. 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 provider of the indices of $Fund^l$ and $Fund^h$ states that they take into account environmental, social and governance (ESG) factors. They do so by excluding companies that violate international norms such as the Global Compact Principles.

The historical correlation between the returns of the two dominated funds and $Fund^l$ is very close to one (Morningstar, 2018). Since the timing of the inflow and outflow of money, and the exact timing of transactions, differ between the funds, the historical correlation is not exactly equal to one. Importantly, these timing differences do not affect the expected allocation in individual stocks of the three funds. On the Premium Pension website, the average returns for the past 5 and 10 years for all funds are stated. These historical returns are stated net of fees, hence, $Fund^l$ outperforms $Fund^m$, which outperforms $Fund^h$. Descriptive statistics of the three funds are presented in Appendix B.1.

The three funds state that their investment strategy is to follow the index as close as possible. Moreover, the funds have similar policies in terms of the use of derivatives and leverage, and have the same exposure to market and liquidity risks due to their equivalent investment strategies. However, $Fund^m$ differentiates itself from the others by stating that it takes an active role with regards to corporate governance concerns on behalf of its owners. It does so by giving a shareholder interest organization the mandate to represent the owners of the fund at shareholder meetings.

$Fund^l$, $Fund^m$, and $Fund^h$ were introduced in the Premium Pension system in 2006, 2000, 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 June 2006) did not make a dominated choice at that time.

THE SAVERS. — 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. 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 $Fund^h$.[13] Approximately 4,200 savers

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[13]888 people are dropped from the sample because they save in both of the dominated funds. Furthermore, observations are dropped in case any of the main variables are missing: year of birth, labor

selected Fund^m before Fund^l was available, and hence, did not make a dominated choice at that time. Around 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.

Table 1 presents descriptive statistics of the savers in the two dominated funds along with the Swedish population. The mean earnings of the savers in the two dominated funds is higher than in the working-age population in Sweden. A larger share is also married and the share of men is slightly higher in the sample as compared to the population. The differences in earnings partly reflect that the people in the sample are older. The average age among those aged 25–64 in the population is 44, while the average age in the sample is 51. If the sample had the same age distribution as the population, average earnings would instead be 364,000 SEK. Hence, the savers in the sample have somewhat higher earnings also conditional on age.

Younger individuals are less likely to have made an active fund choice for their Premium Pension, and are underrepresented in the sample. However, the age distributions in the two dominated funds are similar to that of all savers who have opted out from the default fund, as seen in Appendix Figure B.2. The savers in the dominated and the dominating funds are also similarly active in the Premium Pension fund market as other savers who have left the default fund (see Appendix Figure B.3).

In terms of savings, the average amount in the dominating fund is larger than in the dominated funds (see Appendix Table B.2). The larger savings partly follow from individuals allocating a higher share of their Premium Pension to the dominating fund, relative to the share that savers in Fund^m allocate to Fund^m, which is higher than the share that savers in Fund^h allocate to Fund^h, on average.

C.   Data

We use public data of fund characteristics, and administrative data on individual-level Premium Pension savings, investments, and background characteristics (Swedish Pensions Agency, 2018-2019). The fund data on monthly historical gross returns and fees from 2000 to 2018, for the selected funds, is obtained from the Swedish Pensions Agency and from Morningstar Direct (Morningstar, 2018; Swedish Pensions Agency, 2018-2019). From the Pensions Agency we also obtain data on individual Premium Pension fund choices and Premium Pension fund balances for the sample and for savers in the dominating fund, before and after the experiment. In addition, the Pensions Agency provides individual-level data on 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.

Table 1—: Characteristics of the sample vs the Swedish population

| Variable | Sample | | | | Population |
	Mean	Standard deviation	Minimum	Maximum	Mean
Labor income	417,601	385,930	0	28,200,000	343,900
Year of birth	1967	7.6	1954	1993	1974
Female	0.46	0.50	0	1	0.49
Married	0.54	0.50	0	1	0.43
Fund value	80,287	54,138	3	654,782	N/A
Fund share	0.28	0.17	0.01	1.00	N/A
Years since fund change	6.2	4.9	0.3	18.1	N/A

Note: The sample consists of savers in Fund^m and Fund^h. The data for the savers in the two dominated funds is retrieved from the Swedish Pensions Agency in June 2018 (Swedish Pensions Agency, 2018-2019). Labor income refers to annual labor income in 2016, the most recent available income data in 2018. The other variables refer to values in 2018. For the population, mean labor income, year of birth, fraction female, and share married are computed for those of age 25–64, which is the same age span as in our sample (SCB, 2024*a,b,d*). Fund value refers to Premium Pension savings in Fund^m or Fund^h, and Fund share is the Premium Pension portfolio share allocated to Fund^m or Fund^h. Years since fund change refers to the time since the most recent change of the Premium Pension portfolio. The variables Labor income and Fund value are in SEK. 1 SEK was equal to 0.11 USD in July 2018.

income, year of birth, gender, marital status, and residential municipality. Table 1 presents descriptive statistics of the sample.[14] Unless otherwise stated, all SEK and USD amounts refer to 2018 values, where we use the exchange rate at the time of the experiment in July 2018, meaning 1 SEK = 0.11 USD.

II. Experimental design

In this section we describe the treatments, the treatment assignment, and the relevant outcome variables.

A. Treatments

The objectives of the treatments are twofold. First, we want to evaluate to what extent a relatively cheap information intervention can improve savers' real investments for retirement. Second, we want to quantify the role of information and search costs for dominated fund choices. 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.

- **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 difference in fees between the current and the cheapest index fund with the selected investment strategy is stated. The letter also states that if a fund changes its fee in the future,

[14] An identification key of social security numbers was used to match names and addresses from the Swedish Tax Agency, when posting the letters (Swedish Tax Agency, 2018).
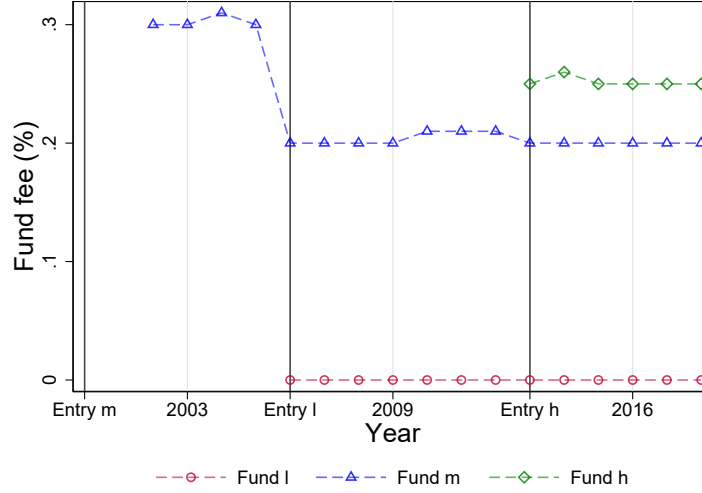
Figure 1. : Historical fund fees

Note: Historical fund fees since the three funds entered the Premium Pension system. Fees denote net fees after a 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 (Swedish Pensions Agency, 2018-2019).

the savers of that fund are informed of the change. 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. 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.[15]

- **ANI** (Aware+Name+Impl): The same content as letter AN, plus a statement that clarifies the expected gain in the Premium Pension account bal-

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[15]L, M, H refer to low, medium, and high amounts, corresponding to 50, 250, and 700 SEK, respectively (approximately 6, 28, and 77 USD). The savers could report the name of the dominating fund on a project website.

Control (4 791)

A (3 980)

Aware

Reading task (199)

AI (3 974)

Aware

Implication
Zero reward now

AI$_H$: High reward now (668)

AI$_M$: Medium reward now (669)

AI$_L$: Low reward now (669)

AN (3 986)

Aware

Name

Reading task (199)
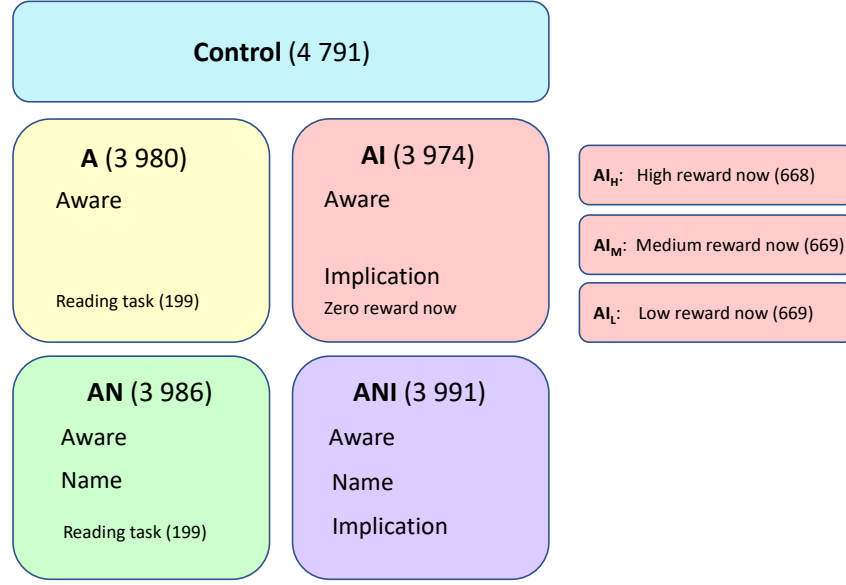
ANI (3 991)

Aware

Name

Implication

Figure 2. : Illustration of the treatment groups, sample sizes in parenthesis

ance at age 65, if the saver immediately reallocates the savings in the dominated fund to the dominating fund.

The treatment letters are used to test three main hypotheses regarding *Awareness*, *Search costs*, and *Monetary implication*. These are described in detail in Appendix B.6. A theoretical framework of the decision to switch funds is outlined in Appendix B.5. A copy of treatment letter A (Aware) is included in Appendix C.

TREATMENT COMPLIANCE. — We control that the treatment letters are sent to the savers. However, we do not observe whether the recipients actually read the 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.[16] This additional text is written at the end of the letter, after the treatment information. 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 treatments.

[16]The recipients are offered 200 SEK (approximately 22 USD).

B. 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 reading task that is described above. Conditional on strata S_{is}, treatment $k \in \{A, AN, AI_a, ANI\}$ for $a \in \{0, L, M, H\}$ is independent of all other variables, including any potential outcomes.

17,960 individuals are sent treatment letters and approximately 4,800 individuals are left as controls.[17] 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
- AI_0:   3,974
- $AI_{L,M,H}$: 2,006 (669, 669, 668 for each reward level, respectively)
- ANI: 3,991

An assessment of the treatment assignment is presented in Appendix Table B.3, where pre-treatment characteristics across the treatment groups are compared. Appendix Figure B.4 presents a comparison between the treatment groups and the control group in terms of the distributions of savings in the funds, labor income, age, and expected gains from switching funds, which is defined in the next section.

C. Outcome variables

The primary outcome variable of interest is a switch from the dominated to the dominating fund Y_{ik}^{switch}, hereafter referred to as *switch funds*. Formally, a person switches funds if the share invested in one of the dominated funds (Fund^m or Fund^h) is reduced and the share invested in the dominating fund (Fund^l) is increased. When we estimate the role of awareness and search costs for dominated choices, the key outcome variable is instead Y_{ik}^{mh}, indicating a reduction of the share invested in the dominated funds. We also consider variables indicating an increase in investments in the dominating fund and if any investment change is made, denoted by Y_{ik}^l and Y_{ik}^{any}, respectively. Additional outcome variables include indicator variables for completing the search task in treatment AI_a and

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

confirming reading a letter for those who receive the reading task, denoted by $Y_{iAI_a}^{search}$ and Y_{ik}^{read}. When we observe a change in an outcome variable we also observe the date at which a change was made. In addition, we observe the number of logins at the Pensions Agency's website, but this data is only available at the treatment-group level. A summary of the outcome variables and their definitions are listed in Appendix B.4.

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 reallocating all of their savings in the dominated fund to the dominating fund.[18] This expected gain shows the monetary implication of the compound effect of the fee difference.

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 saving 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.[19] There is substantial heterogeneity in terms of how much people can expect to gain from a fund switch. The mean and the maximum expected future reward of the savers in the sample are 4,442 SEK (489 USD) and 57,500 SEK (6,325 USD), respectively, and the standard deviation is 4,427 SEK (487 USD).

D. *Implementation*

All treatment letters were sent to the savers at the same point in time (July 19, 2018). The outcome variables Y_{ik}^* ($* \in \{switch, mh, l, any, search, read\}$) for individual i, receiving treatment $k \in \{A, AN, AI_a, ANI\}$, were observed three months after the treatment date. The exact date of any change in the outcome variables is also observed. 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

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[18]Age 65 was the mean age for starting to withdraw from the national public pension system, each year 2005–2016 (Carneck, Karlsson and Carlsson, 2017). The t denotes the number of years an individual has left until age 65. 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.

[19]This forecast can be considered a lower estimate 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. However, the forecast may also be considered an upper estimate, since the individuals can switch funds at some point before the age of 65, regardless of receiving the information. Importantly, the assumptions of the forecast are clearly stated in the letters.

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. The original data collected on the website can be accessed in Kinnerud and Lorentzon (2025). To ensure that the savers trusted 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.

III. 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

$$(1) \qquad Y_{isk}^* = \gamma_k T_{ik} + \delta_s S_{is} + \varepsilon_{isk},$$

where $k \in \{A, AN, AI_a, ANI\}$ and γ_k are the coefficients of interest. S_{is} are strata dummy variables and ε_{isk} are error terms. Our primary tests use robust standard errors. Unless otherwise stated, the data was retrieved from the Swedish Pensions Agency in October 2018, three months after the treatment date (Swedish Pensions Agency, 2018-2019). At the end of the three-month period, there were small differences in investment behavior between the control and the treatment groups, as seen in Appendix Figure E.10. In fact, most of the responses to the treatments occurred within two months.

A. Treatment effects

We begin by considering the intention-to-treat (ITT) effects. From regression (1) 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 increase the probability of switching from the dominated to the dominating fund by 1.9 percentage points (no one makes the fund switch in the control group). Letters that reduce the search costs of finding the dominating fund, by providing its name, increase 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. The treatment effects are also documented in Appendix Table E.2. Table 2 displays the treatment effects with respect to our hypotheses listed in Appendix B.6. It is worth noting that almost no one (five people in total)

in the control group switches funds. Hence, any potential spillover effect on the control group, through people's networks, is quantitatively small.

Table 2—: Hypothesis tests

Hypothesis	Treatments compared	Coefficient difference	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

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.
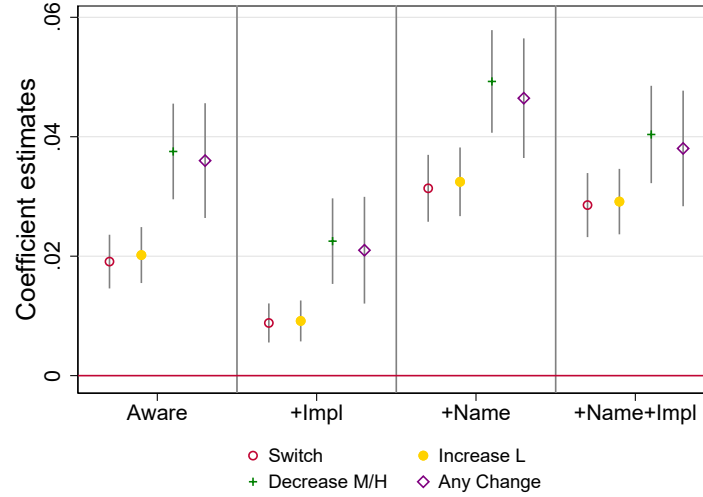

Figure 3. : Treatment effects across treatment groups

Note: Regression coefficients γ_k from regression (1), with $* \in \{switch, l, mh, any\}$. The treatment effects are for treatments A, AI_0, AN, and ANI. The control group is the reference and has a mean of 0.000, 0.001, 0.015, and 0.038, for the respective outcome variables. The markers show the point estimates and the vertical lines indicate the 95 percent confidence intervals.

Figure 3 illustrates that the ordering of the treatment effects for the different outcome variables is similar for all the treatments. 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 for those who are informed that a dominating fund exists (Aware), and by an additional 1.1 percentage point

when the letter also provides the name of the dominating fund (Aware+Name).[20]

To examine the intensive margin of the treatment effects, we look at *how much* people change the portfolio shares invested in the dominated and the dominating fund. The changes in shares are measured relative to the initial share invested in $Fund^m$ or $Fund^h$. In Appendix Figure E.1, the distributions of these relative share changes are displayed. 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.

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 improves some savers' investment choices.

Although the treatment effects from both the letter that increases awareness (A compared to Control) and the letter that reduces search costs (AN and ANI compared to A and AI_0, respectively) are statistically significant, the magnitudes of the treatment effects are relatively small. In particular, individuals who receive the letters that virtually remove search costs, are basically leaving money on the table by staying with the dominated fund. One potential reason for the relatively small treatment effects is a low take-up rate of the information. In fact, the number of savers who confirmed 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 III.C.

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. By informing individuals of the future monetary implications of switching funds, we can 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 is presented (AN and A).

In Figure 3 and Table 2 we see that information about the expected future gain at retirement does not increase the probability of switching funds, beyond

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[20]The treatment effects are not sensitive to if we exclude the people who received the reading task.

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 savers had a prior of the expected gain that was instead larger than the stated forecast. The forecasts for the expected future reward from switching depend on 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 such a bias.

In terms of the information that reduces search costs, we note that the treatment effect is larger for the group that also receives information about the future monetary implication (the coefficient difference between ANI and AI_0 is 0.020, and the coefficient difference between AN and A is 0.012). 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 lowers search costs. Notably, there is an asymmetry in the complementary effect. When the future monetary implication of a switch is known, additional information that reduces 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.

RESPONSES TO IMMEDIATE INCENTIVES. — How does 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 4a. However, the larger share that correctly identifies the dominating fund does not directly translate into fund switches, as illustrated in Figure 4b, and Appendix Table E.1. 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 switch 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 or trust the provided information.
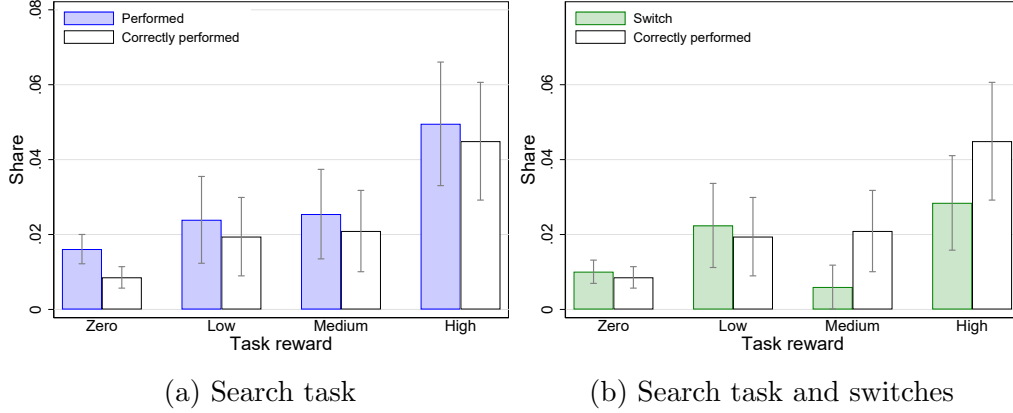
(a) Search task   (b) Search task and switches

Figure 4. : Completing the search task and switching funds

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

B.   *Information as a policy tool*

Although a vast majority of the savers do not respond to the information treatments, a significant share of savers still 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 5 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 approximately 726,000 SEK.[21] The distribution of the expected discounted future rewards is displayed in Figure 5a. The gains 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.[22] This implies a present-value net gain of approximately 30 SEK (3.3 USD) per letter. To improve the cost-benefit outcome, one could target people with more to gain from switching. For example, if only those with the highest

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[21]We account for that some individuals would have switched funds regardless of the treatments, by adjusting for that 0.1 percent switched funds in the control group and 2.3 percent in the treatment groups.

[22]In practice, additional fund information can easily be included in current communication from the Pensions Agency, at negligible cost.

25 percent of discounted reward from switching were sent the treatments (meaning expected gains larger than 2,327 SEK), the present-value net gain would have been 77 SEK (8.5 USD) per letter. Thus, an information intervention of this kind can be motivated from a consumer cost-benefit criterion, however, the net gain is relatively small.

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. Additional benefits may occur through general-equilibrium effects of increased competition in the fund market, if funds respond by decreasing their fees.[23] 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. Moreover, the expected gains from switching could be smaller than our forecasts suggest, if the savers who switch funds would have done so before retirement regardless of receiving the treatment letter.

Overall, the fees that can be saved if people switch from dominated to dominating funds are substantial. As noted in Choi, Laibson and Madrian (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 reallocated all of their savings in the dominated funds to the dominating fund, all else equal, amounts to almost 41 million SEK (approximately 4.5 million USD). Hence, even though our information intervention can be justified from a cost-benefit criterion, this type of policy is nowhere close to solving the problem with dominated fund choices. A policy maker would also need to think about how fund companies would respond to such information if provided at an aggregate level. The broader problem with closet index funds could potentially aggravate. Thus, providing information that facilitates a comparison of similar funds more generally, is possibly a more policy relevant alternative. However, given the relatively low take-up rate and treatment effects that we find, we conclude that a policy maker needs to do more than providing information about better fund options to combat the problem with excessive fees.

C.   *The role of information and search costs*

In order to evaluate how effective information letters are as a policy tool, the relevant measures are the ITT effects presented in the previous sections, i.e., the effects on people who were sent a letter. However, to analyze the role of search

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[23]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 that they save in.

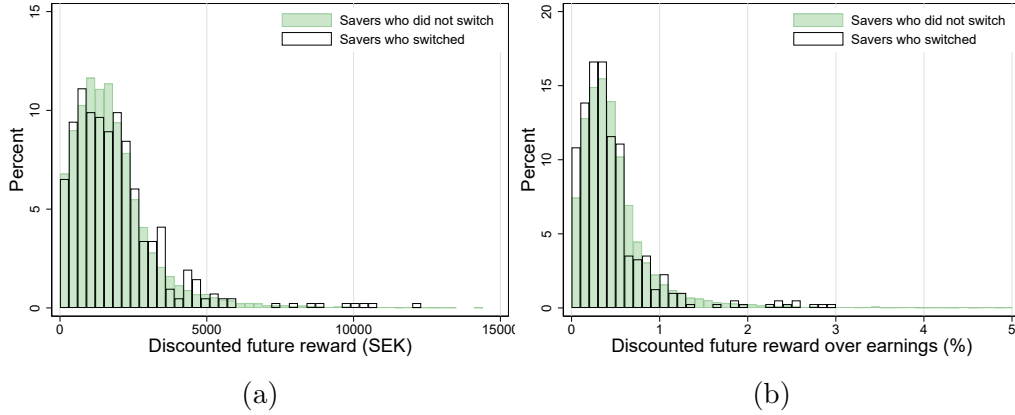(a)   (b)

Figure 5. : Distributions of expected gains from switching

Note: Distributions of the (a) discounted expected future rewards in SEK and (b) discounted expected future rewards divided by labor income, in percent, separately for those who did and did not switch from the dominated to the dominating fund. In total, 414 people switched and 22,314 people did not switch funds. 1 SEK was equal to 0.11 USD in July 2018. In (b), those with discounted future reward over earnings larger than 5 percent are dropped for visual purposes.

and information frictions for dominated fund holdings, we turn to the treatment effects on the treated (TOT) and focus on how the probability of reducing the holdings in the dominated funds is affected. The TOT can also be relevant for policy makers who have more channels through which they can reach out to citizens.[24] To approximate the TOT, i.e., the effects among those who read the letter, we use two approaches. First, we scale the ITT 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.

Let us start by noting that there are no differences in observables between the compliers and non-compliers of the reading task. Table 3 presents the mean characteristics of those who confirmed reading the letter as compared to those who did not. There are no statistically significant differences in the means of observables for these two groups.

In the first approach to approximate the TOT, we scale the ITT effects by the reading-confirmation share of 11 percent.[25] This share 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

[24]The Swedish Pensions Agency estimates that 57 percent of people read their pension forecast letters in 2018 (Pensionsmyndigheten, 2019). They find 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.

[25]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.

Table 3—: Characteristics across reading confirmation

	Did not confirm	Did confirm	P-value
Labor income	410,207	429,654	0.47
Year of birth	1967	1967	0.75
Female	0.44	0.45	0.92
Married	0.58	0.63	0.31
Fund value	85,215	79,193	0.30
Fund share	0.28	0.27	0.52
Future reward	4,509	4,232	0.48

Note: Mean values of characteristics of those who did not confirm, and those who did confirm reading the letter. P-values are from t-tests of equality of means. Fund value is the savings in the dominated fund. The variables Labor income, Fund value, and Future reward are in SEK. 1 SEK was equal to 0.11 USD in July 2018.

estimates provide upper bounds for the TOT. 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 separate treatment. The upper-bound estimates are presented in Figure 6a.[26] The scaled effect of the awareness letter indicates that the probability that savers lower their share invested in the dominated funds is 35 percentage points higher relative to the control group (0.038/0.11). The largest estimate for the TOT is obtained from treatment AN (Aware+Name), where the search frictions to identify the dominating fund are reduced, for outcome variable Y^{mh}. Here we find that the probability that a saver decreases the share invested in a dominated fund is 45 percentage points higher than in the control group (0.049/0.11).

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. However, the means of the different outcome variables for those who did not confirm reading are similar to those of the control group in the main analysis that received no letter. On the other hand, the individuals who confirmed reading the letter could be different from the potential people 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. Moreover, one could be worried that receiving the reading task is affecting the treatment. Given these three limitations we have to be cautious

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

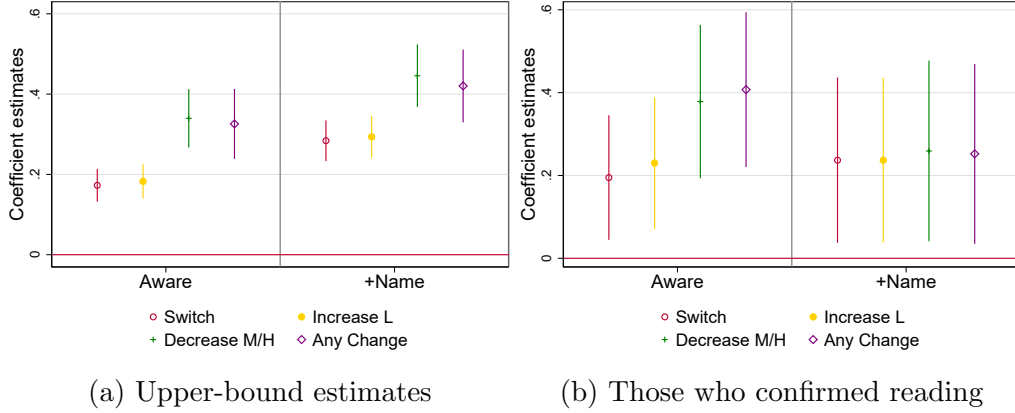(a) Upper-bound estimates   (b) Those who confirmed reading

Figure 6. : Treatment-on-the-treated effects

Note: Regression coefficients γ_k from regression (1), 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, 0.016, 0.016 for treatment AN, for the respective outcome variables.

in our interpretation of the estimates. Figure 6b 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 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 the point estimate is 26 percentage points. These results are broadly in line with the upper-bound estimates.

The analysis of the TOT suggests that even under conservative assumptions 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 essentially removed.

IV. Heterogeneous effects and behavioral models

Although a lack of awareness and search costs can explain a large share of dominated fund choices, it is puzzling why a majority of the savers prevail with their fund choice and leave money on the table, in particular, when being informed about the name of the dominating fund. Potential explanations of the low response rate to the treatments include that many individuals have little to gain from switching funds and that, for many, the reward occurs far into the future. To better understand how the treatment effects vary across individuals with differ-

ent characteristics and expected gains from switching, we examine heterogeneous treatment effects and proceed with a discussion of what behavioral models are consistent with our findings.

A. Heterogeneous treatment effects

We are mainly interested in if treatment effects 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 heterogeneous treatment effects across the degree of urbanization of the residential region and between savers in the two dominated funds (Fund^m and Fund^h). The heterogeneous treatment effects for covariate j are tested using the following regression, estimated with OLS, where we interact the treatment dummies with the covariates $\mathbf{X}_{ij}$,

$$(2) \qquad Y_{isk}^{switch} = \gamma_k T_{ik} + \eta_{kj} T_{ik} \mathbf{X}_{ij} + \rho_l \mathbf{X}_{ij} + \delta_s S_{is} + \varepsilon_{isk},$$

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

The estimates from the heterogeneous treatment effect regression, for our main outcome variable switch of funds Y^{switch}, are displayed in Figure 7.[27] We find no heterogeneous treatment effects across gender, age, or the expected future reward from switching funds. However, 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).[28] In Figure 8b, the heterogeneous treatment effects across labor income are illustrated over earnings quintiles, where we can see that the differences appear to stem from the whole labor-income distribution. Thus, an information intervention of this kind falls short in improving investments in particularly for low-income individuals. As low-income individuals likely would benefit the most from improved investments, there is a need for other policy instruments that better target this group.

Figure 7 also shows that people who save in Fund^m react more than savers in Fund^h. This finding holds when also 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. In fact, people who chose Fund^m before Fund^l was available respond significantly less than those who made a dominated choice. This is shown in Appendix Figure E.3, where we include possible heterogeneous treatment effects along the dominated-choice

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[27]The overall results in Figure 7 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}. See Appendix E.1 for additional analysis of heterogeneous treatment effects.

[28]Lusardi and Mitchell (2007) and Lusardi and Mitchell (2011) also find that more educated individuals are more financially literate. However, we do not have information on educational background.

dimension. One can only speculate about what unobservable could explain why the savers in Fund^m are more responsive than those in Fund^h. One possible explanation is that the savers in Fund^m had made a more conscious choice, than the savers in Fund^h. They did, after all, select a fund with a lower fee than those in Fund^h, possibly suggesting that they are slightly more financially literate or have lower search costs. Moreover, since Fund^m is associated with a stockholder interest organization, it could send a positive signal to savers, causing them to do less due diligence or become more negatively surprised by the treatment information.[29]

The smaller treatment effects of those who chose Fund^m before Fund^l was available could reflect that these people are less active in the fund market in general. In fact, the average time since the savers made a fund choice is approximately 17 years in this group, while it is around 4 years for those who made a dominated choice, as seen in Appendix Table E.3. However, there are no significant heterogeneous treatment effects across previous activity level, if we compare two quantiles based on the most recent investment change (see Appendix Figure E.3). Although, if comparing treatment effects across quintiles of time since the most recent investment change, the most active quintile appears to respond stronger than the least active, as seen in Figure 8a. 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 (Table 4).[30] Thus, if anything, savers who more recently made a fund choice are slightly more likely to respond to the treatments.

Table 4—: Years since most recent investment change

	Control	Treated
No switch	6.27	6.23
Switch	4.84	5.13

Note: Average time 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.

Figure 7 demonstrates that there are no heterogeneous treatment effects between individuals with different gains to be made from switching, as given by their expected future reward. How important a given future reward is for an individual likely depends on when the gain is expected to be realized, i.e., how many years a person has left until retirement, and how large the gain is relative to the person's overall financial situation. It may be rational for a person to not exert any effort at all to switch funds, if the gain is small relatively to their wealth or earnings, along the lines of Kueng (2018). Figure 8c shows that the

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[29]In terms of fund names, the alphabetical order is Fund^m, Fund^l, then Fund^h.

[30]Appendix Figure E.2 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.
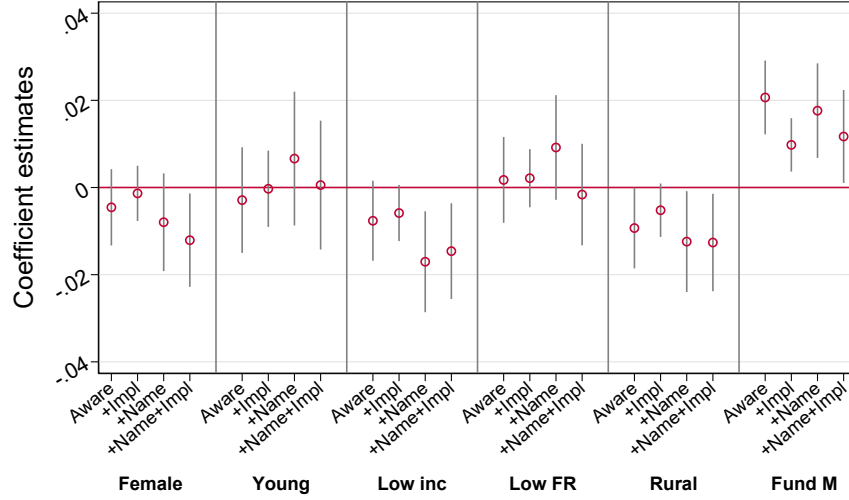
Figure 7. : Heterogeneous treatment effects

Note: Heterogeneous treatment effects across gender, age, labor income, expected future reward from a switch, residential region, and fund. Age, labor income, and 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.

treatment effects are relatively stable across quintiles of expected future rewards divided by earnings. Moreover, the treatment effects are actually declining in the discounted future reward relative to labor income, as seen in Figure 8d.[31] The average future reward relative to earnings in the highest quintile is approximately 7 percent, and when accounting for discounting, the mean is 2.7 percent. Despite these relatively large rewards, the response rates in these groups are low. Hence, many individuals who have relatively sizable gains to be made from switching funds, choose to leave this money on the table.[32]

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[31]The treatment effects across quintiles of expected future reward over earnings and discounted expected future reward over earnings are similar if only considering treatment ANI, where people are informed about the future reward and where search costs are reduced, as seen in Appendix Figure E.5. Figure E.5 also shows that the treatment effects are relatively stable across quintiles of expected future reward and discounted expected future reward. If examining heterogeneous treatment effects among those who confirmed reading a letter the sample size is too small to draw any clear conclusions. This analysis is presented in Appendix Figure E.6.

[32]It is worth noting that future rewards are not randomly assigned to individuals, but depend on past earnings and investment choices and age. However, much of the variation in expected future rewards stems from sources that we argue are plausibly unrelated to the likelihood of switching funds. These include differences in the shares of the Premium Pension account balance allocated to the funds, the exact times of the past investment choices, and the cap on contributions to the Premium Pension.

B. Behavioral models

In the literature on dominated choices, a number of potential explanations are suggested, many of which can be ruled out in our setting. Search costs and uninformed consumers are key suggested explanations, which in our sample account for at most 45 percent of dominated choices. Other suggestions include switching costs and differences in other portfolio benefits that fund companies offer, credit risk, or the display of historical performance (Hortaçsu and Syverson, 2004; Agnew and Szykman, 2005). However, in our setting there are no formal switching costs. Moreover, since the fund choice is administered by the Pensions Agency, the choice is not linked to other portfolio services, and there is no difference in credit risk between the different funds. Since the funds follow the same index strategy, differences in historical performance can also not explain the dominated choices. However, we cannot rule out that some individuals have an emotional attachment or preference for a particular brand name, as suggested in Hastings, Hortaçsu and Syverson (2017).

WHAT CAN EXPLAIN THE RELATIVELY SMALL RESPONSE RATES?. — We find that the response rate to the treatments is relatively low across a range of household characteristics and irrespective of the expected gain from responding. However, households with higher income and those who selected the medium-fee fund rather than the high-fee fund, are more likely to respond, suggesting that financial literacy can play a role. Although the information treatments clearly stated the benefit of the dominating fund, and the letters were sent by researchers cooperating with the public pension system, some effort was still needed on the receiver side. To switch funds, the recipients needed to process the provided information, potentially verify it, make a decision, and implement a fund switch. We argue that given the provided information this decision process requires little time and is relatively straightforward, but it is possibly more daunting for those who are less financially literate.

There are a number of behavioral models that could explain a small response rate to the treatments. First, rational inattention could explain why people who have little to gain from switching funds are unresponsive.[33] For most of the individuals in the sample, the present value of the gain from switching funds is in fact smaller than 1 percent of earnings (Figure 5b). However, rational inattention would predict a higher response rate among those who have more to gain. As noted, many people face relatively large rewards from switching, and this group is equally unresponsive to the treatments. Second, myopia or present bias could contribute to a small response rate to a task that involves an immediate cost and where the reward occurs in the future, as highlighted in O'Donoghue and Rabin

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[33]Rational inattention is discussed in Sims (2003). Maćkowiak, Matějka and Wiederholt (2023) provide a recent review of the literature.

(1999).[34] In this setting, it may be tempting to procrastinate, which could explain why some savers fail to respond to the treatments. However, typical models of myopia or present bias would also predict that response rates are increasing in future rewards. Third, the inertia in investments could stem from a status-quo bias (Samuelson and Zeckhauser, 1988). Since the savers in the sample have made an active fund choice in the past, they are not completely inert, but there may be a preference to stay with a previously chosen fund. A tendency to persist with a past choice can be explained by loss aversion or regret avoidance, and it can also be a way to avoid feeling overwhelmed by a choice.[35] A status-quo bias could then be consistent with a low response rate also when the expected rewards are high, since both loss aversion and regret avoidance, as well as the feeling of being overwhelmed by a decision, can be positively linked to the magnitude of what is at stake.[36] Hence, in our setting, these behavioral explanations could justify adjustment costs that are increasing in potential gains. Importantly though, for a status-quo bias to explain the observed inactivity across future rewards, there needs to be uncertainty associated with making the fund switch. A saver that does not believe in the provided information, that the dominating fund is truly dominating, or fully comprehend the concept of index funds could perceive that there is risk of loss associated with switching to the dominating fund. As shown in Figure 4b, savers are more likely to identify the dominating fund if they are offered an immediate reward. However, this higher likelihood does not directly translate into more fund switches, suggesting that savers perceive that there is a risk associated with switching funds.[37] If the potential reward is high, a saver may wish to exert more effort to verify the provided information. The more financially literate a person is, less effort is likely needed, which could explain the larger treatment effects among high-income individuals, who tend to have a higher level of financial literacy.

To conclude, the low and stable response rates to the treatments across discounted future rewards cannot be explained by behavioral models with fixed adjustment costs. Instead, our results provide suggestive evidence in favor of models with frictions that are increasing in potential gains. A status-quo bias could provide a rational for such models. Savers may be inclined to stay with

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[34]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.

[35]Some individuals may reject the information in the letters in order to avoid cognitive dissonance with their belief that they made a good fund choice in the past. However, such behavior also fails to explain why response rates are stable across future rewards.

[36]Kempf and Ruenzi (2006) find that the status-quo bias is positively related to the number of alternatives.

[37]Our findings could also be in line with some general passivity where some people do not act regardless of the size of expected rewards. Models of time-dependent inaction could generate the observed behavior, if a fixed adjustment cost is sufficiently small, such that essentially anyone given the opportunity to switch funds at a particular point in time chooses to do so. See Andersen et al. (2020) for a discussion. However, such models fail to explain why the response rate to the task of identifying the dominating fund increases in immediate rewards. Liquidity concerns could potentially explain the relatively strong responsiveness to immediate rewards as compared to future rewards, but do not explain the stable activity level across future rewards.

a previous choice if they become overwhelmed by the decision or if they fear to make a mistake, and these behavioral reactions can be stronger if the stakes are higher. To fully disentangle the inertia in dominated fund choices among previously active investors, it would be useful to study these frictions in more detail in future work.

V. 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.

We conduct a large-scale field experiment in the Swedish public pension system. Information letters were sent to people who save in dominated funds, where we test 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.

Our results show that letters that inform savers about the existence of a dominating fund, and reduce search costs for identifying this fund, significantly increase the probability that savers switch from the dominated to the dominating fund. However, the treatment effects and the take-up rate of the treatments are relatively small. When accounting for the low take-up rate, we estimate that a lack of awareness and search costs explain at most 45 percent of dominated fund choices. Our findings demonstrate that a majority of previously active savers do not minimize fund fees even after being informed of the name of the cheapest fund. The high degree of inertia in dominated investments holds across expected gains from switching funds, rejecting models with fixed adjustment costs. We propose that future studies examine behavioral models of inertia where frictions are increasing in potential rewards. Exploring a status-quo bias could be a useful starting point.

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(a) Previous activity level (years)

(b) Labor income (SEK, thousands)

(c) Future reward over earnings (%)

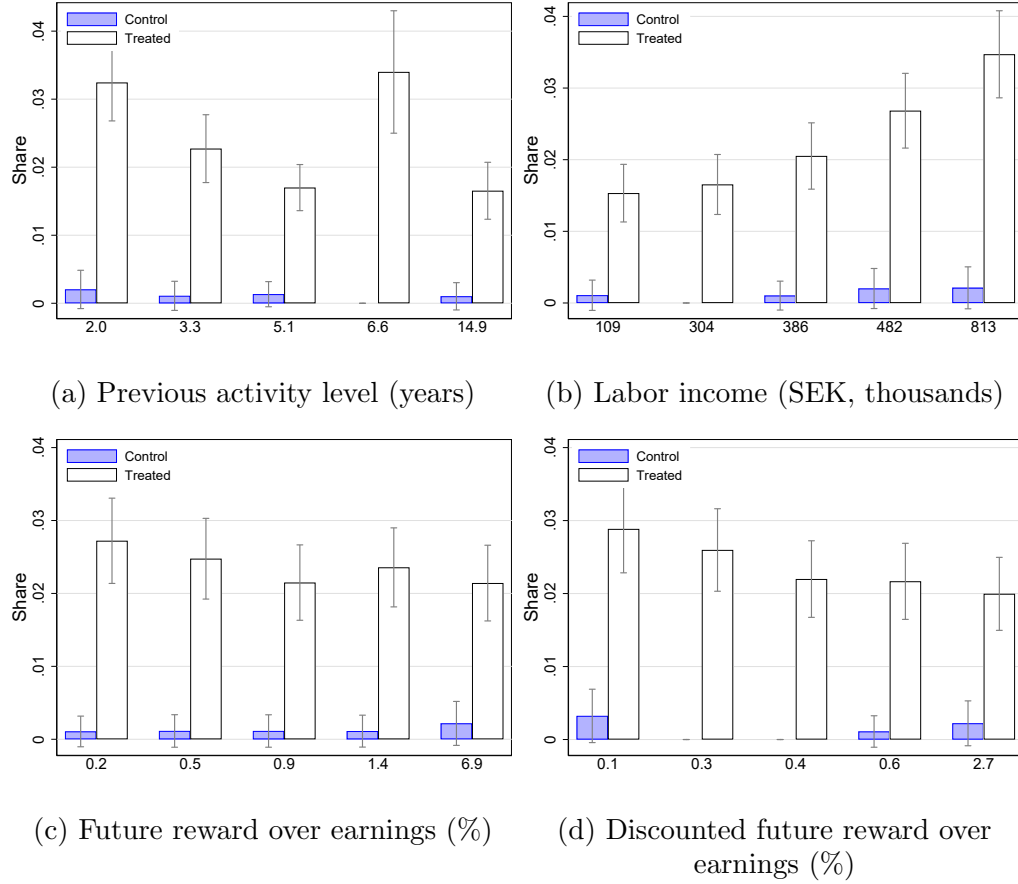(d) Discounted future reward over
earnings (%)

Figure 8. : Heterogeneous treatment effects across quintiles

Note: Shares who switch from the dominated to the dominating fund in all treatment groups combined versus the control group, across quintiles of (a) years since the most recent investment change before the treatment date, (b) labor income (thousands of SEK), (c) expected future reward relative to labor income, in percent, and (d) discounted expected future reward relative to labor income, in percent. 1 SEK was equal to 0.11 USD in July 2018. The vertical lines indicate the 95 percent confidence intervals. The numbers under the bars denote the mean of the quintile. Individuals who are offered an immediate search reward are excluded in Figure (c) and (d).