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CLIMATE POLARIZATION AND GREEN INVESTMENT

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ABSTRACT

We build a nationally representative sample of retirement savers in Sweden to study how climate polarizaton affects individual investment decisions. After the record-breaking heat wave of 2018, respondents in regions with strong support for a right-wing, anti-climate party grow less concerned about climate change, while respondents outside these regions grow more concerned. Those growing more concerned rebalance their retirement portfolios toward climate-friendly mutual funds; those growing less concerned rebalance out of these funds, but to a smaller degree. Financial sophistication and inertia interact with political polarization in driving these effects.

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1 Introduction

Despite broad scientific consensus supporting efforts to curtail global warming, a growing movement of climate-change deniers, prominent especially among right-wing and far-right political groups, stands in opposition to these efforts. The political polarization that has emerged around the topic of climate change is prevalent across the western Europe, the UK and the US, and is part of a broader backlash against environmental, social and governance (ESG) considerations in investment and corporate strategy.[1]

In this paper, we show that political polarization surrounding climate change affects climate-friendly investment allocations in individual retirement savings portfolios. Our study centers around the unprecedented heat wave in the summer of 2018 in Sweden and the media attention it attracted, especially in the run-up to Swedish national elections that fall. The heat wave drove the topic of climate change to the top of the political agenda in Sweden (Demoskop, 2022). This in turn generated polarizing media coverage that broke along political lines. The youth climate activist Greta Thunberg gained international fame during this period, creating further polarization on the far right.[2]

We measure climate change attitudes before and after these events for a nationally representative sample of around 2,500 respondents, and we connect these changing beliefs to subsequent changes in retirement portfolios. Our empirical design is akin to a Bartik (1991) strategy: spatial variation in average political orientation provides ex ante variation in average sensitivity to media coverage induced by the heat wave, which interacts with political orientation to affect attitudes towards the climate, as in Djourelova, Durante, Motte, and Pattacchini (2024). We then relate changing attitudes, affected by political polarization, to climate-related investment decisions occurring after the heat wave.

Households revise their climate-change beliefs substantially between the two surveys.

[1] See Almiron et al. (2020) and Ekberg & Pressfeldt (2021) for evidence from Europe, or Painter & Ashe (2012) for UK evidence. In the US, numerous (Republican-led) state legislatures have passed legislation prohibiting state pensions from investing in ESG-related or fossil fuel-restriction funds.

[2] Vowles and Hultman (2021) detail the way in which digital media outlets affiliated with the political right in Sweden intensify their coverage of Greta Thunberg during this period, ridiculing her with terms like 'Climate-Greta', 'the so-called climate activist Greta Thunberg,' 'doomsday guru,' and other epithets. A March, 2018, story published in Fria Tider (Free Times) details an interview that the 'Green Teenager' [this authors' translation] gave in a mainstream media outlet, Aftonbladet (Fria Tider, 2018).

About half of survey respondents changed their opinion about the speed of global warming in one way or another. For some, the extreme weather conditions acted as a wake-up call, causing them to believe that extreme climate change is now more likely than they previously thought. This effect is stronger for people living in areas with more exposure to the heat wave. Yet a substantial fraction of respondents revise their views in the opposite direction: after the heat wave they report that they think that global average temperature increases are *less* likely. These individuals are more likely to be men, and they are more likely to live in high voter-turnout areas for the Sweden Democrats (SD), a right-wing, populist party that stands in vocal opposition to the UN Paris Agreement and the common climate goals set out by Sweden's national government.

In Sweden, political polarization has a strong gender component. Around 70% of SD voters are men (Jylhä, Rydgren, and Stripling (2020)), while female voters skew towards parties on the political left.[3] In line with these political differences, women in our data, are generally greener than men. Women grow more concerned about climate in general over the sample period, irrespective of their exposure to the heat wave. Only men's views are affected by proximity to the heat wave. Essentially, exposure to the heat wave causes men's views to converge to women's, provided that the exposure occurs outside of high SD voter-turnout areas. Men, and not women, are the ones who become less concerned about the environment in high SD voter-turnout areas.

These results mirror findings in contemporaneous work by Djourelova, Durante, Motte, and Pattacchini (2024), in which exposure to a natural disaster interacts with political orientation to exacerbate climate polarization. In the second part of the paper, we connect these changing beliefs to investment decisions by measuring households' allocations to fossil fuel exclusion funds in their national retirement savings accounts. In low SD voter-turnout areas, those who become more concerned about climate change tilt their retirement portfolios towards fossil fuel exclusion funds. Those in high-SD voter turnout areas do not. In these areas, individuals who grow less concerned about climate adjust their

[3] According to election data from Statistics Sweden, women are over-represented in the Green Party, the Social Democrat party, and the Left Party.

portfolios away from fossil fuel exclusion funds. Thus, individuals exposed to the same weather events adjust their beliefs in opposite directions based on their (politically motivated) priors, and carry these beliefs into retirement savings decisions. In line with previous work, we find the strongest connections between environmental beliefs and financial decisions among more financially sophisticated respondents (Anderson and Robinson (2022)).

Our data allow us to quantify these retirement savings decisions both at the household and aggregate level by benchmarking them against the broader adoption of pro-ESG mutual funds in the Swedish retirement system. The system serves the entire working population of Sweden and has over $200 billion of assets under management, placing it among the top twenty pension funds in the world. ESG mutual funds play an important role in the system—indeed, ESG mutual funds are far more important in Europe than in the US in terms of assets under management (Starks (2023)). Overall, about one-third of the total re-allocation to fossil fuel exclusion funds that occurred in the system comes from active rebalancing; the remainder occurs through funds that reclassify themselves as fossil-fuel exclusion funds. In general, inertia in retirement choices attenuates the aggregate effects of our findings. Nevertheless, the role of active rebalancing is quite strong among those who grow more concerned about global warming. For this subsample, around 76% of the total reallocation comes from active rebalancing. This indicates that the overall transition would have been swifter were it not for the political backlash to the climate change agenda.

In our setting, a common shock experienced by all — the heat wave of 2018 — is subject to different interpretations based on the weight that different agents place on the various pieces of information it contains. Politically tilted media coverage, aimed at catering to individuals' specific preferences and beliefs, exacerbates this. In this sense, our results are connected to a large body of experimental evidence how individuals engage in asymmetric updating; over-weighting information that conforms to our prior beliefs and under-weighting evidence that conflicts with them.[4] This form of 'selective interpretation'

[4]This mechanism is developed and explored in Rabin and Schrag (1999), Mullainathan and Shleifer

is connected to increased polarization of opinion in modern society. Asymmetric updating is especially important in the context of climate change, where there is enormous scope for encountering politically charged, conflicting information. For example, Sunstein et al (2017) show that respondents who are initially skeptical about anthropogenic climate change attach more weight to unexpected good news about climate change and tend to dismiss unexpected bad news about climate change, while respondents who are already convinced of climate change attach more weight to unexpected bad news and dismiss unexpected good news.[5]

Our results add to the burgeoning climate finance literature in several ways. While it is broadly accepted that political polarization causes a divergence of opinions and beliefs about climate and related issues, ours is some of the first evidence on the real effects of this political polarization, especially at the individual level.[6] Measuring individual changes in beliefs in response to a common weather shock unravels the dynamics of the dispersion in beliefs about climate change (see Dechezleprêtre et al, 2023). Second, our evidence for how individual-level *changes* in climate beliefs translate into portfolio allocations adds to previous work examining cross-sectional differences in portfolio allocations (see Hong and Kostovetsky (2012), Pan et al (2023), Giglio et al (2023), and Riedl and Smeets (2017)). Third, our results show how investor preferences and financial sophistication interact, which builds on a large body of work in household finance and retirement savings, including Calvet, Campbell, and Sodini (2009), Lusardi and Mitchell (2009, 2014), Carrol et al (2009) and Madrian and Shea (2001). Finally, our measurement of the relative importance of individual choices versus investment manager decisions in the retirement system's transition to ESG-centered investment options complements work by Hartzmark and Sussman (2019), Krueger, Sautner, and Starks (2020), Barber, Morse, and Yasuda (2020) and Atta-Darkua et al (2022) illustrating the role that financial institutions

(2005), Andreoni and Mylovanov (2012), Baliga, Hanany, and Klibanoff (2013), Glaeser and Sunstein (2014), and other papers.

[5]See also Nyhan and Reifler (2010), Kahan et al (2012) and Fryer, Harms, and Jackson (2019).

[6]A recent paper by Goldman, Gupta and Israelson (2024) links politically tilted coverage of financial news to an increase in abnormal stock trading volume, but their work is silent on whether the excess volume is driven by retail or institutional investors, and the source of their political tilt is not necessarily related to climate change, but political affiliation more broadly.

play in the transition to fossil-fuel free investments.

The balance of the paper proceeds as follows. Section 2 provides institutional details and background concerning political polarization in Sweden and its connection to weather events in the summer of 2018. This sets the backdrop for our empirical analysis. Section 3 describes our survey and connects it to pension data. In Section 4, we show how temperature revisions vary with characteristics and the heat wave. Section 5 relates these temperature revisions to rebalances and portfolio holdings. Section 6 shows the relation between climate revisions and the allocations to exclusion funds in the aggregate. Section 7 concludes.

2 Politics, Polarization, and Climate Change in Sweden

Our paper makes use of regional voting data for the Sweden Democrats (SD), a right-wing populist party which is in many ways stand in direct opposition with the green movement. We combine this data with a heat wave shock that affected parts of the country and can therefore assess asymmetries in how beliefs and behavior change for people observing or experiencing the same basic phenomena. The mechanism which we set out to capture is that a weather shock triggers a discussion that is shaped by the prevailing local political environment and therefore leads people to arrive at different conclusions.

In the following subsections, we describe the political environment, the heat wave and timing of events between our two surveys that explains the basic research design of our study. We also present aggregate evidence that the heat wave itself indeed is associated with increased concerns about global warming on the household level.

2.1 Sweden Democrats and Political Polarization

The Sweden Democrats (SD) are a right-wing populist party that has experienced enormous growth in popularity over recent years, fueled by increasing dissatisfaction with the traditional political parties, as has been witnessed in many other European coun-

tries.[7] The SD Party was formed in the 1980's with close ties to the nationalistic neo-nazi movement. Initially they were primarily focused on opposing immigration, viewing it as a force that diluted traditional Swedish identity and values. It has since formulated a full-scale political agenda in opposition to mainstream policies on a wide range of topics, including EU membership, gay rights and climate change legislation. Opposition to climate change legislation remains a key plank in its party platform. The party first crossed the 4% vote-share threshold for seats in Swedish Parliament in the 2010 election with 6% of the vote, and has since grown dramatically, with vote shares in the 2014 of 13%, 17% in 2018 and 21% in the 2022 elections, making it the third largest party in Sweden in the 2022 election.

Rydgren and van der Meiden (2019) explores possible reasons for this development. One is that SD successfully managed to politicize immigration. Another is that political convergence among established parties provided an opportunity to take opposing sides in many key issues as a way to profile them as a clear alternative. SD votes are higher in rural areas with lower education, greater income disparity and higher immigration. The anti-immigration and climate sceptic policies makes the party less attractive to women. Men make up around 70% of SD voters (Jylhä, Rydgren, and Stripling (2018)).

Since 2020, the SD party has voted against environmental regulations ("The Green Deal") in the European Parliament more than any other party in Sweden. Out of the 222 times the Sweden Democrats voted, 69% of the votes were against these green legislation (Hirschberg and Hallgren (2023)).

2.2 The Heat Wave of 2018

In the summer of 2018, Sweden was gripped by a record-setting heat wave. Data from the Swedish Meteorological and Hydrological Institute (SMHI) offer a useful way to measure the magnitude and geographic variation of the event. Warnings are issued at the county level; the 290 municipalities belong to 21 distinct administrative counties in Sweden. The

[7] See Pew Research Center, https://pewrsr.ch/3CDu5Pp.

warnings are graded from Class 1 (some risks and disturbances to transport and other parts of society); Class 2 (danger, damage and larger disturbances); and very rare Class 3 (serious danger, serious damage and major disturbances). Warnings are categorized into six types: Heat, Wind, Rain, Snow, Flood and Thunderstorms. We focus on exclusively on heat, for which there are only Class 1 and 2 warnings. The Swedish Meteorological Institute issues a Class 1-warning when daily maximum temperatures are expected to be at least 30°C for three consecutive days, and a Class 2-warning when daily maximum temperatures are expected to be at least 30°C for five consecutive days or daily maximum temperatures are expected to be at least 33°C for three consecutive days.

Prior to 2014, there had been only one single recorded heat warning, but the weather in the summer of 2014 was exceptionally warm throughout many parts of Scandinavia. This heat wave, however, was surpassed by the one that occurred in the summer of 2018, during which temperatures were 3-5 degrees Centigrade higher than normal in Sweden. In July, 2018, Stockholm experienced the highest average monthly temperature in its 262-year history of systematic temperature measurement. The heat wave in 2018 triggered forty-two Class 1 and thirteen Class 2 warnings across the country. As shown in Appendix D, these were issued mainly over the east side of the country and were not limited exclusively to the southern part of the country.

Even though this extreme weather event contained little information about future global climate change, previous work suggest that people directly or indirectly react to them.[8] Moreover, this weather shock coincided with national elections that took place in the early fall of 2018 just after the heat wave. Thus, the heat wave itself became a political flash point: it became both a tool for those advocating stronger measures to fight climate change, as well as an important source of pushback among climate skeptics. The media played an important role in this political pushback.

[8]Weather-induced preference shocks have been explored in various settings before including car purchases: Busse et al (2015); real estate prices: Bernstein, Gustafson, and Lewis (2019); stock prices: Choi, Gao, and Jiang (2020); and pricing of options: Kruttli, Tran, and Watugala (2021).

2.3 Climate Change in the Public Debate

As in many other countries, 2018 was the year in which the awareness and concern about climate change moved to the top of the political agenda in Sweden. To get an overview of how political opinon changed during the time of our surveys, we collect data on polls and news media. One of the most established polls is made by Demoskop who surveys voters about the ten most important topics monthly, where "Climate change" is one such topic. We also count articles with keywords "Climate change" and "Global warming" obtained from the Media and Climate Change Observatory.[9] Opposing views on climate change is proxied by similar article counts from far-right media obtained from Vowles and Hultman (2021).

Figure 1 here

Figure 1 presents a time series plot for these three data sources centered around a window for the two surveys which shows how climate change quickly grew to become an important topic on the political agenda. The shaded grey area shows that there is a first spike in interest in climate change among voters during the early fall in 2018 following the heat wave in July. The heat wave was followed by an intensified discussion about climate change which peaked in September (where Mainstream media coverage peaks in Figure 1). The Demoskop poll shows that "Climate change" replaced "Immigration" as the most important topic for Swedish voters at this time. The timing of events includes Greta Thunberg's climate strikes in August 2018 and the IPCC report in October the same year. The Global Climate March in in the spring of 2019 and Greta Thunberg's speech to the UN in September later in the year were both important media events for the climate movement, when we also see that the far-right media was especially active. Jylhä, Rydgren, and Stripling (2020) and Vowles and Hultman (2021) give a detailed exposition of how climate news were distorted, and how Greta Thunberg was discredited in right-wing news media. The elevated interest in climate change from the right-wing media is a reaction to the increased coverage by mainstream media.

[9]European Newspaper Coverage of Climate Change or Global Warming, Boykoff et al (2023).

2.4 *Analyzing Polarization and Climate at the Macro Level*

We combine spatial variation in exposure to the heat wave and political environment to to our individual microdata on revisions to climate change. Our research design therefore makes it possible not only to understand to which extent the heat wave changed peoples revisions, but also to which extent these changes differ depending on the political predisposition in the area.

Figure 2 here

Figure 2 illustrates the spatial variation in voting and areas affected by the heat wave. The darker regions in Figure 2 indicate municipalities with above median voting turnout for the Sweden Democrats (SD) in 2018. Striped regions marks areas affected by the heat wave of 2018.

For broad evidence of how the heat wave affects concerns about climate change, we collect open source data from a national survey administrated by the Public Health Agency in 2019 that targeted parents of 12 year-olds asking them if their children display climate worry or anxiety ("Often" or "Very often"). The data is only available in averages on the county level, thereby reducing the number of observations to 21. The question is targeted towards the kids in the family, so we assume that the county averages are representative of the prevailing view of families in the region. We find that this coarse measure of climate anxiety varies considerably across regions: the minimum is 12% and maximum 24% with a mean of 18%.[10] We explore this data in regressions using aggregated voting data of the Sweden Democrats together with regional dummies for the heat wave shown in Figure 2 as explanatory variables.

Table I presents the results. Column (1) shows that the average proportion displaying climate anxiety is around 4% higher in areas that were exposed to the heat wave. This is a large difference compared to the unconditional mean of 16.6%. The result is statistically significant despite the low number of observations. Column (2) introduces a dummy

[10]The Public Health Agency reports a strong gender difference. The fraction reporting climate anxiety is 22% among girls but only 16% among boys. The data does not allow us to split on gender across counties.

variable for above- or below- county-level median SD voter turnout. The loading on the SD voter turnout variable is negative and about half the value of the heat wave coefficient, indicating that exposure to the heat wave generated much less climate anxiety (as reported by parents) in high SD areas. In column (3), the heat wave dummy is interacted with the SD voting variable. Our statistical significance is hampered by the fact that there are only 21 observations in the county-level data, but the interaction term indicates that climate anxiety is both lower on average in high-SD areas and less affected by the heat wave in high-SD voter areas.

Table I here

Our data, described below, allow us to measure these effects with much greater precision, both in terms of granularity (voting precinct versus county level) and through additional demographic controls (e.g., gender, income). But these preliminary results on the county-level directly shows that worry about climate change has a political dimension, and is not uniformly distributed across those treated with the same heat shock. In the next section we describe our survey data procedure in detail and then show that the asymmetry in responses to the heat wave we have document here carries over to revisions in climate change expectations.

3 Data and Empirical Setting

Our data consists of two sets of survey responses from the same individuals that are matched to detailed administrative data. The two surveys allow us to measure changes in beliefs about climate change before and after the heat wave, and how the changes in turn influence investment decisions.

Our empirical strategy can be described in four steps. First, in conjunction with Statistics Sweden (SCB), we administered a series of surveys, the first one in January and February 2018.[11] The first survey, which is documented in detail in Anderson and Robinson

[11]SCB is a government agency responsible for collecting and compiling nationwide statistics in Sweden,

(2022), targeted 20,000 randomly selected individuals aged 18 to 65 who were provided instructions by mail on how to complete the survey online. After two reminders, we received 4,230 completed responses corresponding to a 21% response rate. We then administrated a follow-up survey to the same respondents in August and September 2019. Around 60% of the original respondents participated in the second survey, resulting in a total of 2,561 complete responses. Both surveys show high response rates and are in line with other surveys solicited by the SCB. By comparison, Giglio et al (2021) work with data reflecting around a 4% response rate, which is more typical of household surveys. Working with SCB also has the advantage that our sample demographics can be compared to the underlying population where we apply survey weights to make our analysis generalizable.

In a second step, Statistics Sweden matches the survey responses to administrative data obtained from various sources, including the Swedish Tax Authority. This step allows us to combine financial literacy and environmental views that we elicited in our surveys with a large set of demographic and wealth characteristics. We also know in which of the 290 municipalities the respondent lives in Sweden, which allows us to match on local voting outcomes.

Because we are specifically interested in understanding the link between environmental views and investment decisions, we add the complete transaction histories from the Swedish Pension Agency (SPA) in the third step. Since the SPA provides retirement savings accounts for the whole working Swedish population, we can obtain mutual fund choices for virtually every individual in our sample. The data include the timing and fund composition of any rebalances as well as the year-end portfolio balances. From the SPA, we also obtain fund characteristics, which allows us to classify the funds the same way they are presented at the SPA website. Data on monthly fossil fuel exclusion are available from April 2019, but we hand-collect yearly data for all funds back to 2017 — before the survey.[12]

similar to the US Census Bureau. Details of the response statistics and the matching procedure is provided in Appendix A and Appendix B presents the survey questions.

[12]The hand-collected data is obtained from the mutual fund companies annual reports, in which we

Finally, we merge the data with weather warnings obtained from the Swedish Meteorological and Hydrological Institute (SMHI). We match county-level warnings data to the survey data. Because there are only 21 county administrative units in Sweden, the variation in weather warnings data is necessarily coarse.

In the remainder of this section, we explain the Swedish pension system, measures of sustainability and the weather warnings data in more detail. We then show the data on individual allocations in our sample and explain our survey measures and outcomes sorted on investor characteristics.

3.1 The Swedish Pension System

The Swedish Pension system currently operates two types of accounts for each individual contributing to the system.[13] One is a defined contribution account funded on a pay-as-you-go basis based on a contribution rate of 16% of labor income, analogous to Social Security in the United States. A second account is based on an additional 2.5% of labor income. This operates in a manner similar to a 401(k) plan in the United States, but as part of the state pension, rather than an as an employer-sponsored plan. Individuals are allowed to control how this account is invested by allocating this portion of their account across as many as five different funds. A reallocation is made by stating percentage allocations to a newly chosen portfolio, which triggers a liquidation of the old portfolio and a complete rebalancing into the new one with the desired weights. The simplified rebalancing procedure is different from many private savings schemes, where people often just choose allocations for new inflows, or alternatively, are required to reallocate by selling previous holdings before buying new funds. Inflows to the pension accounts are distributed annually according to the weighting scheme in November. The pension system is therefore a very suitable laboratory to test questions related to beliefs and investments because it involves the whole working population and the amounts are proportional to

classify exclusion based on a threshold of 5% restriction of fossil fuel investments.

[13]The Swedish pension system underwent a dramatic transformation in the 1990s. A full account of this transition is beyond the scope of this paper; details are discussed at length in Palme, Sunden, and Söderlind (2007) and Palmer (1998).

income.

Investors who do not make a choice automatically fall into the default fund. The default fund is managed by a government controlled company, called AP7, and offers a low-fee, well-diversified fund that employs screening of individual companies in order to take socially responsible investing considerations into account. Since the fund is a broad index fund, it has minimum restrictions of its investment universe, but does exclude manufacturers of biological, nuclear and cluster weapons.[14] More importantly, it does not exclude companies operating in the fossil fuel sector.

The default fund is not part of the general fund offering available for selection, but is by far the most common choice for first entrants in the system since the launch in 2000. As has been widely documented in the literature, default fund investors are generally less financially sophisticated investors with lower income and financial literacy; inertia characterizes many individual's choices. The individual pension data contains the full history of allocations ("rebalances"), in which the share of default fund investors are close to the overall fraction of 40% of all people in the pension system. At the end of 2021, the total assets under management (AUM) were just over SEK 2 Tn (USD 200 Bn) and covered six million people, a number which is close to the weighted sample in ages 18-65 that we apply. After only twenty years since inception, the system is still under consolidation and is expected to level out at approximately twice the size measured by AUM, placing it among the ten largest pension funds in the world.

At its launch in 2000, there were 254 funds to select from; this number quickly grew to include almost 900 funds by 2018. There were historically only a minimum set of requirements (such as following the UCITS directive) for a fund to enter an agreement with the SPA and become eligible for participation in the system. In the debate that followed a few scandals where investors had been defrauded and a more broader discussion about improving governance and choice architecture, the SPA were given new guidelines in 2018.[15] In December 2018, the SPA formally terminated all agreements with its current

[14] As of December 2021 the AP7 maintains a list of 97 "blacklisted" firms that are individually screened and excluded from investment, most of them due to breach of UN principles of human rights.

[15] Anderson and Robinson (2018) show the negative relation between choice and financial literacy.

fund companies to be renewed only if funds could comply with a new set of rules, in which the most substantive change was a minimum cap for its AUM. Another requirement was for the fund company to subscribe to the UN Principles for Responsible Investments, but representatives from the SPA tell us that this restriction was not binding. The new requirements decreased funds available for selection from over 800 in 2018 to less than 500 in 2021. The dotted line in Figure 3 shows a stark decrease in the total number of funds offered in 2019 and 2020, where delistings were done in batches. Holders of delisted funds received an information letter from the SPA with information about the change and instructions on how to choose a substitute fund. Non-choosers were diverted to the default fund. From April 2019 and onwards, all funds are classified with respect to sustainability objectively (by exclusions and Morningstar ratings) in much more detail than previously.

3.2 Green Investment Options in the Swedish Pension System

We collect historical monthly fund characteristics from the SPA website to match with individual holdings. A green ESG label was introduced in 2004 to allow companies label their funds as incorporating social (ethical) or environmental aspects in their investment processes. This procedure did not stipulate any standards or minimum requirements by the SPA. Historically, funds were therefore likely to differ in scope in which they adhere to green investments and other aspects of corporate social responsibility (Anderson and Robinson (2022) give a detailed overview). It is also a clear possibility that some reclassifications were made as a strategic response to increased consumer demand, as in Cooper, Dimitrov, and Rau (2001).

In 2019, the SPA launched more extensive online tools for investors to assess the environmental performance of funds. The online tool enables investors to screen and sort funds according to specific strategies as well as fund fees across category, type of funds

Dahlquist, Martinez, and Söderlind (2017) documents inertia also for those who initially chose a portfolio of funds in the pension system and Cronqvist, Thaler, and Yu (2018) show that the fraction of new entrants in the system making fund choices decreases.

and geographic regions. Three additional characteristics were introduced. First, funds could now classify themselves into three broad categories separately based on sustainable stewardship: Environmental, Social and Governance. Around 94% of funds reported that they in some way adhere to all these principles at the end of 2021. The new decomposed ESG label is like the former version not subject to external validation and will likely encompass a lot of variation in the degree to which they comply with ESG standards.

Second, the Morningstar climate risk metric is reported, ranging from "Negligible" (0-10) to "Severe" (40 and higher). The scale aims to capture, in absolute terms, to what extent funds are exposed to financial risks related to climate change. Although the Morningstar climate risk metric is a universal assessment of "expected green" performance, such measures are subject to noise and lack consistency across providers (Dimson, Marsh, and Staunton (2020)). At the end of 2021, there were 34 funds without a Morningstar Climate Risk score, including the default fund. The sample average (median) of funds available is 23 (22), the minimum 8 and maximum 41. Our sample closely matches the distribution of the overall holdings in the pension system.[16]

Finally, funds report up to 13 exclusion strategies (so-called *negative selection* funds as in Hong and Kacperczyk (2009)).[17] We focus on fossil fuel exclusions as they naturally appear to be the most relevant strategy for investors aiming to steer their portfolios away from carbon emitting firms. Choosing exclusions is also likely the most salient way for investors to reveal their preferences over investment mandates. From the annual reports of fund companies, we complement the PPA data by hand-collecting fossil fuel exclusions on the fund-level for 2017 and 2018 which enables us to trace holdings of these funds over time.

There is an obvious link between climate risk and fossil fuel exclusions. The fossil fuel industry is exposed to risks related to carbon regulations, decreasing demand for its products and increasing costs related to the implementation of emission reduction tech-

[16]See Appendix C: Figure C.1 presents a screen print of the web tool and Figure C.2 plots the full Morningstar climate risk score distribution across funds and portfolios.

[17]The exclusions categories are: Fossil fuel, Coal, Uranium, Gene modification, Arms, Nuclear weapons, Cluster bombs, Biological/Chemical weapons, Alcohol, Tobacco, Pornography, Gambling, and breach of UN human rights conventions.

nologies. Fossil fuel exclusion is a narrow measure that captures a reluctance to avoid a particular high carbon dioxide-emitting sector today. They turn out to be highly correlated and our empirical analysis shows that the results are quite similar for both measures of green investments.

We match the aggregate AUM of all funds to the fossil fuel exclusion classification to characterize the development of the Swedish pension system from January 2017 to December 2021 when the sample ends.

Figure 3 here

The grey area in Figure 3 shows the capital allocated to the default fund (light grey) and all other funds available for selection (dark grey). The green area shows the capital allocated to fossil fuel exclusion funds from 2017 and 2021. Exclusion funds were quite rare in 2017 (the solid black line shows that the fraction of about 10% of the number of available funds), but quickly grew to become a substantial share of the pension fund space in 2021. About half of the funds available in the Swedish system exclude fossil fuel at the end of our sample. This represents around 44% of the total pension wealth. Text boxes indicate the approximate timing of our two surveys.

Is the growth of exclusion funds in Figure 3 a result of investors' increased awareness of climate change? We use the weighted portfolio average of fossil fuel exclusions along with Morningstar climate risk assessments as measures of investment tilts when we analyze portfolio choice as a function of changing global temperature beliefs in Section 5. We measure the portfolios in 2021, allowing investors to rebalance their portfolios from when they took the survey to the end of the sample. To which extent is the change driven by passive investment and funds changing their investment mandate? We introduce a measure of *active fossil fuel exclusion* by using rebalances in the time series from the day they took the first survey in 2018 up until the end of 2021. The total fossil fuel exclusion weight in 2021 can be decomposed into a component attributed to rebalances (actively re-weighting the portfolio) and a passive part which is attributed to reclassification of the fund, measured at the day the individual took the first survey to the end of

the sample period. An individual that did not make any rebalancing decisions will have a passive weight identical to the total exclusion weight. An individual who made a decision will have an active weight equal to the total weight as long as funds have unchanged classifications, but can have both an active and passive part if some funds change their classification after the rebalancing decision.

The decomposition has a distinct advantage over a simple difference in weights between two time periods as it explicitly addresses the issue of reclassification, which is a substantial part of the overall change in exclusion fund holdings. As such, the decomposition in an active and passive component can be thought of as portfolio changes attributed to demand (rebalances) and supply (reclassifications). It gives us the opportunity to verify that measured beliefs relates to active choices, but it also allows us to obtain an approximation of how much of the increased total allocation to exclusion funds are attributed to active choices and how much is due to a change in the offering of funds on the aggregate level for the studied time period.

3.3 Survey Questions

Our first survey includes basic questions about financial literacy, green preferences and climate beliefs. The questions and responses to the environmental and financial literacy tests are analyzed in detail in Anderson and Robinson (2022). In the second survey, we repeat one question from the first survey. We ask:

- "Over the next 20 years, how likely do you find the following scenario?"
  - "The average temperature on earth will rise by more than one degree Centigrade"

The 20-year timeframe was chosen so that individuals were being asked to look forward over their own lifetimes, rather than over longer future periods that they will not experience personally. A one centigrade rise within such a short time frame as 20 years is quite unlikely compared to current scientific consensus (although this is being contin-

uously revised). According to the United Nations and the Intergovernmental Panel of Climate Changes (IPCC), the increase in global average temperature is just above one Centigrade since the beginning of industrialization, even if the pace in which occurs is increasing. The historical pace is around 0.17 Centigrade per decade. A further one degree increase within only twenty years would imply that the target for the Paris agreement to keep world's temperature increase well below two Centigrades before year 2100 would be missed by a wide margin.

Table II here

Table II presents a transition matrix of the responses across the two surveys. Overall, 1,264 people did not revise their expectations: 684 revised up and 613 revised down the probability of a sharp global temperature increase. In other words, there is substantial variability in the perceptions of how a temperature increase will play out within the next two decades, which partly may be explained by the large uncertainty associated with these assessments (see Giglio, Kelly, and Stroebel (2021)). On average, respondents find a given temperature increase somewhat more likely in 2019 compared to when asked the same question in 2018. In our analysis that follows, we use the off-diagonal elements of Table II to construct temperature revisions ("Revised up" for the upper diagonal elements and "Revised down" for the lower diagonal elements).

Figure 4 presents the frequency responses displayed separately for men and women across the two surveys in 2018 and 2019 within and outside high Sweden Democrat voting districts. In short, the graph shows that there is a gender divide: women grew to be more concerned and men less concerned. In total, 47% of women find a rapid climate change very likely in 2019 compared to 40% in 2018. This fraction remained unchanged for men in general. Turning to more conservative areas with high share of Sweden Democrat votes, there is a decrease in the fraction of men finding a rapid temperature change likely: 37% found it very likely in 2018, but only 35% in 2019. The fraction finding it unlikely or very unlikely doubled from 6% to 12%. Women in high SD area differ - if anything - in becoming more concerned across surveys. These results are consistent with the

proposition that political polarization drives a wedge in peoples beliefs across gender.[18]

Figure 4 here

Table III provides a more detailed demographic breakdown of the respondents. Response rates for younger, lower-income individuals with lower education are generally lower. Since the second survey is conditioned on having responded to the first, this difference is accentuated. Individuals responding to both surveys are on average older, have higher income and education relative to the overall Swedish population. More than half of the individuals in our sample went to college and 35% of our respondents are 55 or older, while only 19% of the Swedish working age population is in this age range. Statistics Sweden compute survey weights for us based on age and gender in order to achieve a closer representation of the underlying population.

Columns marked "Temperature change" in Table III shows the fraction of people revising up or down. On average, most individuals revised their expectation upwards (27% up compared to 24% down). The weighted averages across the two surveys diminishes the gap but is similar, but younger people are in general more concerned about climate change. This could reflect generational shifts in attitudes toward the environment, or it could be a manifestation of the increased pessimism documented in Heimer, Myrseth, and Schoenle (2019). Men are less likely to revise up their assessment compared to women. We also find upward revisions to be associated with higher education, low SD votes, high financial literacy and and somewhat u-shaped for age where the propensity to revise up is largest for the youngest and oldest cohort.

Table III here

In order to verify that differences in beliefs about a global temperature increase indeed are associated with general climate awareness and concerns, we asked our respondents in the second survey to which extent they would agree or disagree with four statements

[18]In the 2018 elections, the Sweden Democrats were expected to have twice as many male as female voters, Holmberg and Oscarsson, September 2018, "SVT:s Vallokalsundersökning Riksdagsvalet 2018."

concerning climate-related concerns (E), but also two questions related to social (S) and governance (G) beliefs. The questions are as follows:

- *Notice GW (E)*: "I have already noticed the effects of climate change in Sweden"
- *Worry GW (E)*: "I'm worried about climate change and what it means for myself and my family"
- *Government Action (E)*: "The government should do more to fight climate change"
- *Foreign Aid (S)*: "I am willing to pay higher taxes to increase Sweden's aid to poor countries"
- *High Trust (G)*: "I trust the government to invest my pensions in a sustainable way"

The responses fall on a five-point Likert scale from from "Strongly Disagree" to "Strongly Agree," where we report the fraction of respondents responding "Strongly Agree" across demographics in Table III.[19] The overall fraction of respondents strongly agreeing that they have noticed the effects of climate change where they live is 58%, 24% agree and only 7% disagree to some extent. More women than men, more young compared to old, but less people living in SD dominated regions report to have noticed this change. A smaller fraction is worried about climate change. Around 23% (27%) strongly agree (agree) to this statement, but almost twice as many women compared to men worry about climate change. Over half of the respondents think that the government should do more to fight climate change, which is an opinion held more commonly by the young, women, lower income individuals with higher education living in low SD dense areas.

There is much less agreement over the two last questions related to social values and (green) governance, where there is a larger fraction disagreeing than agreeing. Only 9% state a willingness to pay higher taxes to increase foreign aid to poor countries, but this fraction varies with characteristics along the same lines as for the environmental questions. The last question is about governance and asks to what extent you trust the government to invest your pensions sustainably. This is particularly relevant in the Swedish

[19]Table B.2 in Appendix B provides a full tabulation of these results.

pension system where almost half of the aggregate holdings are invested in the default fund as shown in Figure 3. About one third of the respondents show low trust in the government to manage their pension with sufficient sustainable standards. Trust is lower for the middle aged, highly educated and among the financially literate.

Overall, the average responses show a high concern for environmental issues and willingness to take action. The correlation within the environmental questions and between foreign aid is high, but much lower for the governance question. Cross-sectionally, characteristics associated with these views are broadly consistent with what is found in other studies measuring pro-social preferences (Falk et al (2018) and Dechezleprêtre et al (2023)). We analyze how these differences in perceptions and call for action relate to revisions of temperature changes in Section 4.

4 Changing Beliefs about the Severity of Climate Change

We begin our analysis by first exploring how temperature revisions relate to individual characteristics and then show how the temperature revisions relate to our measures of environmental attitudes.

To understand the motivation for changing beliefs about climate change, we utilize local heat warnings issued between the two surveys. We create a dummy to be equal to one if the respondent lives in an area exposed to a Class 2 warning in 2018. In untabulated results, we use the number of Class 2 warnings along with Class 1 warnings to control for spatial correlation between them. Since the results are qualitatively identical, we opt to use the simpler dummy representation which allows for an easier interpretation of magnitudes.

Table IV tabulates the results of Probit regressions where the dependent variable is upward or downward revisions. The first five columns of Table IV shows the results for upward revisions. Column (1) shows that men are about 5% less likely to revise up their expectations of a one degree global temperature. Those having been exposed to the heat wave are 3-4% more likely to revise up, but the statistical power of this result is weak.

Columns (2) and (3) split the sample on gender and show that the heat wave only affected men's upward revisions, not those of women. In column (2), the loading on the SD vote variable is also negative for males and the magnitude is similar to that of the heat wave estimate. Column (2) thus captures a key result in the paper, which is that men's beliefs about the severity of climate change were affected by their proximity to the heat wave, but only if they were outside high-SD voting districts; those within these anti-climate strongholds reacted in the opposite manner. Columns (4) and (5) partitions the sample into high (above median) versus low (below median) SD voting districts and shows that the it is men within these areas that revised down. Outside of high SD-districts, people affected by the heat wave tend to update their beliefs upwards.

Table IV here

The corresponding results for downward revisions are presented in columns (6) through (10) of Table IV. In column (1), the coefficient estimate of the dummy variable for men is twice as strong for downgrades which in turn suggests that, overall, men were more prone to revise down than to revise up. The gender effect disappears for downward revisions when sorting on SD strongholds. Men (women) are more likely to revise down, independently of the political environment. The difference in results between upward and downward revisions is driven by the omitted category (one omits the other category plus the unchanged assessments). Taken together, we find considerable asymmetries in how people update their climate beliefs. The heat wave made men, particularly outside SD strongholds, to revise up. Women are much more reluctant compared to men to have revised down their estimates between the two surveys.

The power of our main cross-sectional tests may or may not be affected by the fact that we only observe spatial variation in weather at a coarse level. Nevertheless, the split-sample results suggest that the low power in the full sample is driven at least partly by the gendered nature of the response to weather shocks. Our analysis ultimately does not hinge on cleanly identifying the effect of weather shocks on individual expectations. We merely show that expectations change in a manner consistent with the shock for some,

while they change oppositely for others—aligning with political leanings. Our results suggest that the weather shock did have an effect of people revising their expectations, but that this effect is mainly stems from the revisions of men, who begin with lower average levels of concern about climate change than women. Women revise upwardly regardless of their proximity to the weather shock.

To check whether our temperature revision variable truly captures salient concerns about climate change, we test how well it can be associated with increasing awareness, fears and the willingness to take action against climate change that we measure in the second survey in 2019.

Table V presents the results from four Probit regressions where the dependent variable takes the value of one for strongly agreeing to the five ESG-statements presented in Section 3.3 (Notice GW, Worry GW, Government Action, Foreign Aid and Government Trust). Among the independent variables, we include separate dummy variables for up and down revisions. We include a set of characteristics as controls: a dummy if the respondent lives in a high SD voting district, financial literacy score, male dummy, log of income, age (divided by 10) and a university education dummy.

Columns (1) through (3) of Table V show that revisions about expectations of temperature change indeed are associated with people having noticed climate change, being more worried about climate change and thinking that the government can do more to fight climate change. We also note that the effect is fairly symmetric in that the point estimates are similar for revising down or up. The parameter estimate in column (1) of Table V implies that people having revised up are 22% more likely to having noticed climate change where they live and men in general are 11% less likely to strongly agree with the statement. In general, we find that young, university educated women display greater concerns for global warming. People living in areas with a high SD voting outcome are generally less concerned. They are not less likely to have noticed global warming in their neighbourhood, but they are less worried about it and less likely wanting the government to do more to fight climate change.

Social concerns estimated in column (4) of Table V. The support for tax funded aid to poor countries is lower for university educated, older men and within high SD voting districts. Changing views about climate change is associated with less social support for those who revise down, but not among those revising up. This provides further evidence that downward revisions of climate concerns are associated with having conservative views of social policies.

Finally, column (5) of Table V displays the results for trusting the government on sustainability and pensions. Agreeing to the statement requires people to trust the government to begin with, but also in its ability in green stewardship. The young and financially literate are less likely to think so. Those revising up are generally more trusting in the government. This finding has implications for how people engage within the pension system. Those showing greater trust in the government's ability to manage their pension according to their green concerns would have less incentive to leave the default fund and to make an active choice of mutual funds.

Table V here

The results so far show that temperature revisions provide a meaningful measure of green beliefs and attitudes. These beliefs are much less articulated in areas of high SD voting outcomes, where we find important differences in how beliefs are updated across demographics. In particular, we find that men in high SD voting districts are less likely to revise their expectations of a sharp global temperature increase upwards. Men who are affected by the heat wave do. Women are much more likely to revise up independently of the heat wave. The revisions carry over to more general measures of concerns about climate change. Revisions are strongly related to our measures of climate concerns, but people living in high SD voting areas are less likely to worry about climate change or think that the government should do more to fight it. We find that downward revisions in climate change beliefs spill over to less social concerns. Those revising up tend to exhibit stronger trust in the government's ability to address sustainability within a pension context. The next section analyzes how these findings interact when examining financial

decisions within the context of the Swedish Pension system.

5 Climate Change Revisions and Portfolio Choices

In this section we connect revisions to beliefs about climate change to the rebalancing of retirement portfolios. Of the total 2,561 respondents in our sample, 2,521 own a retirement account at the Swedish Pension Authority in years 2018 through 2021. Choices are made by investors rebalancing their portfolio, i.e. they choose a weighting scheme consisting of up to five funds. As shown in Anderson and Robinson (2022), the propensity to rebalance has been falling over time and new investors coming into the system increasingly fall into the "non-choice" default fund. The fraction of investors in the default fund in the sample is 43% and very similar to the population average of 40%. We find that 28% of the investors (711 respondents) in our sample trade at some point during the three years after the second survey in 2019 up until the end of 2021.

We present our results as follows. We begin by using the full sample to understand who is in the default fund and to what extent they leave it by making an active choice in the time period between the first survey and sample end. Since the default fund does not exclude fossil fuel, it is helpful to understand to what extent changing preferences or beliefs are pulling investors out of default. We then focus on the individuals that have made a choice with the idea that they are likely to be more attentive to their portfolios (they already at some point made a rebalancing decision). Realizing that portfolio changes are rare and sticky, we allow investors to rebalance their portfolio after the first survey up until the end of 2021. We use two measures of how well portfolios align with concerns about climate change in 2021: we use the Morningstar Climate Risk measure and fossil fuel exclusions. Both measures are available to investors at the PPA website. Finally, we construct a measure of actively traded tilts towards fossil fuel exclusion funds from the date of the first survey. We do this for two reasons. First, it is a way of validating the cross-sectional results of portfolios in 2021 and that they indeed can be attributed to those actually tilting their portfolios. Second, the decomposition allows us estimate how much

of the AUM moved into exclusion funds are attributed to choices and how much is by reclassification.

5.1 Opting out of the default fund

Table VI presents the results from OLS regressions where the dependent variable in column (1) through (3) is a dummy variable that takes the value of one if the investor is in the default fund as of 2021. We use our measures of temperature revisions as well as worry about climate change and low trust for the government to manage the pension sustainable as our main variables of interest along with controls. Control variable follow those from Table V. Column (1) shows that revisions of global warming expectations are not correlated with opting out of the default fund; that is, increased concern about global warming is not generally associated with greater financial engagement. In column (2) we see that people who worry more about climate change are 10% more likely to be in the default fund, but in column (3) this effect is attenuated when we include investor characteristics. Default investors are typically younger, have lower financial literacy and income — all characteristics associated with lower financial sophistication as suggested by for example Van Rooij, Lusardi, and Alessie (2011). People in high SD-areas are somewhat less likely to be in the default fund.

Table VI here

In columns (4) through (6) of Table VI, the dependent variable takes the value of one if the investor was in the default fund at the end of 2017 but opts out sometime before 2022. This variable is meant to capture increased financial engagement that is plausibly triggered by extreme weather events. Again, climate forecast revisions are not associated with sudden opting out, but in columns (5) and (6) we see that individuals who do not trust the government to manage their pensions in a sustainable way (*Government Trust*) coupled by strong fears of global warming (*Worry GW*) are more likely to leave the default fund over this period. This suggests that climate concerns, coupled with doubt in

the government, drive retirement savers to become more actively engaged in the management of their retirement portfolio, even if the magnitude of a 5% increased likelihood is relatively modest.

These results are helpful in understanding the dynamics of investor behavior, because it suggests that many who worry about climate change the most tend to stick to the default fund. Those who leave the default fund are those who possess sufficient financial skills and are both worried and doubt the government's ability to manage their pensions in a sustainable way.

5.2 Temperature Revisions and Portfolio Holdings in 2021

In this section we focus on the investors outside the default fund. These investors have by definition made at least one rebalancing choice at some point, and can therefore be thought of as having paid some attention to their retirement portfolio. We explore the cumulative effect of rebalancing decisions and investigate whether investors' portfolio holdings at the end of 2021 are affected by the climate change revisions that we measure between 2018 and 2019. As we already established that default fund investors were less likely to opt out due to changing beliefs, we here turn our attention to those out of default. We use an extensive set of controls in this analysis acknowledging that portfolio choices are based on a range of considerations. As portfolio controls, we use fractions of type of fund in each category (Stock, Bond, Mixed and Target), portfolio-weighted past one-year return and standard deviation, fund fee and the exposure to local retail networks (consisting of the four main banks in Sweden). In addition, we dummy out the initial individual temperature assessment (labeled "TA controls") in 2018 such that the temperature change measure indicates any movement from the point at which investors were before the second survey.

We begin by analyzing the results from the Morningstar climate risk scale for mutual funds. The sample average (median) of funds is 23 (22), the minimum 8 and maximum 41. We weight portfolios according to the Morningstar climate risk ranking for available

funds, effectively dropping 1,112 observations where we cannot calculate the portfolios' climate risk due to missing data.

Table VII presents the results from an OLS regression where the dependent variable is the portfolio weighted Morningstar climate risk rating. Column (1) shows that upward temperature revisions are strongly correlated with lower climate risk exposures as measured by Morningstar. We find that women and older investors hold portfolios with less climate risk. High financial literacy is associated with more climate risk (at least in relative terms) which may suggest that they are "sin" investors (Hong and Kacperczyk (2009)). Columns (2) and (3) split the sample on financial literacy and show that temperature revisions translate into holdings at over twice the rate among the financially sophisticated. These results presumably relate back to the results of Table VI where we note that men are more likely to re-balance compared to women. Finally, columns (4) and (5) split the sample in high versus low SD voting regions. We find a strong association between lower climate risk scores and upward revisions outside high SD regions, but no effect for those living in those regions. Those who revise down in these regions are more exposed to climate risk, but the difference is not significant.

Table VII here

In summary, revisions of climate change expectations are reflected in portfolio holdings. We find the average effect to be relatively small, a -0.3 coefficient for those who revise up is to be evaluated against an overall portfolio climate risk mean of around 23. Overall, climate risk exposures are subject to both financial literacy and political preferences and are considerably different for subsamples of the population. Although climate risk undoubtably is a relevant variable for measuring investor portfolio choices with respect to climate concern, it may be a measure that is relatively opaque to individual investors. We therefore turn to fossil fuel exclusion choices, which are straightforward and easy to interpret.

Table VIII repeats the analysis of Table VII but replaces the dependent variable with the fraction of funds allocated to fossil fuel exclusion funds. We find a similar pattern for

the loadings of coefficients. Consistent with previous results, women and older investors are tilted more towards exclusion funds. Those who revise up have a 5% higher weight in fossil fuel exclusion funds compared to the average. We do not find a similar effect for downward revisions. Columns (2) and (3) again shows that this is by and large conditional on possessing higher financial literacy. The sorting on high versus low Sweden Democrat districts in columns (4) and (5) makes the difference in updating of beliefs and investment responses more clear. Those revising up outside of SD strongholds generally tilt their portfolios toward fossil fuel exclusion funds, but we find no such effect for those living within such areas.

Table VIII here

Since we know the trading history of investors, we refine the dependent variable of fossil fuel exclusions by decomposing it into an active and passive part:

$$\text{Total Portfolio Amount}_i = \underbrace{\text{Exclusion Funds}_i}_{\text{Active + Passive}} + \text{Other Funds}_i \tag{1}$$

An allocation to exclusion funds is labeled active when a portfolio choice is made. The active portfolio is adjusted over time if allocations were affected by passive changes in the classification of the fund. Passive changes occur when funds change their investment mandate.[20]

Table IX presents the result for a repeated analysis where the dependent variable is the active component of fossil fuel exclusions and is a function of having made an active portfolio decision.

Column (1) shows that the loadings of the characteristics associated with active exclusion funds change compared to Table VIII. This is because rebalancing is also a function of financial sophistication. The overall results are similar compared to Table VIII, but we note a much more pronounced effect for respondents in high SD areas. Comparing the coefficients for up and down revisions between columns (4) and (5), we see much sharper

[20]For completeness, we include the regression results for passive exclusions in Appendix E, which shows that the documented link between temperature revisions and portfolio holdings are exclusively related to active rebalancing.

evidence for respondents living in high SD municipalities. In particular, those who revised down also actively trade out from fossil fuel exclusion funds. The point estimate suggests that the fraction of active fossil fuel exclusion funds is over 8% lower in high SD districts. Conditional on trading, we find evidence that people revising down within SD districts tend to lower their exposure to exclusion funds. In this respect, asymmetric revisions in climate beliefs carry over to asymmetries in portfolio tilts.

Table IX here

To summarize, we find ample evidence that climate revisions among investors translate into portfolios with lower carbon emission intensities. This effect is mainly coming from upward revisions, but we also find that people living in areas with higher SD voting turnouts tend to move in the opposite direction. In these voting districts, downward revisions are associated with a decreased exposure to exclusion funds. Financial sophistication and participation is an important component in understanding the mechanism in which revisions in beliefs translate into action. We find that the financially sophisticated (as measured by higher financial literacy) are more likely to increase their exposure to fossil fuel exclusion funds. Within areas with a larger fraction of Sweden Democrats, we find evidence of a "backlash-effect" in retirement investments. Those who revise down in these areas also steer their portfolios away from fossil fuel exclusion funds.

6 Implications for Aggregate Holdings

The results thus far are developed at the individual level, allowing us to see how individual's beliefs affect their portfolio holdings. The final step in our analysis is to aggregate these individual results up to the aggregate level to quantify how individual preferences affect the overall transition towards green investment in the pension system. To do this, we divide investors into three groups based on whether they have grown more concerned, less concerned, or not changed their views about the environment. Then we measure average pension holdings for these groups, separately capturing changes that

have come through active rebalancing versus simply being allocated to funds which relabeled themselves as fossil-fuel exclusion funds, or which voluntarily adopted fossil fuel exclusions. This allows us to account for the widespread inertia in the system, especially among less financially sophisticated investors, and to compare to which extent the shift towards pro-ESG funds in the retirement is driven by investor demand considerations or changing investment mandates by funds.[21]

Table X here

This analysis is presented in Table X. Column (1) uses the population weights we obtained from Statistics Sweden to aggregate our respondents up to the national level and shows that roughly fifty percent of the population did not change their opinion on the environment. Those who grew more concerned slightly outnumber those who grew less concerned in aggregate. Column (2) reports point estimates from the following estimation:

$$\text{Portfolio Amount}_i = \alpha + \beta_1 \text{Revised up}_i + \beta_2 \text{Revised down}_i + \epsilon_i, \tag{2}$$

where Revised up and Revised down are the previously defined dummy variables for whether an individual revised their beliefs about temperature increases up or down, and where subscript i denotes the type of portfolio holding based on the decomposition in Equation 1, which in column (2) is the overall portfolio. The holdings of the average respondent in the neutral group is captured by α, which equals approximately 410,000 Swedish crowns (SEK). Column (3) repeats the above regression but focuses only on fossil fuel exclusion portfolio amounts, and shows that approximately SEK 184,000, or roughly 45% of the wealth on average, was allocated toward fossil fuel exclusion funds.[22] Nevertheless, for the neutral group most of these holdings arise through passive reallocation, not active rebalancing toward green funds as can be seen by comparing the point estimates reported in columns (4) and (5). Of the 184,000 crowns on average dedicated to

[21] Hong and Kostovetsky (2012) and Kempf and Tsoutsoura (2021) document politically motivated investment decisions on the institutional level.

[22] This closely matches the 44% number from Figure 3, which is the aggregate fraction of fossil fuel excluded AUM in the overall pension system.

fossil fuel exclusion funds, less than one-third, or SEK 52,215, was actively allocated in green funds by the individual (column 4). The remaining SEK 131,128 (see column 5) arose because the individual was already allocated to a fund that now excludes fossil fuels but previously did not. In other words, the choice was made by the investment manager, not the mutual fund investor. The fact that they did not change this allocation could simply be a reflection of inertia or inattention, or it could capture the fact that the fund's investment adopted fossil fuel exclusions in anticipation of a potential investor backlash. Our data are silent on this distinction.

The net effect for individuals who grew less concerned is not different than the neutral group. They hold a statistically insignificant SEK 16,026 more in their portfolios on average, and if anything, they hold slightly less in fossil-fuel mutual funds than the neutral group. This effect is a mix of a mild reallocation towards fossil-fuel exclusion funds offset by slightly smaller positions in funds that reclassified. But these differences from the neutral group are all statistically insignificant and small in magnitude.

In contrast, the results are considerably different for the group that grows more concerned about climate change. They have larger portfolios on average (adding the SEK 39,171 point estimate from column (1) to the neutral group yields an average of around 450,000) and hold SEK 32,923 more in fossil fuel exclusion funds, a statistically significant 18% increase over the neutral group. Comparing the point estimate in column (4) to the average illustrates that around 76% of the total increase comes from active rebalancing, totaling 25,641 additional crowns. The balance of SEK 7,282 comes from investments in funds that reclassified themselves as fossil fuel exclusion funds.

In sum, this indicates that investors who grew more concerned about climate change were more likely to allocate their wealth towards fossil fuel exclusion funds, while the aggregate effect of downward revisions was muted. This illustrates the importance of financial sophistication as a mediator connecting climate beliefs to financial actions, as in Anderson and Robinson (2022). On average, financial sophistication is higher for those who grew more concerned about climate. They actively rebalance about 50% more of

their retirement savings wealth than the neutral group, and almost ten times more than the group that revises downward. In contrast, the group of individuals who revise downward look more or less identical to the neutral group in terms of their rebalancing behavior. The strong negative response at the individual level for downward revisers in high SD areas has only a small impact on aggregate outcomes because these individuals are few in number and hold smaller portfolios on average than others.

In sum, the aggregate results point to that changing views indeed materialize in meaningful tilts toward exclusion funds, but the effect is small relative to the substantial reorientation of capital towards fossil fuel exclusions by the funds themselves through the choices of investment managers.

7 Conclusion

Over the last decade, one of the world's largest retirement systems went from offering very few climate-friendly investment choices to being dominated by them. Changing beliefs about the severity of future global warming among retirement savers is an important component in this transition. This paper shows that these investment choices were influenced by political polarization that arose in reaction to extreme weather events.

There is a strong gender component to our findings, in line with broader gender differences in political orientation in our sample. For men, proximity to extreme weather events increased the likelihood that they grew more concerned about global warming, while women across the board became more concerned about the climate, regardless of their proximity to adverse weather events. At the same time, men living in right-wing strongholds were generally less concerned about climate change after the extreme weather events than they were before. This illustrates a form of political polarization in which opinions increasingly diverge in the face of common information because of the manner in which the information is interpreted.

Individuals, especially those outside right-wing strongholds, who grew more concerned about climate change tilted their portfolio towards fossil-fuel exclusion funds.

Individuals who grew less concerned, especially in right-wing strongholds where anti-environmentalist sentiment was high, actively down-weighted their exposure to fossil-fuel exclusion funds. The aggregate effects of these competing responses are driven in part by their relative measure in their population and their aggregate portfolio holdings, but also by differences in financial sophistication, which contributes to inertia in portfolio holdings.

Given the increasing extent to which political polarization spills over into capital markets, understanding how inertia, financial sophistication, and political leanings affect the manner in which environmental preferences are reflected in household financial decisions remains an important area for future research. These results also raise important questions about how policy directives aimed at implementing majority opinions can themselves generate political backlash. As concerns about climate change become increasingly acute, understanding the role of behavioral forces operating at the individual level and how these forces aggregate into market-level outcomes are important topics for future research.

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Table I: Regional Variation in Climate Fear, Heat Warnings and Voting Outcomes

This table presents OLS regressions where the dependent variable represent average responses (by county) to the National Health Survey made by the Swedish Public Health Agency. The dependent variable Climate Anxiety is the average response to a survey targeting parents of 12 year-olds and whether their kids have expressed worry or anxiety with respect to climate change ("Often" or "Very often"). This question was asked in 2019. Heat Wave is a dummy that takes the value of one for regions that were affected by class 2 heat warnings during summer of 2018. SD Votes denote the percentage fraction of inhabitants voting for the Sweden Democrat party. All regressions are weighted by population and the constant is excluded from the presentation. Standard errors in parenthesis, and one, two and three asterisks denote significance at the 10, 5, and 1% level, respectively. There are 21 counties in the sample.

	(1)	(2)	(3)
VARIABLES	Climate anxiety	Climate anxiety	Climate anxiety
Heat wave	4.289***	4.674***	5.490***
	(1.419)	(1.151)	(1.671)
SD High		-2.127*	-0.581
		(1.062)	(1.239)
Heat wave × SD High			-2.349
			(1.816)
Constant	16.576***	17.184***	16.742***
	(0.823)	(0.806)	(1.113)
Observations	21	21	21
R-squared	0.488	0.605	0.637

Table II: Changing Beliefs About Future Temperature Increases

This table tabulates the answers to the question "Within the next twenty years, how likely is a global temperature increase by more than one Centigrade". Responses include Highly Unlikely, Unlikely, Neutral, Likely, Highly Likely. The responses come from a survey administrated to the same people: the first survey in the spring of 2018 and the second in the fall of 2019. There are 2,561 respondents in the sample where 613 revised their estimates down, 684 up and 1,264 remained unchanged between the two surveys.

	Temp Forecast 2019					
Temp Forecast 2018	Highly Unlikely	Unlikely	Neither/ nor	Likely	Highly Likely	Total
Highly Unlikely	13	6	7	19	15	60
Unlikely	7	20	22	50	22	121
Neither/nor	9	33	102	131	53	328
Likely	23	45	142	496	359	1,065
Highly Likely	16	23	51	264	633	987
Total	68	127	324	960	1,082	2,561

Table III: Sample Characteristics and Survey Responses

This table presents means for our key survey questions among the 2,561 respondents who took the survey in 2018 and 2019 across demographics. The first two columns report the sample fractions and population averages. The first two rows report the overall actual and survey weighted means. The columns labeled "Temperature change" report the fraction of respondents revising up or down in Table II when asked the question "Within the next twenty years, how likely is a global temperature increase by more than one Centigrade". Columns labeled "Survey questions" report fractions strongly agreeing to the statements: "I have already noticed the effects of climate change in Sweden" (*Notice GW*); "I'm worried about climate change" (*Worry GW*); "The government can do more to fight climate change" (*Government action*); "I am willing to pay higher taxes to increase Sweden's aid to poor countries" (*Foreign aid*). The last column reports the fraction disagreeing to the statement "I trust the government to invest my pension in a sustainable fashion" (*Government Trust*). There are 2,561 respondents in the sample.

			Temp. Change		**Survey questions**				
	Sample	Pop.	Revised		Notice	Worry	Gvt.	For.	Gvt.
	prop.	prop.	Up	Down	GW	GW	Act.	Aid	Trust
Overall	1.00	1.00	0.27	0.24	0.58	0.23	0.52	0.09	0.08
Pop. Wtd.	.	.	0.26	0.25	0.59	0.25	0.54	0.11	0.08
Gender									
Men	0.50	0.51	0.24	0.28	0.52	0.17	0.42	0.07	0.08
Women	0.50	0.49	0.30	0.20	0.64	0.29	0.61	0.11	0.09
Age									
18-24	0.08	0.15	0.26	0.23	0.62	0.30	0.60	0.16	0.06
25-34	0.15	0.23	0.21	0.27	0.66	0.31	0.59	0.17	0.07
35-44	0.17	0.21	0.27	0.25	0.59	0.27	0.55	0.10	0.07
45-54	0.25	0.22	0.27	0.26	0.56	0.20	0.50	0.06	0.10
55-65	0.35	0.19	0.28	0.21	0.55	0.20	0.46	0.06	0.09
Income									
0-111	0.11	0.25	0.25	0.25	0.60	0.28	0.54	0.14	0.08
111-287	0.37	0.25	0.28	0.25	0.60	0.23	0.51	0.08	0.09
287-399	0.32	0.25	0.26	0.23	0.57	0.22	0.53	0.09	0.09
399+	0.20	0.25	0.26	0.24	0.55	0.23	0.47	0.07	0.06
Education									
Some school	0.09	0.17	0.25	0.26	0.50	0.21	0.48	0.09	0.10
High school	0.35	0.44	0.27	0.24	0.54	0.17	0.46	0.05	0.10
University	0.56	0.39	0.27	0.24	0.62	0.28	0.56	0.12	0.07
SD Votes									
High	0.39	.	0.26	0.25	0.56	0.21	0.48	0.07	0.08
Low	0.61	.	0.27	0.24	0.59	0.25	0.53	0.10	0.09
Financial literacy									
High	0.45	.	0.26	0.26	0.59	0.23	0.50	0.10	0.07
Low	0.55	.	0.27	0.23	0.57	0.23	0.52	0.08	0.10

Table IV: Temperature Revisions and Heat Waves

This table reports the results of Probit regressions where the dependent variable is a dummy variable for temperature revisions which are derived from changing the reported likelihood of a more than one Centigrade global temperature rise within 20 years between the two surveys in 2018 and 2019. SD votes denotes the 2018 municipality percentage voting outcome. Men and University take the value of one for men and for higher education; zero otherwise. Financial literacy denotes the test score ranging from 0 to 5. Income is scaled in logs and age is divided by ten. Columns (1) through (5) presents the results for upward revisions and columns (6) through (10) for downward revisions. Columns (1) and (6) show the results for the full sample, and remaining columns partition the sample on gender and below or above median voting districts for the Sweden Democrats. There are 2,561 respondents in the sample where 613 revised their estimates down, 684 up and 1,264 remained unchanged between the two surveys. Survey weights are used in all regressions. Standard errors in parenthesis, and one, two and three asterisks denote significance at the 10, 5, and 1% level, respectively.

	Revised up					**Revised down**				
		Gender		SD Votes			Gender		SD Votes	
	All	Men	Women	Low	High	All	Men	Women	Low	High
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Heat Wave	0.035*	0.069***	0.003	0.060**	-0.009	-0.030	-0.064**	0.004	-0.041	-0.012
	(0.019)	(0.026)	(0.028)	(0.025)	(0.031)	(0.020)	(0.030)	(0.025)	(0.025)	(0.031)
SD votes	-0.003	-0.007**	0.000			0.001	0.003	-0.002		
	(0.002)	(0.003)	(0.003)			(0.002)	(0.003)	(0.003)		
Fin. Lit.	-0.001	-0.001	-0.000	-0.005	0.006	0.012	0.008	-0.008	-0.013	0.019
	(0.009)	(0.012)	(0.012)	(0.011)	(0.014)	(0.008)	(0.013)	(0.011)	(0.011)	(0.013)
Men	-0.051**			-0.022	-0.097***				0.101***	0.096***
	(0.020)			(0.026)	(0.032)				(0.025)	(0.031)
Log Income	0.011	-0.001	0.026	0.008	0.011	-0.008	-0.009	-0.004	-0.008	-0.003
	(0.011)	(0.013)	(0.020)	(0.015)	(0.017)	(0.008)	(0.012)	(0.010)	(0.011)	(0.012)
Age	0.012*	0.011	0.013	0.015	0.008	-0.005	-0.013	0.001	-0.007	-0.002
	(0.007)	(0.010)	(0.010)	(0.009)	(0.011)	(0.007)	(0.011)	(0.009)	(0.009)	(0.011)
University	-0.015	-0.028	-0.000	-0.014	-0.018	0.001	-0.013	0.051**	0.051**	-0.028
	(0.020)	(0.028)	(0.030)	(0.026)	(0.032)	(0.020)	(0.030)	(0.026)	(0.026)	(0.031)
Observations	2,561	1,285	1,276	1,563	998	2,561	1,285	1,276	1,563	998
F-stat	2.51	2.32	0.69	1.75	1.77	0.93	1.29	0.78	3.56	2.59

Table V: Temperature Revisions and ESG Concerns

This table reports the results of Probit regressions where the dependent variables takes the value of one for reporting Strongly Agree to the following questions for environmental concerns (E): "I have already noticed the effects of climate change in Sweden" (column 1) "I'm worried about climate change" (column 2); "The government should do more to fight climate change" (column 3). For social beliefs (S): "I am willing to pay higher taxes to increase Sweden's aid to poor countries" (column 4) ; and for governance (G): "I trust the government to invest my pension in a sustainable way" (column 5); all zero otherwise. All questions were asked in the 2019 (question 4 in the 2018) survey only. The dummy variables Temperature revisions (up or down) are derived from changing the reported likelihood of a more than one Centigrade global temperature rise within 20 years between the two surveys in 2018 and 2019. High SD, Men and University take the value of one for respondents from above median Sweden Democrats Party voting districts, men and for higher education; zero otherwise. Financial literacy denotes the test score ranging from 0 to 5. Income is scaled in logs and age is divided by ten. Survey weights are used in all regressions and the constant is excluded from the presentation. Standard errors in parenthesis, and one, two and three asterisks denote significance at the 10, 5, and 1% level, respectively.

	E			S	G
	Notice GW	Worry GW	Gvt. Act.	Foreign Aid	Gvt. Trust
VARIABLES	(1)	(2)	(3)	(4)	(5)
Revised up	0.225***	0.137***	0.203***	0.033	0.040**
	(0.027)	(0.031)	(0.030)	(0.022)	(0.018)
Revised down	-0.194***	-0.172***	-0.217***	-0.044***	-0.022*
	(0.028)	(0.019)	(0.028)	(0.013)	(0.013)
Men	-0.111***	-0.110***	-0.184***	-0.027**	-0.000
	(0.023)	(0.020)	(0.023)	(0.013)	(0.012)
High SD	0.014	-0.048**	-0.057**	-0.034***	-0.010
	(0.023)	(0.019)	(0.024)	(0.013)	(0.011)
Fin. Lit.	0.022**	0.016*	0.015	0.010*	-0.012**
	(0.010)	(0.009)	(0.010)	(0.006)	(0.005)
Log Income	-0.008	-0.003	-0.010	-0.007	0.005
	(0.010)	(0.008)	(0.011)	(0.004)	(0.005)
Age	-0.014*	-0.028***	-0.026***	-0.027***	0.011***
	(0.008)	(0.007)	(0.009)	(0.005)	(0.004)
University	0.059**	0.066***	0.054**	0.046***	-0.013
	(0.023)	(0.020)	(0.024)	(0.013)	(0.012)
Observations	2,561	2,561	2,561	2,561	2,561
F-stat	24.18	18.35	24.51	9.31	2.61

Table VI: Default Fund Choices and Climate Beliefs

This table reports the results of OLS regressions where the dependent variable in columns (1) through (3) is a dummy taking the value of one if the respondent is in the default fund at the end of 2021, or was in the default fund as of the end of 2017 but opted out at some point after up until 2021 (columns (4) through (6)). Independent variables Worry GW and Government Trust are dummy variables indicating worry about global warming and trust in the government to manage pensions sustainably (see Table III). High SD, Men and University take the value of one for respondents from above median Sweden Democrats Party voting districts, men and for higher education; zero otherwise. Financial literacy denotes the test score ranging from 0 to 5. Income is scaled in logs and age is divided by ten. Temperature Assessment (TA) controls are dummy variables for the temperature likelihood response to the first survey in 2018. Survey weights are used in all regressions and the constant is excluded from the presentation. Standard errors in parenthesis, and one, two and three asterisks denote significance at the 10, 5, and 1% level, respectively.

	Default			Opted out		
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Revised up	-0.020	-0.016	0.001	0.003	0.004	0.005
	(0.027)	(0.026)	(0.023)	(0.010)	(0.010)	(0.009)
Revised down	0.003	0.017	0.007	0.012	0.014	0.013
	(0.027)	(0.027)	(0.024)	(0.011)	(0.011)	(0.011)
Worry GW		0.096***	0.034		0.018	0.016
		(0.027)	(0.025)		(0.012)	(0.012)
Gvt. Trust		-0.010	0.009		0.004	0.008
		(0.049)	(0.042)		(0.018)	(0.018)
Worry × Trust		-0.095	-0.066		-0.046**	-0.048**
		(0.085)	(0.075)		(0.021)	(0.021)
High SD			-0.036*			0.007
			(0.020)			(0.009)
Fin. Lit.			-0.030***			-0.004
			(0.009)			(0.004)
Women			0.009			-0.013
			(0.021)			(0.009)
Age			-0.142***			-0.014***
			(0.007)			(0.004)
Log Income			-0.033***			0.007**
			(0.008)			(0.003)
University			-0.000			0.007
			(0.020)			(0.007)
Observations	2,521	2,521	2,521	2,402	2,402	2,402
R-squared	0.000	0.007	0.181	0.001	0.003	0.016

Table VII: Temperature Revisions and Climate Risk Exposure in 2021

This table reports the results of OLS regressions where the dependent variables is the weighted Morningstar Climate Risk score at the end of 2021. The dummy variables Revise up or down are derived from changing the reported likelihood of a more than one Centigrade global temperature rise within 20 years between the two surveys in 2018 and 2019. High SD, Men and University take the value of one for respondents from above median Sweden Democrats Party voting districts, men and for higher education; zero otherwise. Financial literacy denotes the test score ranging from 0 to 5. Income is scaled in logs and age is divided by ten. Column (1) uses the full sample in the estimation; columns (2) and (3) on high and low financial literacy based on having at least four correct answers (High) or less (Low); columns (4) and (5) into voting districts above or below median for the Sweden Democrats party. Fund controls include portfolio fractions for fund category, exposure to retail networks, one year past return, portfolio weighted standard deviation and fee. Temperature Assessment (TA) controls are dummy variables for the temperature likelihood response to the first survey in 2018. Survey weights are used in all regressions and the constant is excluded from the presentation. Standard errors in parenthesis, and one, two and three asterisks denote significance at the 10, 5, and 1% level, respectively.

	Weighted MS climate risk score				
		Fin. Literacy		SD Votes	
	All	Low	High	Low	High
VARIABLES	(1)	(2)	(3)	(4)	(5)
Revised up	-0.292***	-0.160*	-0.443***	-0.315**	-0.189
	(0.091)	(0.092)	(0.161)	(0.127)	(0.119)
Revised down	0.122	0.067	0.172	0.162	0.098
	(0.093)	(0.105)	(0.153)	(0.124)	(0.137)
High SD	-0.005	0.088	-0.084		
	(0.067)	(0.083)	(0.110)		
Fin. Lit.	0.065**			0.115**	-0.003
	(0.030)			(0.045)	(0.041)
Men	0.143**	0.153*	0.179*	0.078	0.254**
	(0.066)	(0.084)	(0.104)	(0.086)	(0.104)
Age	-0.168***	-0.117***	-0.208***	-0.148***	-0.197***
	(0.033)	(0.042)	(0.054)	(0.041)	(0.055)
Log Income	-0.047	-0.023	-0.046	-0.094	-0.011
	(0.049)	(0.056)	(0.060)	(0.087)	(0.035)
University	0.010	0.048	-0.003	-0.036	0.075
	(0.074)	(0.076)	(0.131)	(0.102)	(0.098)
TA controls	Yes	Yes	Yes	Yes	Yes
Fund controls	Yes	Yes	Yes	Yes	Yes
Observations	1,409	749	660	826	583
R-squared	0.477	0.443	0.498	0.432	0.554

Table VIII: Temperature Revisions and Investments into Fossil Fuel Exclusion Funds

This table reports the results of OLS regressions where the dependent variables is the portfolio weight in fossil fuel exclusion funds at the end of 2021. The dummy variables Revise up or down are derived from changing the reported likelihood of a more than one Centigrade global temperature rise within 20 years between the two surveys in 2018 and 2019. High SD, Men and University take the value of one for respondents from above median Sweden Democrats party voting districts, men and for higher education; zero otherwise. Financial literacy denotes the test score ranging from 0 to 5. Income is scaled in logs and age is divided by ten. Column (1) uses the full sample in the estimation; columns (2) and (3) on high and low financial literacy based on having at least four correct answers (High) or less (Low); columns (4) and (5) into voting districts above or below median for the Sweden Democrats party. Fund controls include portfolio fractions for fund category, retail networks, one year past return, portfolio weighted standard deviation and fee. Temperature Assessment (TA) controls are dummy variables for the temperature likelihood response to the first survey in 2018. Survey weights are used in all regressions and the constant is excluded from the presentation. Standard errors in parenthesis, and one, two and three asterisks denote significance at the 10, 5, and 1% level, respectively.

	Fossil fuel exclusion weight				
		Fin. Literacy		SD Votes	
	All	Low	High	Low	High
VARIABLES	(1)	(2)	(3)	(4)	(5)
Revised up	0.051***	0.025	0.077***	0.064***	0.015
	(0.020)	(0.025)	(0.030)	(0.024)	(0.032)
Revised down	-0.003	0.009	-0.017	0.005	-0.016
	(0.018)	(0.025)	(0.026)	(0.023)	(0.028)
High SD	0.007	-0.001	0.015		
	(0.014)	(0.019)	(0.021)		
Fin. Lit.	-0.017**			-0.019**	-0.006
	(0.007)			(0.009)	(0.010)
Men	-0.026*	-0.042*	-0.027	-0.021	-0.052**
	(0.015)	(0.022)	(0.021)	(0.019)	(0.024)
Age	0.018**	0.004	0.035***	0.030***	-0.007
	(0.007)	(0.010)	(0.011)	(0.009)	(0.010)
Log Income	0.004	0.001	0.003	0.003	0.007
	(0.009)	(0.016)	(0.010)	(0.015)	(0.008)
University	0.007	-0.015	0.024	0.012	-0.008
	(0.016)	(0.021)	(0.023)	(0.020)	(0.025)
TA controls	Yes	Yes	Yes	Yes	Yes
Fund controls	Yes	Yes	Yes	Yes	Yes
Observations	1,436	761	675	940	496
R-squared	0.493	0.467	0.510	0.499	0.510

Table IX: Temperature Revisions and Active Investments into Fossil Fuel Exclusion Funds

This table reports the results of OLS regressions where the dependent variables is the active portfolio weight in fossil fuel exclusion funds at the end of 2021. The active weight is derived from choices made from when taking the first survey to the end of 2021 and excludes passive re-classifications. The dummy variables Revise up or down are derived from changing the reported likelihood of a more than one Centigrade global temperature rise within 20 years between the two surveys in 2018 and 2019. High SD, Men and University take the value of one for respondents from above median Sweden Democrats Party voting districts, men and for higher education; zero otherwise. Financial literacy denotes the test score ranging from 0 to 5. Income is scaled in logs and age is divided by ten. Column (1) uses the full sample in the estimation; columns (2) and (3) on high and low financial literacy based on having at least four correct answers (High) or less (Low); columns (4) and (5) into voting districts above or below median for the Sweden Democrats party. Fund controls include portfolio fractions for fund category, retail networks, one year past return, portfolio weighted standard deviation and fee. Temperature Assessment (TA) controls are dummy variables for the temperature likelihood response to the first survey in 2018. Survey weights are used in all regressions and the constant is excluded from the presentation. Standard errors in parenthesis, and one, two and three asterisks denote significance at the 10, 5, and 1% level, respectively.

	Active fossil fuel exclusions				
		Fin. Literacy		SD Votes	
	All	Low	High	Low	High
VARIABLES	(1)	(2)	(3)	(4)	(5)
Revised up	0.051*	0.037	0.066*	0.069**	0.028
	(0.027)	(0.036)	(0.039)	(0.034)	(0.040)
Revised down	-0.015	-0.046	0.021	0.033	-0.074**
	(0.021)	(0.028)	(0.032)	(0.029)	(0.030)
Fin. Lit.	0.012			0.011	0.015
	(0.009)			(0.012)	(0.012)
Men	0.030	0.021	0.038	0.017	0.042
	(0.020)	(0.026)	(0.028)	(0.026)	(0.031)
Age	-0.007	-0.028*	0.017	-0.005	-0.014
	(0.011)	(0.014)	(0.016)	(0.014)	(0.017)
Log Income	0.017*	0.018	0.013	0.029*	0.004
	(0.010)	(0.019)	(0.011)	(0.017)	(0.010)
University	0.064***	0.041	0.088***	0.066***	0.056*
	(0.019)	(0.026)	(0.028)	(0.025)	(0.029)
TA controls	Yes	Yes	Yes	Yes	Yes
Fund controls	Yes	Yes	Yes	Yes	Yes
Observations	1,436	761	675	845	591
R-squared	0.070	0.076	0.079	0.076	0.086

Table X: Temperature Revisions and Aggregate Redistributions of Wealth

This table reports the reports underlying population proxied by the sample weights (in thousands) in Column (1) and average portfolio values in columns (2) through (5). The average portfolio is obtained by regressing the individual portfolio value on dummies for revisions such that the constant denote the neutral (omitted) group. Column (1) presents the overall retirement portfolio and column (2) the value invested in fossil fuel exclusion funds. Columns (4) and (5) decompose the exclusion investments from column (3) in active and passive investments where active investment is attributed to a change in the portfolio during the time period 2018 to 2021. There are 2,521 retirement accounts in the calculation reflecting 5,949,329 people in the underlying population.

	Population	Portfolio	Fossil Fuel exclusions		
	000′	Total	Total	Active	Passive
VARIABLES	(1)	(2)	(3)	(4)	(5)
Revised up	1,527	39,171**	32,923**	25,641**	7,282
		(19,285)	(15,017)	(8,817)	(12,458)
Revised down	1,471	16,026	-400	2,970	-3,370
		(19,573)	(14,823)	(8,185)	(12,495)
Constant	2,951	409,751***	183,343***	52,215**	131,128**
		(11,352)	(8,917)	(4,128)	(7,969)
Population / Sample	5,949	2,521	2,521	2,521	2,521

Figure 1: Climate Change Opinion and Media Coverage

This figure plots the time series from three data sources centered around the window between the two surveys in February 2018 through September 2019 (highlighted by the shaded box). The shaded curve traces out proportion of polled voters ranking "Climate change" as the most important topic (right scale). The solid and dotted lines show the number of published articles about "Climate change" or "Global warming" in mainstream versus right-wing media. The poll data comes from Demoskop, mainstream media from the Media and Climate Change Observatory, and the right-wing media obtained from Vowles and Hultman (2021).

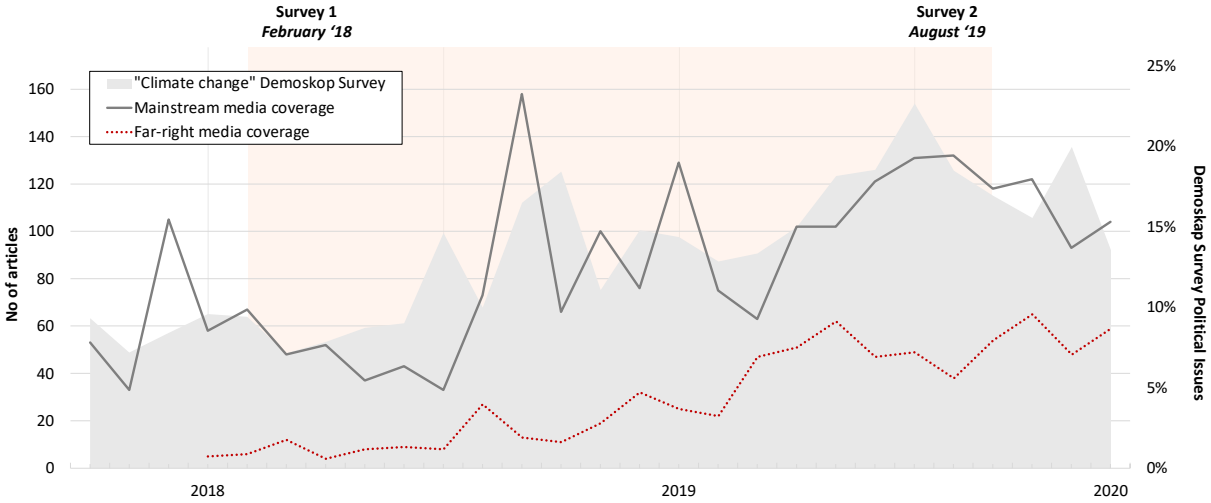


Figure 2: Spatial Variation in Heat Warnings 2018-2019 and SD Voting Outcomes 2018

This figure plots the overlap of heat warnings and Sweden Democrat (SD) voting outcomes in Sweden. Dashed areas denote regions with class 2 heat warnings for the time period between the first and second survey from April 2018 to August 2019. Colored areas denote municipalities with above-median SD votes in the 2018 election. The definition of the variables follow those of the dummy variables used in Table IV in the main text. The weather data is obtained from the Swedish Meteorological and Hydrological Institute (SMHI), classified into Class 1 (mild), Class 2 (moderate) or Class 3 (severe) across 21 regions. Voting data is obtained from Statistics Sweden.

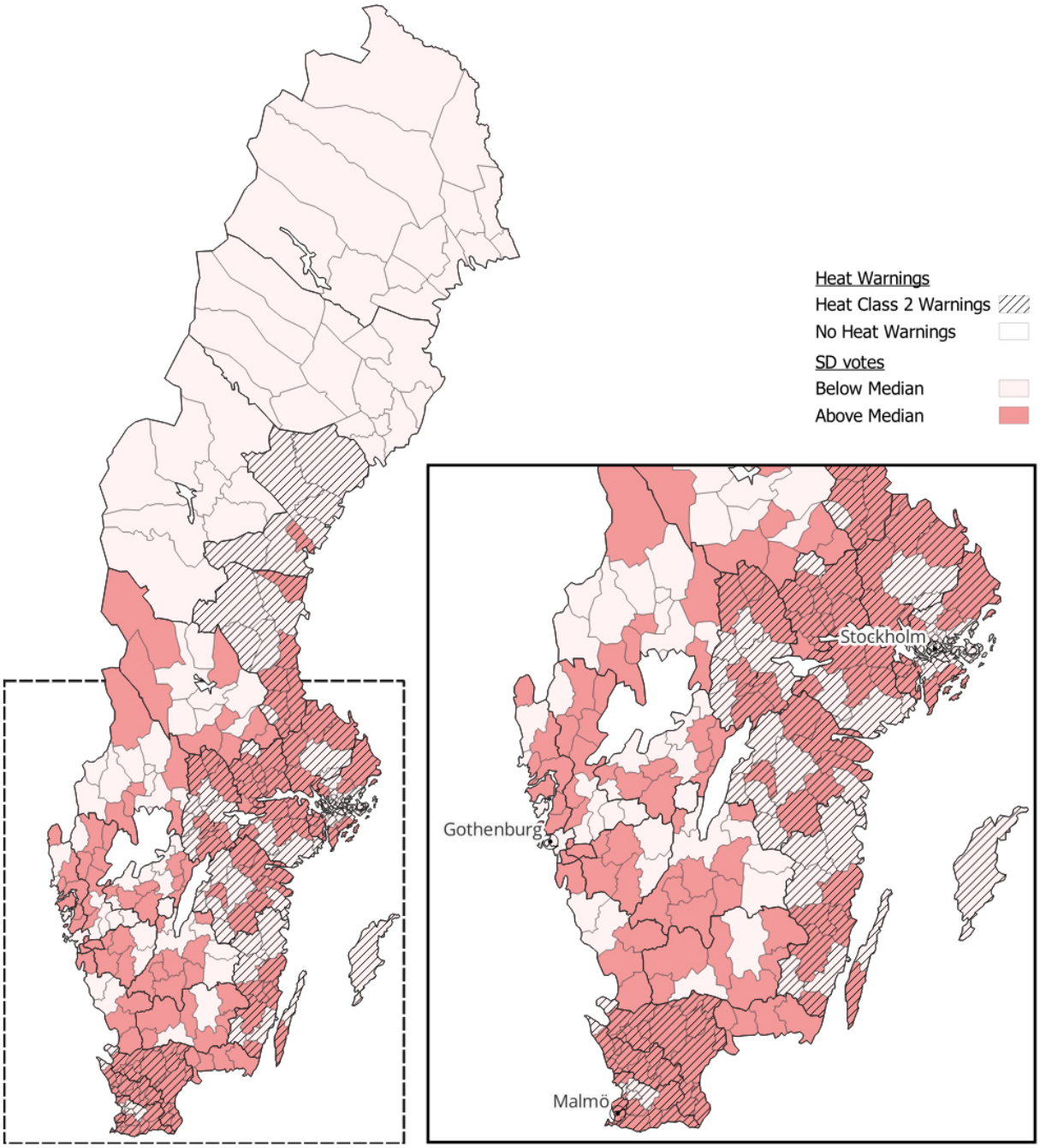


Figure 3: The Swedish Pension System and Fossil Fuel Exclusion Funds

This figure shows the assets under management (AUM) in the Swedish Premium Pension System from January 2017 to December 2021 (shaded area, left scale). The top green area traces out the amount allocated to fossil fuel exclusion funds, the dark grey area to all other funds available for selections, and the light grey area the default fund which does not exclude fossil fuel. The bold line traces out the fraction of fossil fuel exclusion funds (right scale) and the dotted line the number of funds available for selection (left scale). The two text boxes indicate the timing of the two surveys. The data for investments are collected from the Swedish Pension Authority webpage.

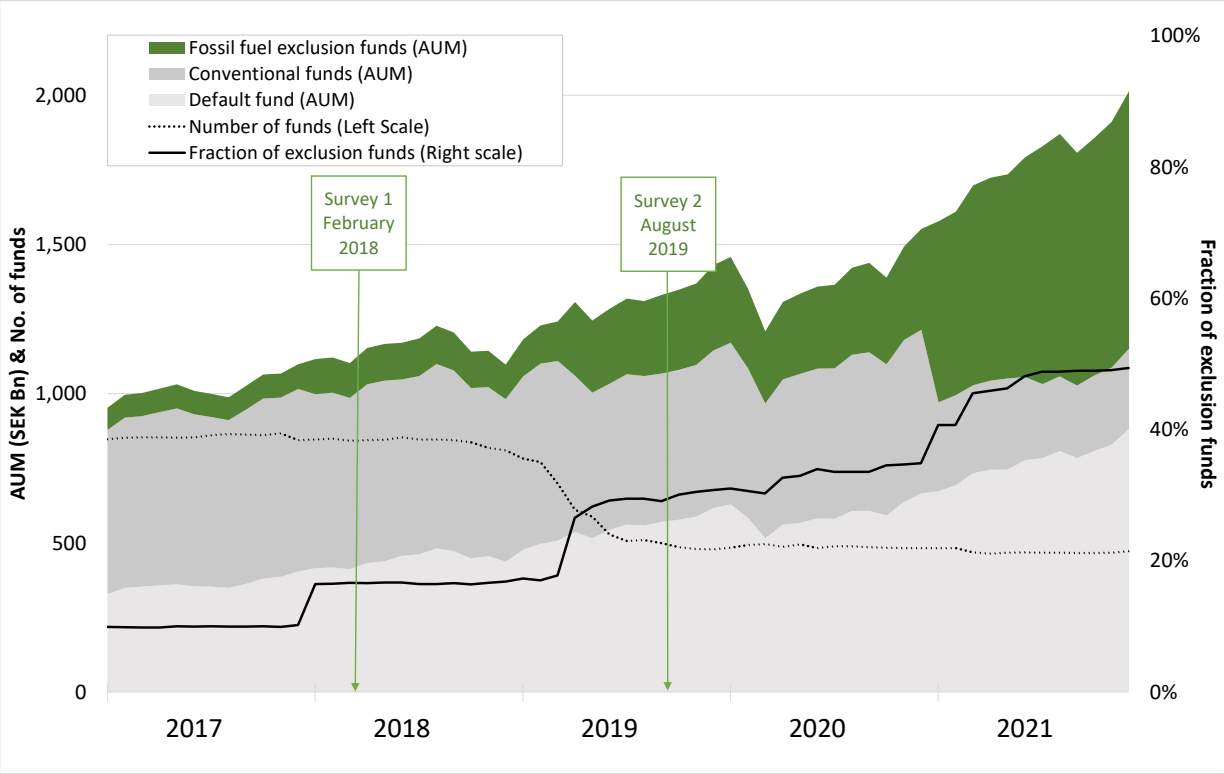
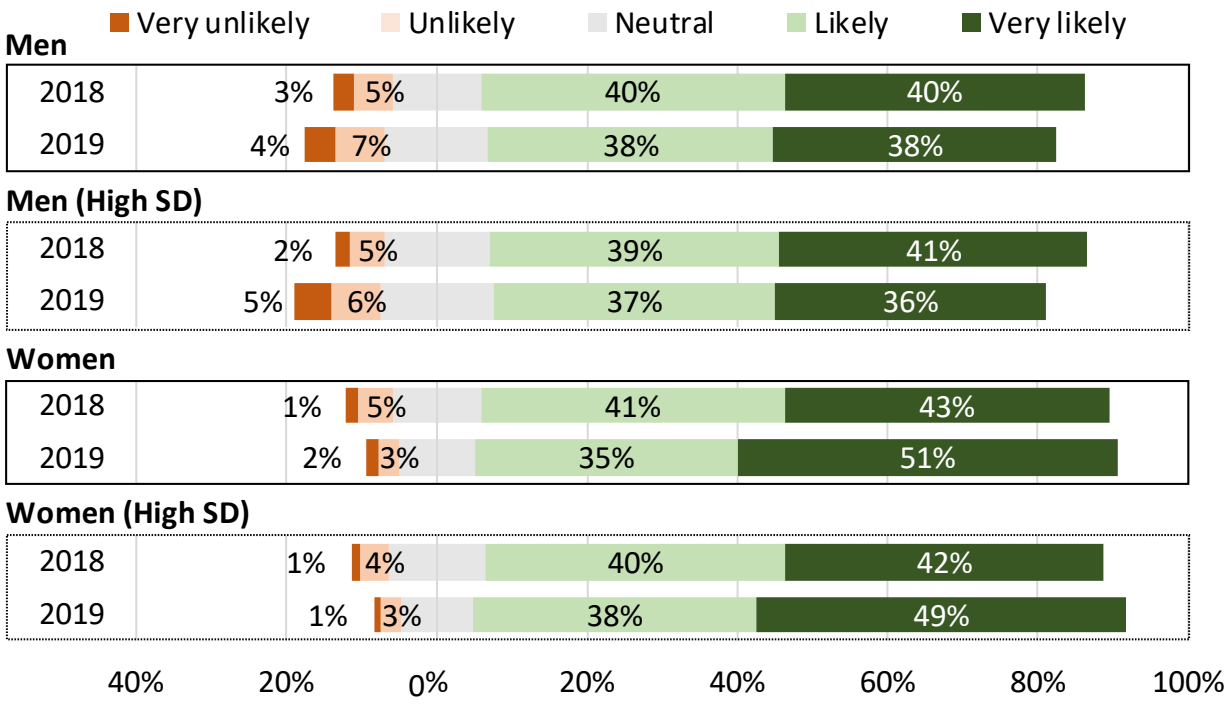


Figure 4: Temperature Assessments in 2018 and 2019

This figure displays the responses the statement "In the next twenty years, how likely is a one Centigrade rise in global temperature?" ranging from "Very unlikely" to "Very likely". Revisions are measured on a five-point Likert scale measured between the surveys from Very Unlikely to Very Likely. The top part of the graph displays the survey responses in 2018 and 2019 for men and separately for those living in voting districts with above median votes for the Sweden Democrats Party ("High SD"). The bottom part of the figure displays the results for women. The graph is centered across the neutral responses. There are 2,561 respondents in total.



A Sampling procedure

This appendix presents the data collection and matching procedure in detail. In early 2018, Statistics Sweden (SCB) mailed out 19,977 invitations to a random sample of Swedes aged 18-65. The invitation contained information about the survey and how to log on to the response website at SCB, what registry data that was going to be used and matched to the survey responses if the respondent agreed to participate, and contact details to SCB and one of the authors in case of questions. On behalf of the authors, SCB also collected and matched pension data to the survey which was supplied by the Swedish Pension Agency (SPA). All identities are scrambled and the analysis was conducted through the mainframe computer situated at the SCB from which the authors only can retrieve and keep aggregated results.

The procedure followed all standards applied by SCB and the project has been approved by the Swedish Ethical Review Authority. SCB calibrated the sample to an underlying population of 6,097,316 Swedes in the ages 18-65 as of the end of 2017 using gender and age (details of the exact survey weight methodology and mailer is available upon request).

Panel A and B of Table A.1 presents details of the sampling procedure. Panel C of Table A.1 summarizes the matching of survey responses with retirement accounts. From the total sample of 2,561 respondents 2,521 also owned retirement accounts at the SPA at the end of 2021. Fund holdings is matched to monthly fund characteristics obtained from the SPA website that excludes the default fund. Exclusion fund exposure is obtained for the retirement sample from their selection of 499 available mutual funds and the default fund at the end of 2021 and is calculated as a portfolio weight. There were 1,436 investors with an active portfolio choice as of 2021. The default fund and 33 other funds have missing data for the Morningstar Climate Risk measure. 1,112 investors (1,085 in default and 27 investors in open funds) were invested in missing funds and so are dropped from the regression leaving 1,409 observations. The distribution of Morningstar Climate Risk scores is presented in Figure C.2.

Table A.1: Sample Selection

This table display details of the sample construction across the two surveys conducted in the spring of 2018 and fall of 2019. In 2018, 19,977 randomly selected individuals in the ages 18-65 were invited to take the first survey, of which 4,257 responded. In the fall of 2019, the 4,244 people who remained in the Statistics Sweden (SCB) registry where contacted again to take a second survey. Panel A displays details about the survey invitations, responses and deletions due to missing data. Panel B displays details of the overall responses and final sample in the 2019 survey across three survey waves from first invite to second reminder. Panel C shows the number of observations remaining when matching the survey data to pension holdings from which we only have sustainability data for the privately managed funds, excluding the stock and bond default fund. Panel D of Table A.1 presents the survey weights obtained by Statistics Sweden which are computed using the age and gender profile of survey respondents compared to the underlying sample presented in Table III.

Panel A:	**Survey invitations**			
Note	Responses	% of Total	Removed	Remark
Survey 1 invitations	19,977	100.0	0	Survey 1 open February 7, 2018
Survey 1 total responses	4,257	21.3	15,720	Survey 1 closed April 5, 2018
Survey 1 final responses	4,230	21.2	27	Missing location data
Survey 2 invitations	4,244	100.0	13	Survey 2 open August 22, 2019
Survey 2 total responses	2,596	61.2	1,648	Survey 2 closed October 8, 2019
Deletion 1	2,582	60.8	14	Missing SCB registry data
Deletion 2	2,561	58.1	21	Missing Survey 1 responses

Panel B:	**2019 responses**			
Note	Responses	% of Total	Sample	Date
First invitation (Wave 1)	1,347	31.7	1,334	August 22, 2019
Reminder 1 (Wave 2)	775	18.3	766	September 5, 2019
Reminder 2 (Wave 3)	474	11.2	461	September 19, 2019
Responses	2,596	61.2	2,561	Survey 2 closed October 8, 2019
Deletions	0	0.0	35	From Panel A
No response	1,582	37.3	1,582	
Returned mail	18	0.0	18	
Declined	46	1.1	46	
Blank	2	0.0	2	

Panel C:	**SPA Fund Matching**			
Note	Responses	SPA	Choice	Rebalanced
Full sample	2,561	2,521	1,436	711

Panel D:	**Survey weights**			
Strata	Weight	Freq.	% of Total	Population
1	1207.513	451	17.61	544,588
2	1337.449	454	17.73	607,702
3	1996.194	325	12.69	648,763
4	2126.129	325	12.69	690,992
5	2710.985	204	7.97	553,041
6	2840.921	252	9.84	715,912
7	3926.926	194	7.58	761,824
8	4056.861	156	6.09	632,870
9	4646.952	102	3.98	473,989
10	4776.887	98	3.83	468,135

B Survey instrument

This appendix presents the five modified financial literacy questions solicited in the first survey in 2018 along with the four questions used for soliciting environmental beliefs in the 2019 survey.

Table B.1: Five modified financial literacy questions

This table presents the five ("Big-5") financial literacy questions used in the study and corresponding frequency responses on each item. Correct answers are highlighted in boldface. The category of incorrect answers also includes missing responses. The questions have been translated from Swedish into English. There are 2,561 observations.

1. *Compounding*. Suppose you had $100 in a savings account and the interest rate was 2% per year. After 5 years, how much do you think you would have in the account if you left the money to grow? Please select one.
   (a) **More than $102 (2,340, 91.7%)**
   (b) Exactly $102 (42, 1.7%)
   (c) Less than $102 (63, 2.5%)
   (d) Don't know (76, 3.0%)
   (e) Prefer not to say (31, 1.2%)

2. *Inflation*. Imagine that the interest rate on your savings account was 1% per year and inflation was 2% per year. After 1 year, how much would you be able to buy with the money in this account? Please select one.
   (a) More than today (123, 4.8%)
   (b) **Less than today (2,021, 79.0%)**
   (c) Exactly the same as today (93, 3.6%)
   (d) Don't know (281, 11.0%)
   (e) Prefer not to say (39, 1.5%)

3. *Diversification*. Buying a single company's stock usually provides a safer return than a stock mutual fund. Please select one.
   (a) True (147, 5.8%)
   (b) **False (2,120, 83.0%)**
   (c) Don't know (255, 10.0%)
   (d) Prefer not to say (31, 1.2%)

4. *Long-Term Savings*. Suppose you were given $10,000 as a gift and wanted to double the amount by saving the money ten years without having to touch it. What interest rate would you require to achieve this goal? Please select one.
   (a) About 15% annual interest rate (163, 6.4%)
   (b) About 10% annual interest rate (966, 37.8%)
   (c) **About 7% annual interest rate (1,197, 46.8%)**
   (d) Don't know (191, 7.5%)
   (e) Prefer not to say (41, 1.6%)

5. *Bond Pricing*. If interest rates fall, what should happen to bond prices? Please select one.
   (a) **They will rise (437, 17.1%)**
   (b) They will fall (540, 21.1%)
   (c) They will stay the same (1,089, 42.6%)
   (d) Don't know (451, 17.7%)
   (e) Prefer not to say (38, 1.5%)

Table B.2: Environmental Beliefs

This table reports the responses to four statements regarding climate change asked in the survey. Boldface indicates how responses have been coded to dummies. The statements have been translated from Swedish into English.

1. "I have already noticed the effects of climate change in Sweden"
   (a) Stongly disagree (109, 4.3%)
   (b) Disgree (63, 2.5%)
   (c) Don't Agree nor Disagree (301, 11.8%)
   (d) Agree (604, 23.6%)
   (e) **Strongly Agree (1,481, 57.9%)**
2. "I'm worried about climate change and what it means for myself and my family"
   (a) Stongly disagree (20, 0.8%)
   (b) Disgree (129, 5.1%)
   (c) Don't agree nor disagree (641, 25.1%)
   (d) Agree (1,154, 45.7%)
   (e) **Strongly Agree (595, 23.3%)**
3. "The government should do more to fight climate change"
   (a) Stongly disagree (77, 3.0%)
   (b) Disgree (83, 3.3%)
   (c) Don't agree nor disagree (375, 14.8%)
   (d) Agree (687, 27.0%)
   (e) **Strongly Agree (1,319, 51.9%)**
4. "I am willing to pay higher taxes to increase Sweden's aid to poor countries"
   (a) Stongly disagree (517, 20.4%)
   (b) Disgree (460, 18.0%)
   (c) Don't agree nor disagree (782, 30.8%)
   (d) Agree (552, 21.7%)
   (e) **Strongly Agree (230, 9.0%)**
5. "I trust the goverment to invest my pension in a sustainable way"
   (a) Stongly disagree (401, 15.8%)
   (b) **Disgree (456, 17.9%)**
   (c) Don't agree nor disagree (1,070, 42.0%)
   (d) Agree (403, 15.8%)
   (e) **Strongly Agree (215, 8.5%)**

C Fund Selection at the Swedish Pension Authority

This appendix give details about rebalancing retirement accounts at the Swedish Pension Authority (SPA). Figure C.1 shows a screen print of the web tool for choosing funds at the Swedish Pension Authority (SPA) which was launched during 2019. Figure C.2 plots the frequency distribution of Morningstar Climate Risk scores for the active funds in the pension system at the end of 2021.

Figure C.1: SPA Fund Choice Interface

This figure shows a screen print of the SPA web tool for searching, filtering and ranking funds based on Fund type (e.g. industry, geographic area), Fund category (e.g. stocks, bonds, mixed, target), Fund company, Risk level (from very low to very high) and Exclusions. The tool allows for choosing actively managed or index funds as well as sustainable funds and funds with the Morningstar low carbon indicator. Funds can be sorted by category, fee, Morningstar climate risk, financial risk and past returns. Website http://pensionsmyndigheten.se/mina-tjänster/fondtorg/sok accessed on January 25, 2023.

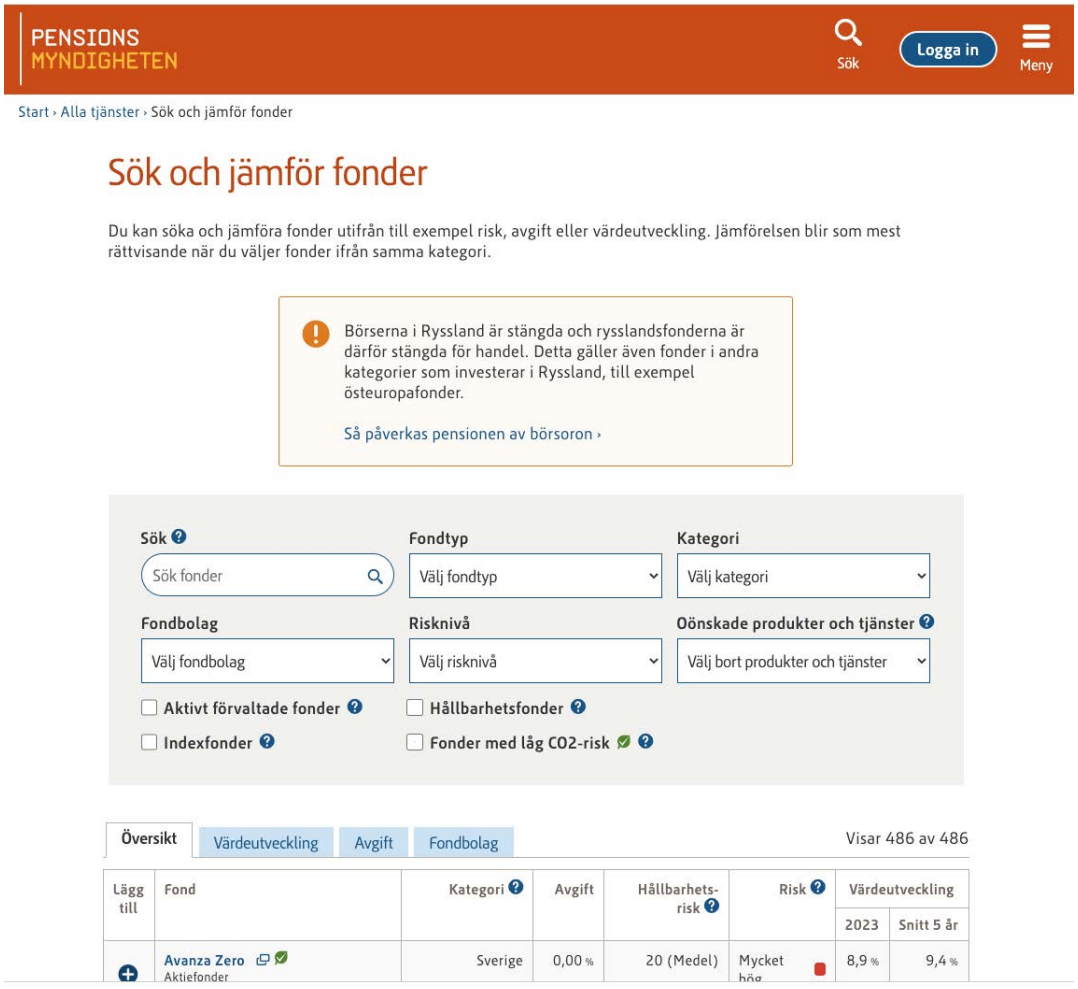
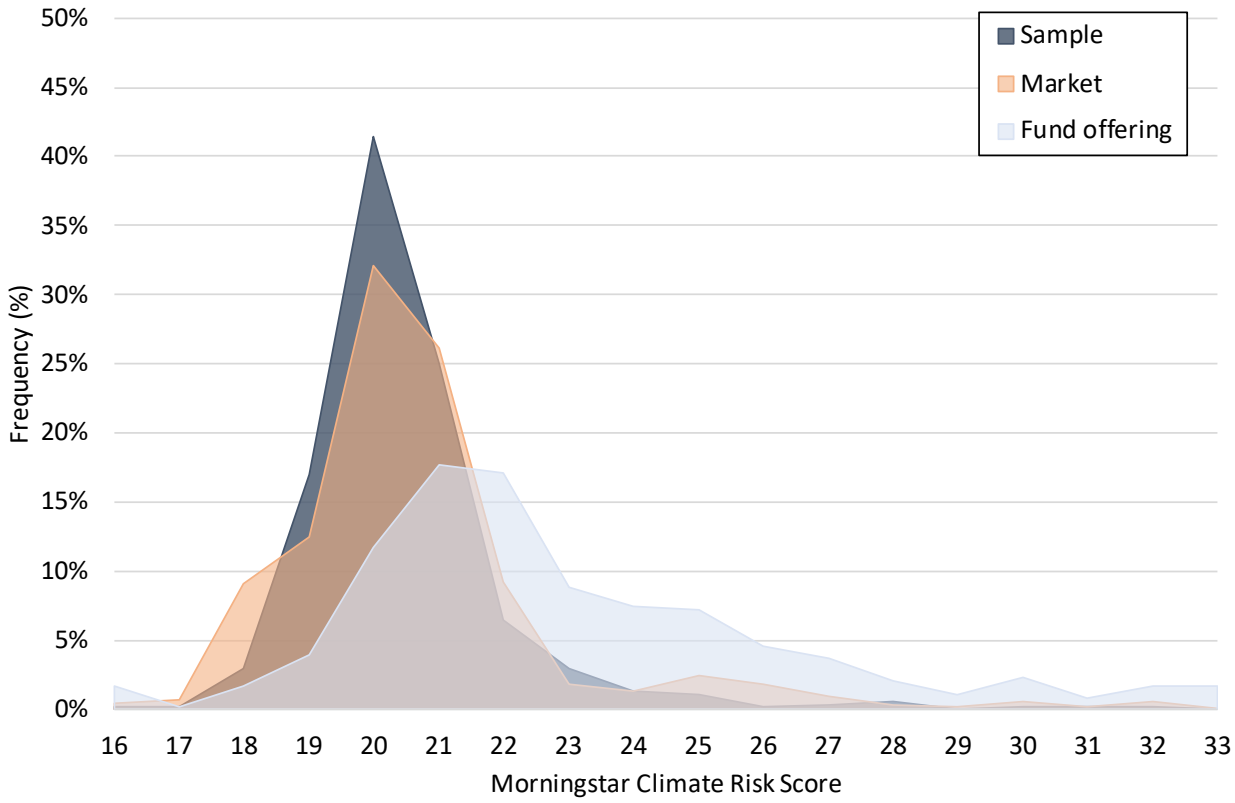


Figure C.2: Morningstar Climate Risk Scores

This figure presents the frequency distribution of Morningstar Climate Risk score for the sample of 466 funds (out of a total of 499) available in the pension system as of 2021 ("Fund offering" marked in light grey). Dark grey shows the weighted score for the sample of individuals ("Sample"). The orange area shows the weighted score distribution for all individuals in the Swedish pension system. The Morningstar Climate Risk score data is collected from the Swedish Pension Authority website.



D Meteorological and Voting data

This appendix describes the weather warnings and voting outcomes for the Swedish Democrats. Weather warnings have been obtained from the Swedish Meteorological and Hydrological Institute and voting outcomes from Statistics Sweden. Sweden is around the same size as the state of California with a distance of 1,572 kilometers from north to south. About 15% of its area rests over the arctic circle. The country is divided into 21 counties and 290 municipalities.

Table D.1 presents the number of Class 1 and 2 heat warnings across Sweden's 21 counties for 2018 and 2019. Counties are sorted (approximately) from north to south. There were a total of 55 warnings issued during 2018 of which 13 of the stronger Class 2 type. There were only 13 warnings issued during 2019, none of them Class 2. Figure 2 displays the same data in a map format separately for Class 1 and 2 warnings for the two years. We use the sum of weather warnings in all regressions since people in this study were exposed to both shocks between surveys. The last map presents voting outcomes at the municipality level of the Swedish Democrats (SD) in the 2018 election. We define a dummy to take the value of one for municipalities where SD share of votes were above the median (13.6%) and zero otherwise. The map plots the voting outcomes only for the above median municipalities for which the dummy takes the value of one.

Table D.1: Heat Warnings in Sweden 2018 and 2019

This table presents the heat warnings issued in Sweden across 21 regional counties during 2018 and 2019. The warnings are presented separately for Class 1 (some risks and disturbances to transport and other parts of society) and Class 2 (danger, damage and larger disturbances) warnings. The data are collected from the Swedish Meteorological and Hydrological Institute. Counties are ordered (approximately) from north to south.

	Class 1			Class 2		
County	2018	2019	Total	2018	2019	Total
Norrbotten	2	1	3	0	0	0
Västerbotten	2	2	4	0	0	0
Jämtland	0	0	0	0	0	0
Västernorrland	1	1	2	1	0	1
Gävleborg	4	0	4	1	0	1
Dalarna	2	0	2	0	0	0
Värmland	1	0	1	0	0	0
Uppsala	2	2	4	2	0	2
Västmanland	1	1	2	1	0	1
Örebro	2	0	2	1	0	1
Stockholm	3	2	5	2	0	2
Södermanland	2	1	3	1	0	1
Östergötland	2	0	2	1	0	1
Västra Götaland	4	0	0	0	0	0
Jönköping	3	2	5	0	0	0
Gotland	2	0	2	1	0	1
Kalmar	3	1	4	1	0	1
Halland	0	1	1	0	0	0
Kronoberg	2	2	4	0	0	0
Blekinge	2	1	3	0	0	0
Skåne	2	2	4	1	0	1
Total	42	19	61	13	0	13

E Passive Fossil Fuel Allocations

This appendix presents additional cross-sectional regressions of passive weights to fossil fuel exclusion funds for the period 2017 to 2021, measured at the end of 2021.

Table E.1: Temperature Revisions and Passive Investments into Fossil Fuel Exclusion Funds

This table reports the results of OLS regressions where the dependent variables is the passive portfolio weight in fossil fuel exclusion funds at the end of 2021. The passive weight the residual of the total exclusion weight and active weight as explained in the main text. The dummy variables Temperature revisions (up or down) are derived from changing the reported likelihood of a more than one Centigrade global temperature rise within 20 years between the two surveys in 2018 and 2019. High SD, Men and University take the value of one for respondents from above median Sweden Democrats Party voting districts, men and for higher education; zero otherwise. Financial literacy denotes the test score ranging from 0 to 5. Income is scaled in logs and age is divided by ten. Column (1) uses the full sample in the estimation; columns (2) and (3) on high and low financial literacy based on having at least four correct answers (High) or less (Low); columns (4) and (5) into voting districts above or below median for the Sweden Democrats Party party. Fund controls include portfolio fractions for fund category, retail networks, one year past return, portfolio weighted standard deviation and fee. Temperature Assessment (TA) controls are dummy variables for the temperature likelihood response to the first survey in 2018. Survey weights are used in all regressions and the constant is excluded from the presentation. Standard errors in parenthesis, and one, two and three asterisks denote significance at the 10, 5, and 1% level, respectively.

	Passive fossil fuel exclusions				
		Fin. Literacy		SD Votes	
	All	Low	High	Low	High
VARIABLES	(1)	(2)	(3)	(4)	(5)
Revised up	0.001	-0.012	0.011	-0.019	0.009
	(0.029)	(0.041)	(0.040)	(0.037)	(0.047)
Revised down	0.012	0.055	-0.038	-0.031	0.057
	(0.024)	(0.036)	(0.031)	(0.031)	(0.035)
Fin. Lit.	-0.029***			-0.039***	-0.013
	(0.010)			(0.013)	(0.015)
Men	-0.055**	-0.063**	-0.065**	-0.028	-0.101***
	(0.022)	(0.031)	(0.030)	(0.028)	(0.036)
Age	0.025**	0.032*	0.018	0.030**	0.015
	(0.012)	(0.017)	(0.016)	(0.015)	(0.018)
Log Income	-0.013	-0.017	-0.011	-0.017	-0.004
	(0.009)	(0.017)	(0.011)	(0.014)	(0.011)
University	-0.057***	-0.057*	-0.064**	-0.040	-0.077**
	(0.022)	(0.031)	(0.030)	(0.029)	(0.034)
TA controls	Yes	Yes	Yes	Yes	Yes
Fund controls	Yes	Yes	Yes	Yes	Yes
Observations	1,436	761	675	845	591
R-squared	0.359	0.313	0.382	0.390	0.336