A Breath of Change: Can Personal Exposures Drive Green Preferences?

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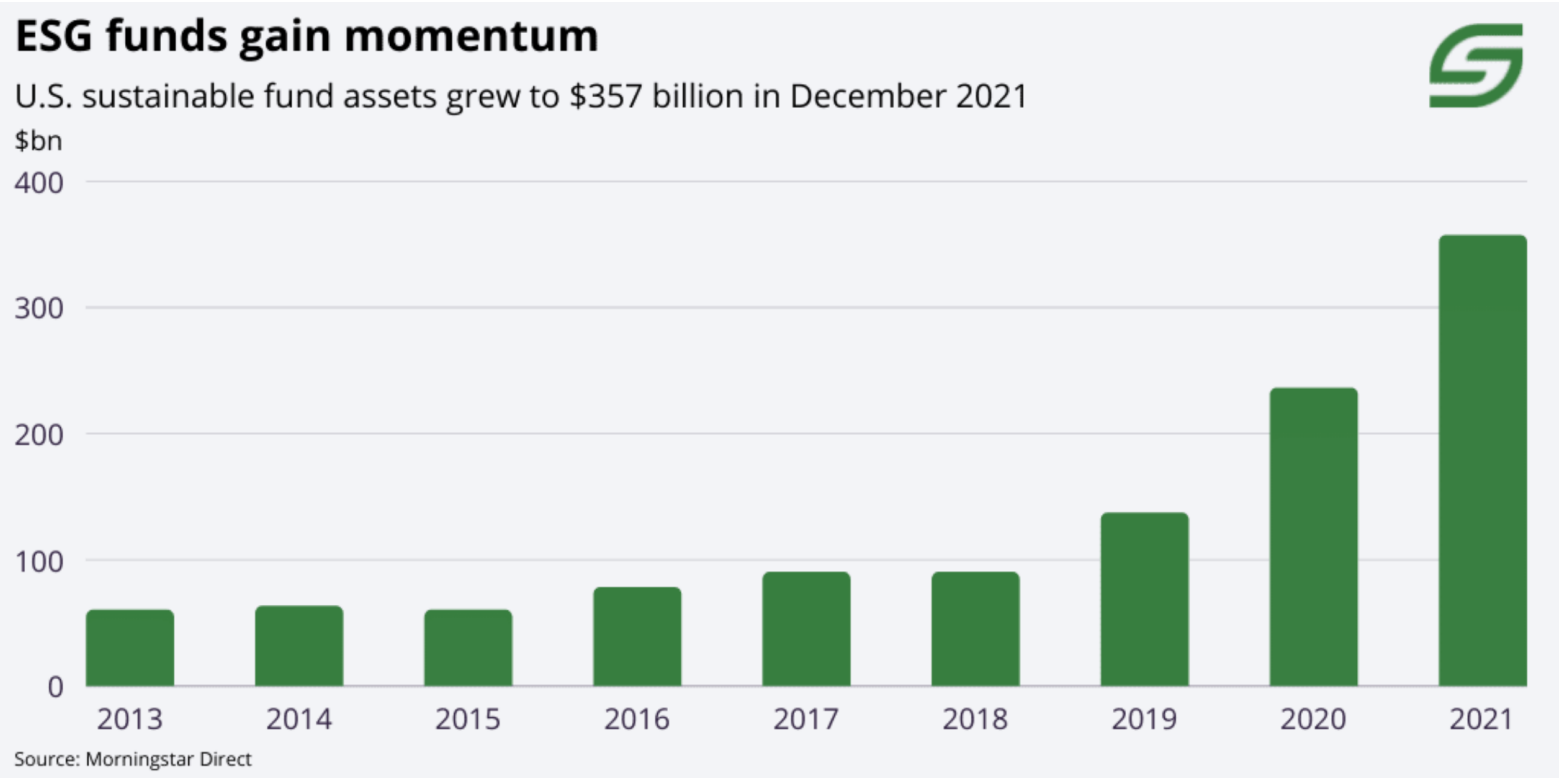

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Question: What can affect the preference for green investing?

Answer (this paper): Idiosyncratic personal experiences affect individual investors' preferences.

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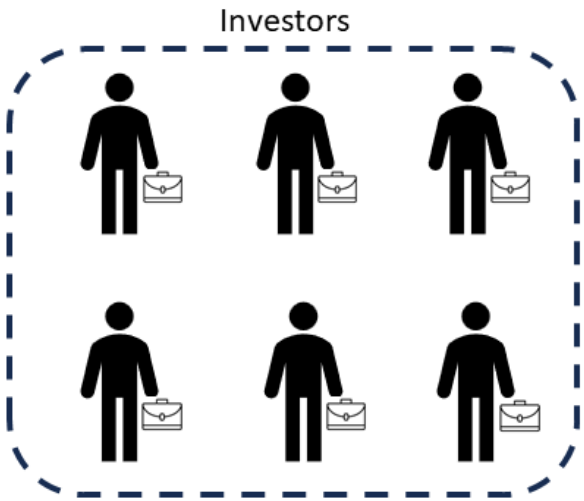

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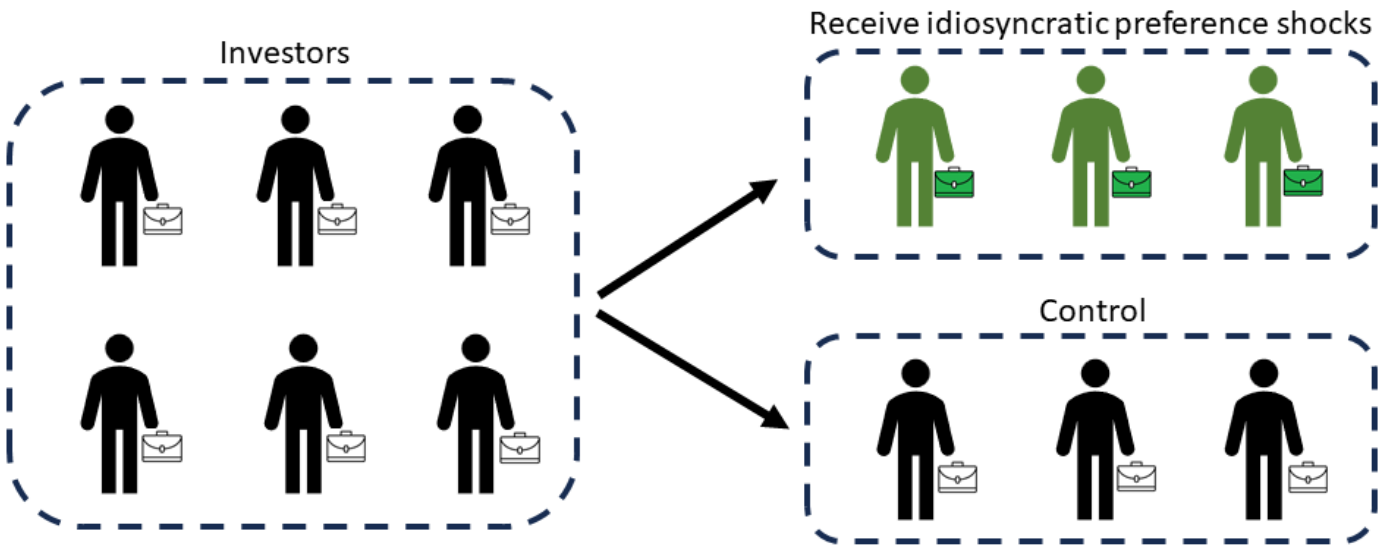

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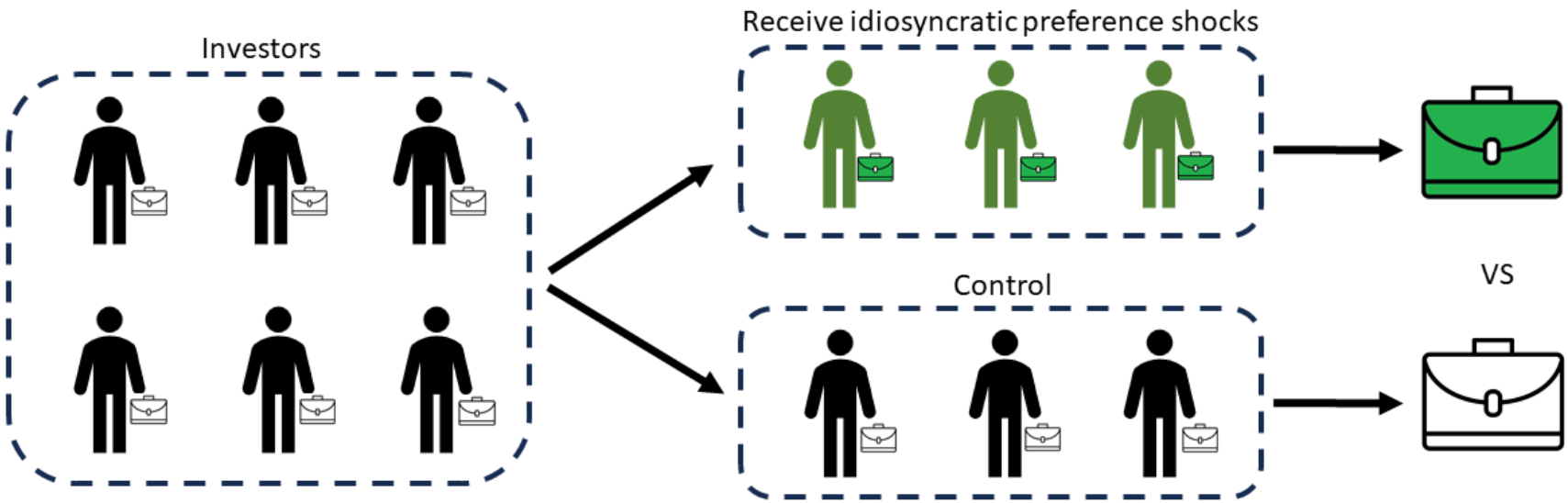

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   - Data from Denmark: investors' holdings, demographics, family links, etc.
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This paper

We show that:

1. Idiosyncratic experiences matter for investors' "green" preferences:
   - investors, whose children get **respiratory** diseases, **decrease** their holdings of "**brown**" stocks and **increase** their holdings of "**green**" stocks

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4. Asset types matter:
   - no effect on ESG funds holdings

Related literature

- Factors influencing ESG preferences
  - Riedl & Smeets'17; Giglio et al.'23, Andersen et al.'23; etc.
  - **This paper**: We look at experiences as determinants of preferences.
- Health outcomes and asset holdings
  - Rosen & Wu'04; Døskeland & Kvaerner'21; Kvaerner'22; etc.
  - **This paper**: We use specific health outcomes as instrument for "green" preferences.
- Experience and (economic) behavior
  - Malmendier & Nagel'11; Koudijs & Voth'16; etc.
  - **This paper**: We show how relevant experiences change investment preferences in the cross-section of stocks.
- Experience and ESG behavior
  - Choi, Gao, and Jiang'11; Fisman et at.'23; etc.
  - **This paper**: We show that idiosyncratic experiences of retail investors drive their investment preferences.

Respiratory diseases and air pollution

1. Respiratory diseases can be caused by air pollution (Dockery et al.'93, Pope & Dockery'06, US EPA'09)
   - Causal relationship between air pollution and cardiopulmonary diseases (US EPA'09).
2. Even small levels of air pollution can be harmful (Dockery & Pope'94)
   - evidence from the US (Dockery et al.'93)
   - evidence from Finland: pollutants' effect is amplified by low temperatures (Pönkä'91)
3. Kids are a risk-group (US EPA'09, Shüepp & Sly'12)

Data

1. **Portfolio holdings** from the Danish Tax and Customs Administration (SKAT) Holdings of stocks & mutual funds at the end of the year
2. **Income and wealth information** are from the official records at the Danish Tax and Customs Administration (SKAT)
3. **Educational records** from the Danish Ministry of Education
4. **Hospital admissions data** from the Danish National Board of Health (Sundhedsstyrelsen)
5. **Individual and family data** from the official Danish Civil Registration System (CPR Registeret)
6. **Fund names** from Morningstar and Nasdaq Nordic

Overall sample: 2011 to 2021, hospital visits - until 2019 q1.

Stocks Classification

1. Classification based on "green" and "brown" energy stocks
2. Conservative approach: using a subset of stocks with a clear "type"
3. Energy stocks selected based on industry codes, name searches, and business scope
4. Green energy stocks (106 stocks)
   - Engines & turbines (SIC 351)
   - Solar power
   - Wind power
5. Brown energy stocks (73 stocks)
   - Oil & gas extraction (SIC 13)
   - Petroleum refining and related industries (SIC 29)
   - Gas production and distribution (SIC 492)
   - Electric and gas, and other utility (SIC 493)

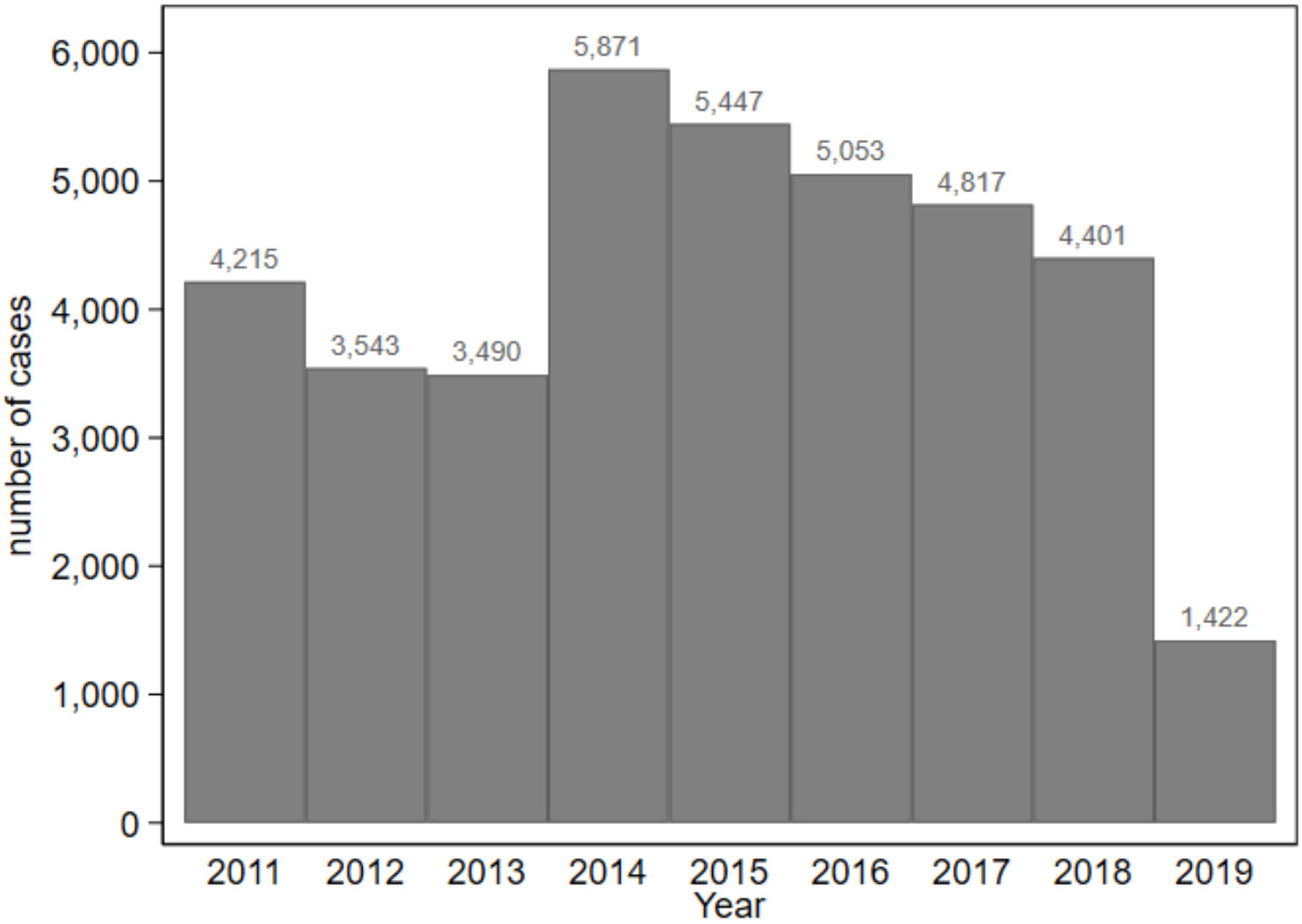
Sample formation

International classification of diseases, 10-th eddition (ICD-10): codes DJ00-DJ99 - respiratory diseases.

Sample:

- all cases of respiratory hospital visits in the sample (1995-2019)
- first hospital visit per each child
- aggregation to the parent level
- first kid to get respiratory disease for each parent
- parents who hold financial assets at year *t-1*
  (caveat: parents who enter the financial market after the treatment are not present in the sample)
- mothers and fathers are taken as separate observations

Sample


6,000
5,000
4,000
3,000
2,000
1,000
0
number of cases
4,215
3,543
3,490
5,871
5,447
5,053
4,817
4,401
1,422
2011
2012
2013
2014
2015
2016
2017
2018
2019
Year

Summary statistics: individual characteristics

	All	Sample
Income (1,000 DKK)	336.6	513.4
	(624.8)	(637.6)
Financial wealth (1,000 DKK)	560.1	367.6
	(1394.7)	(1138.9)
Age (years)	51.5	37.4
	(21.2)	(7.8)
Gender (% male)	52.8	58.6
	(49.9)	(49.3)
Married (%)	50.8	59.4
	(50.0)	(49.1)
Education (years)	13.7	15.5
	(3.1)	(2.2)
Number of children	0.5	1.3
	(0.9)	(0.9)
N	11,442,067	50,065

Methodology: Staggered difference-in-differences

- Under heterogeneous treatment effects, staggered diff-in-diff regression estimators, can be biased (Goodman-Bacon'21; Baker, Larcker, and Wang'22).

- To address the potential bias, we use the (dynamic) estimator designed by Sun & Abraham'21.

- We estimate

$$Y_{i,t} = \alpha_i + \lambda_t + \sum_{m=-K}^{-2} \mu_m D_{i,t}^m + \sum_{m=0}^{L} \mu_m D_{i,t}^m + \nu_{i,t}$$

α_i - person fixed effect,
λ_t - time fixed effect,
$D_{j,s} = 1$ if $i = j, t = s$, otherwise $D_{j,s} = 0$.

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  - Proportion of "brown" stocks in the portfolio
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  - Difference of indicators ("green" minus "brown"), difference of proportions.

Kids' respiratory diseases and "brown" stock holdings

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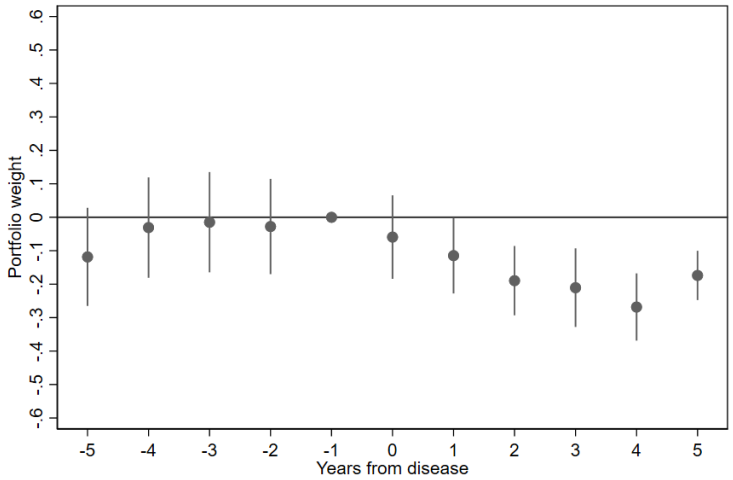
Portfolio weight of "brown" stock



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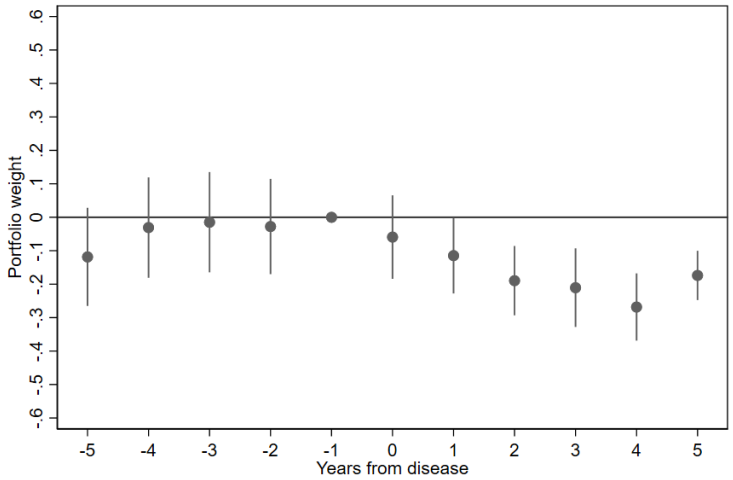

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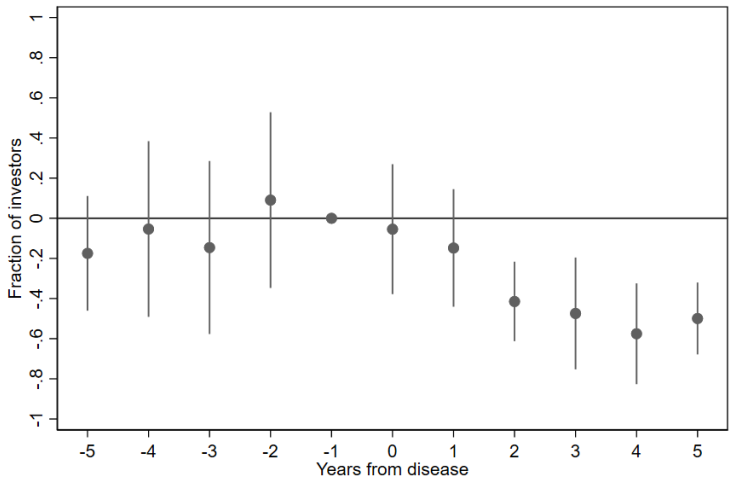

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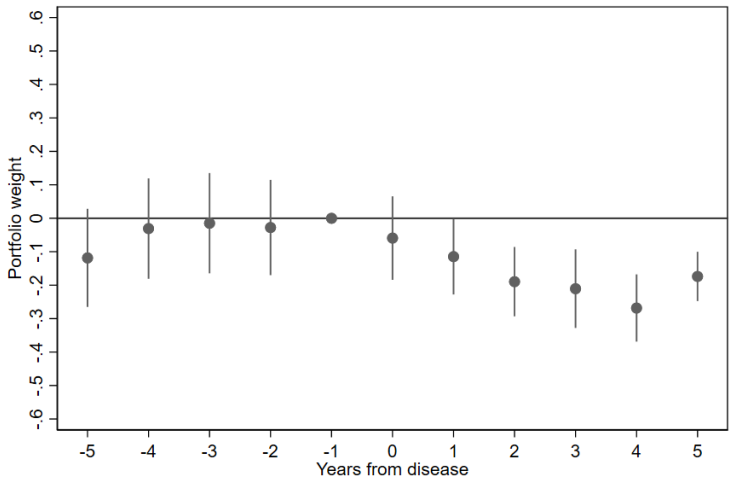

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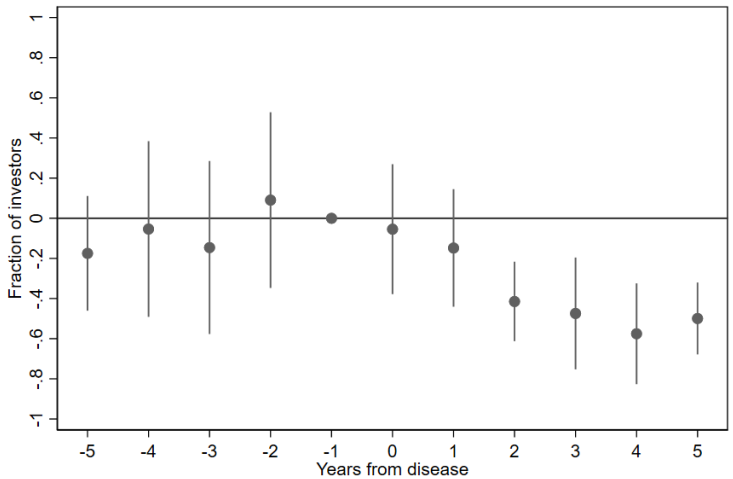

	Portf. weight	$\mathbb{1}${holds "brown"}
ATT, p.p.	-0.192***	-0.424***
	(0.042)	(0.096)
Num. obs.	758,697	758,697
Num. treated	46,184	46,184

For reference:

	Average (pre-treatment)
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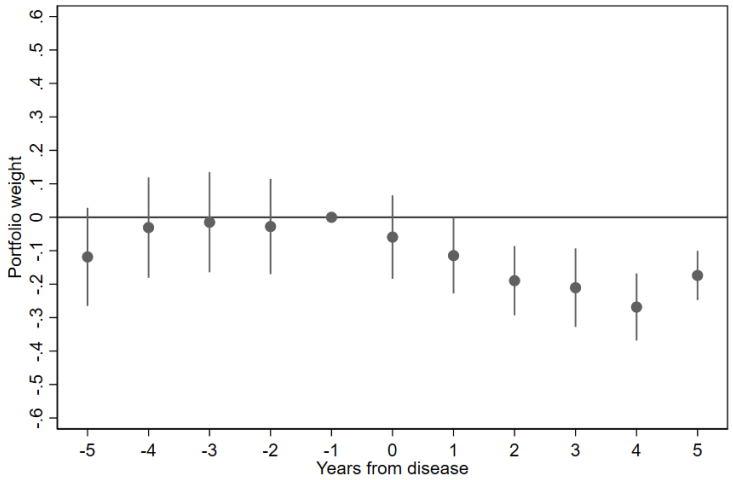

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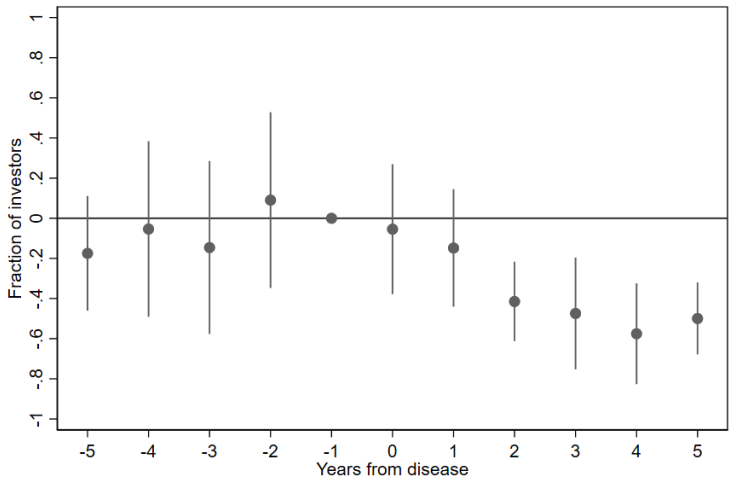

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- Treated investors **decrease their holdings** of "brown" stocks compared to controls by 8%-12% of the initial level.

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Placebo tests

Diseases of digestive organs

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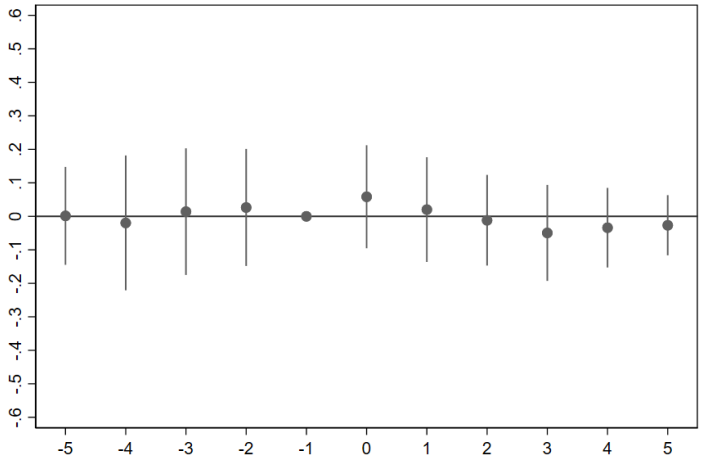

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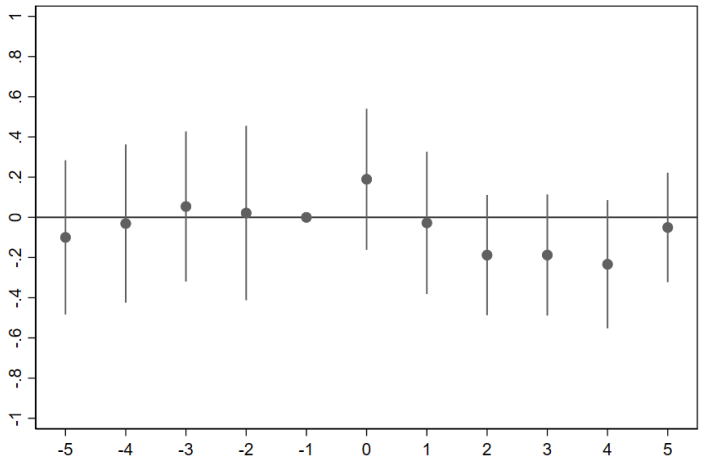

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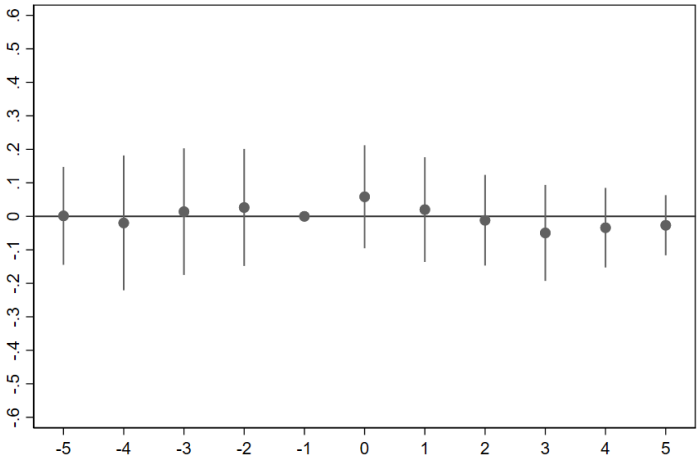

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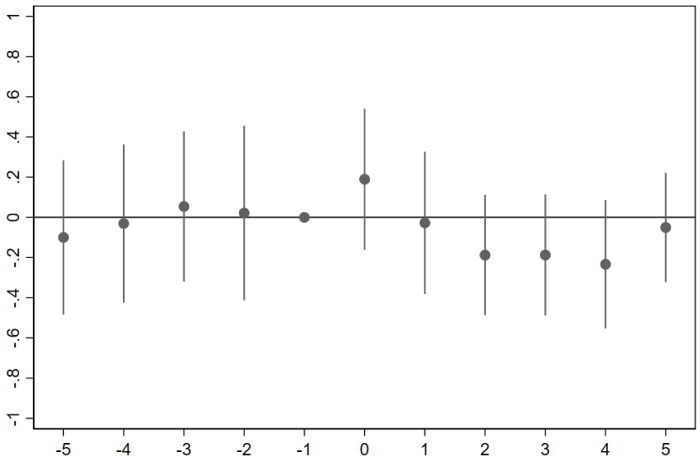
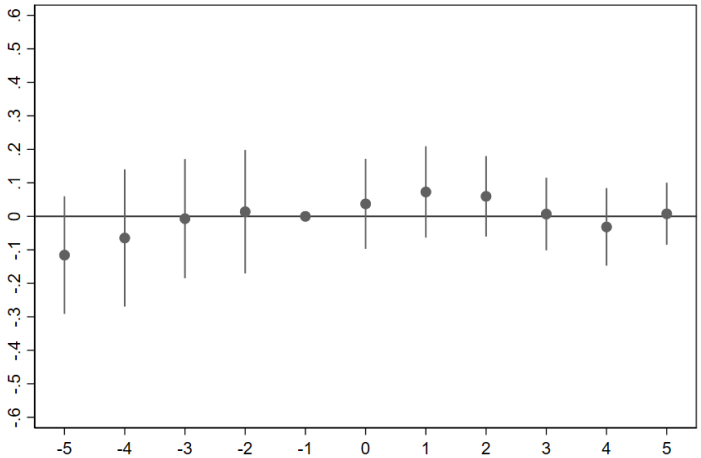


Bones, muscles, & connect. tissues

Portfolio weight of "brown" stock



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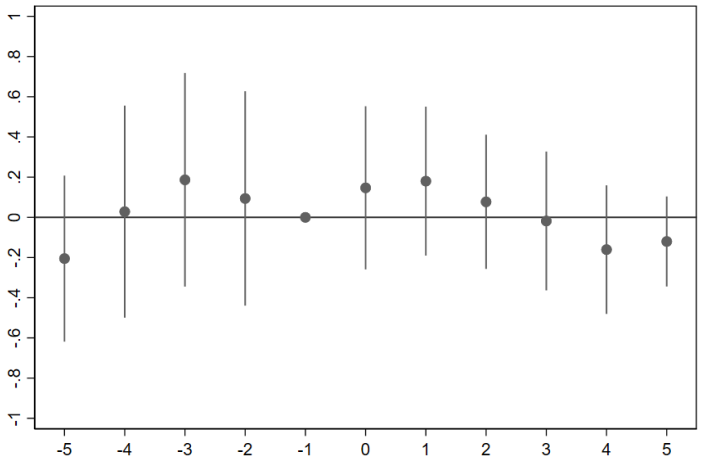

"Brown" stock holdings: Active divestment?

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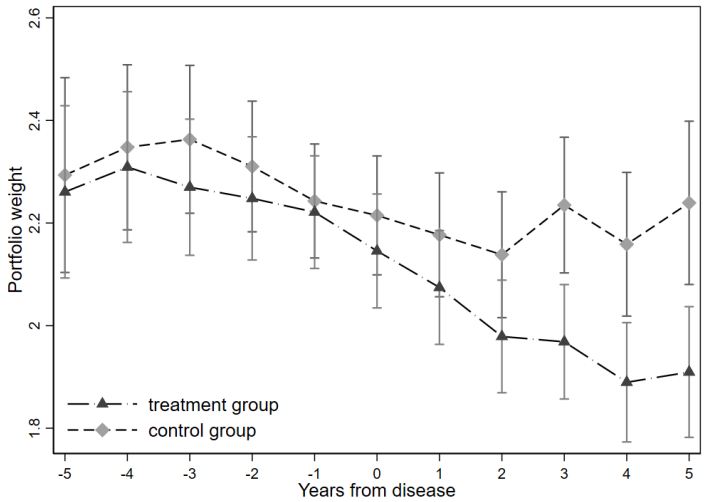

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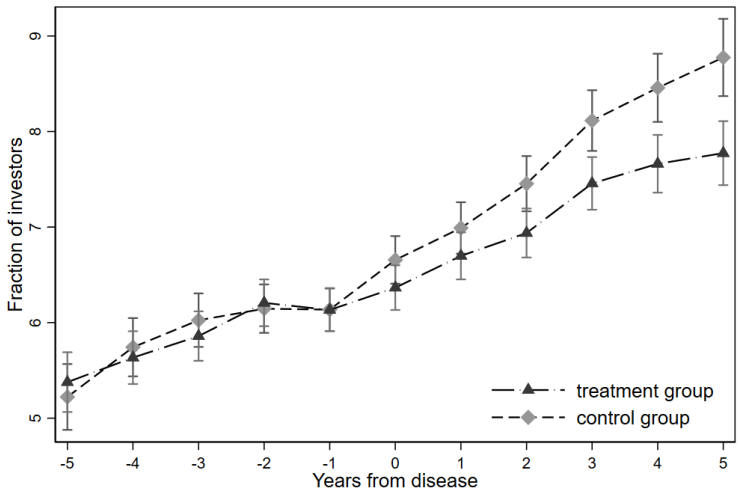

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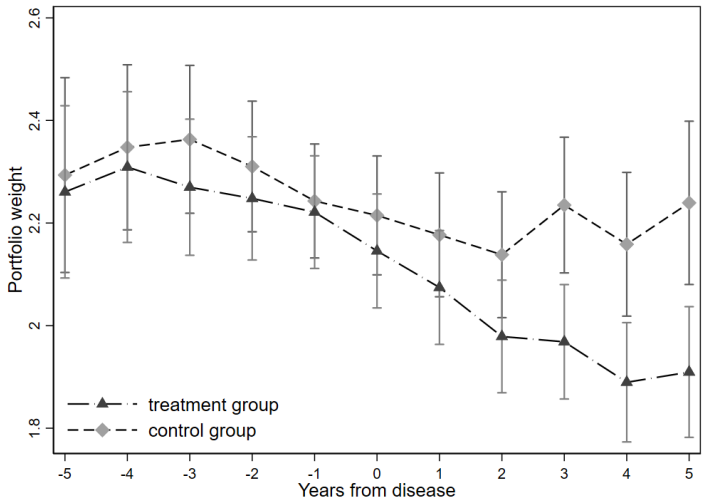

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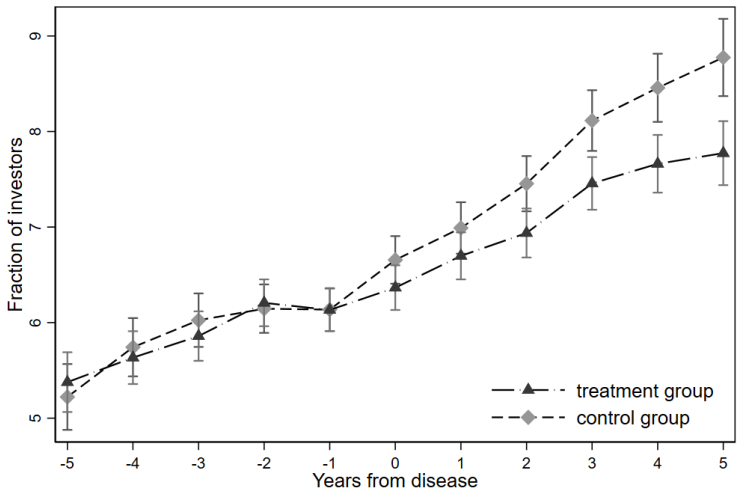

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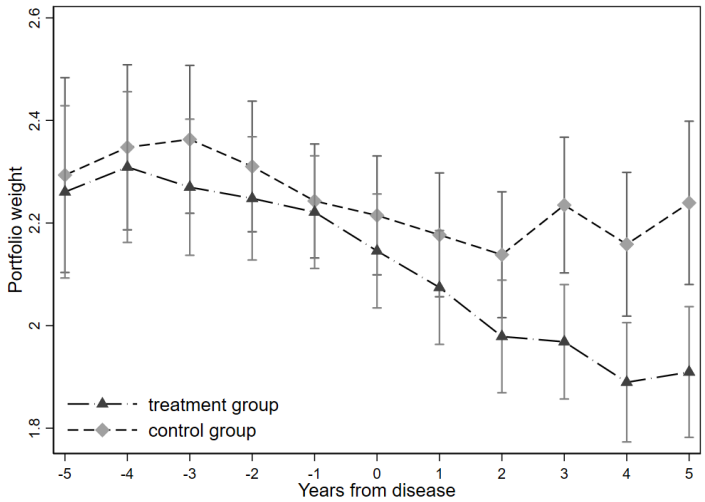

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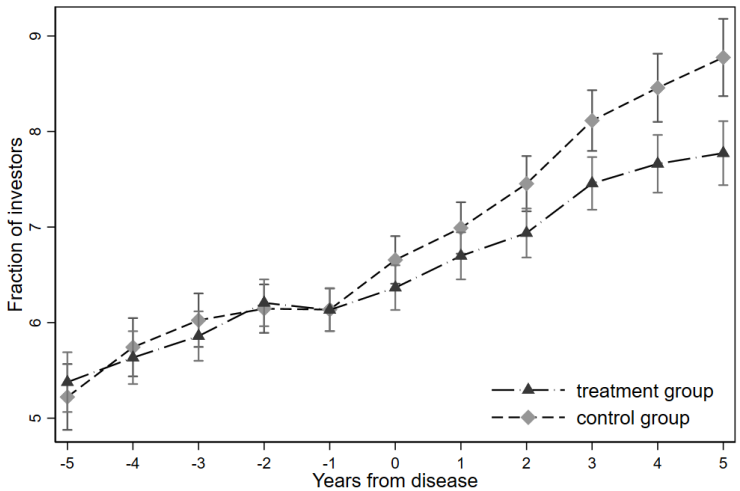
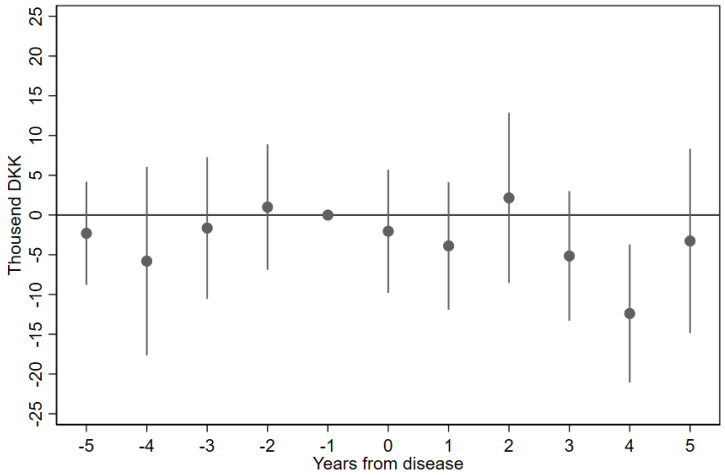


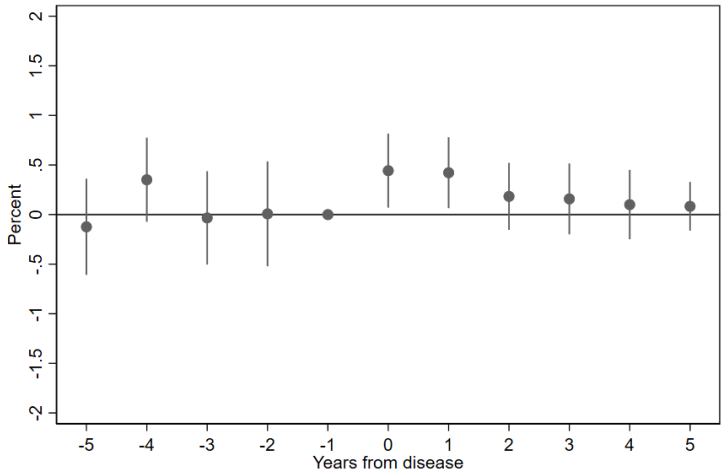
- Investors from the **control** group do not significantly decrease the portfolio weight on "brown" stocks.
  Treated investors decrease their portfolio weights on "brown" stocks.
- Investors from the **control** group increase the probability of holding a "brown" stock over time.
  Similarly, **treated** investors are more likely to hold a "brown" stock over time.

Alternative Explanations

Bank account holdings



Risky asset share



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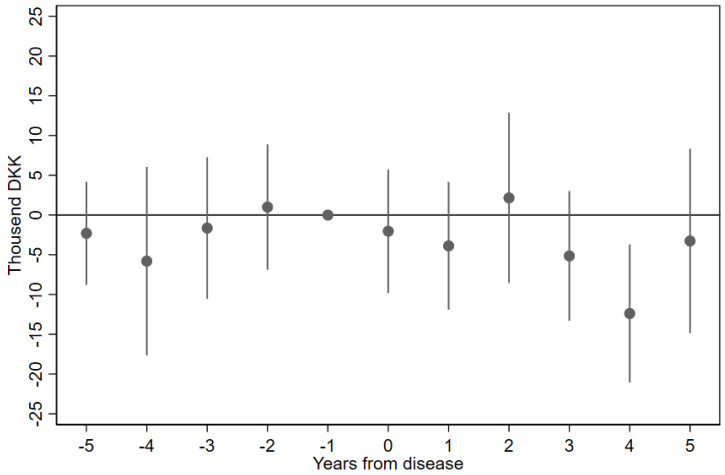
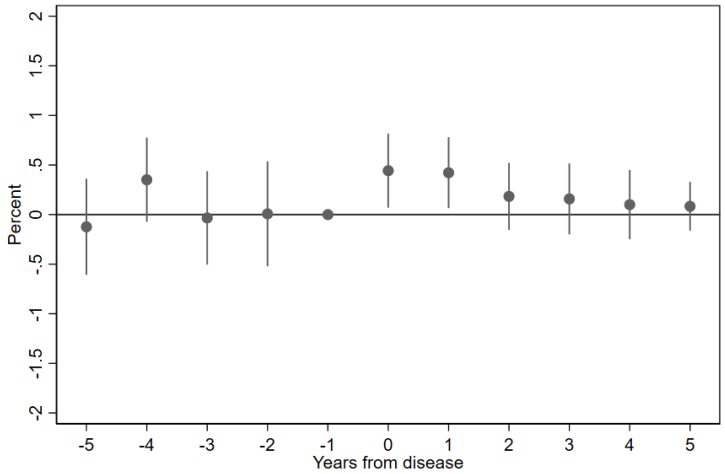


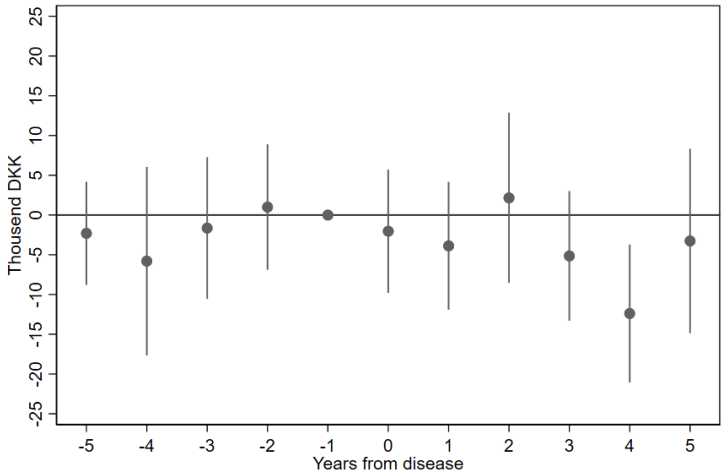
Risky asset share



- No economically significant change in deposit amounts after the treatment: No liquidity shortage for **treated** group.

Alternative Explanations

Bank account holdings



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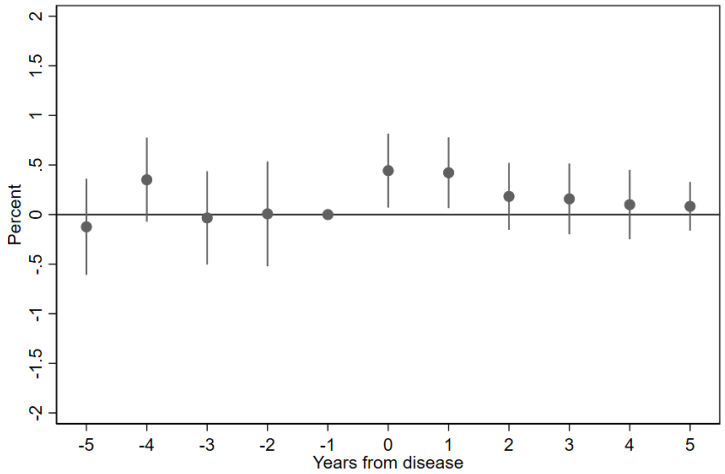
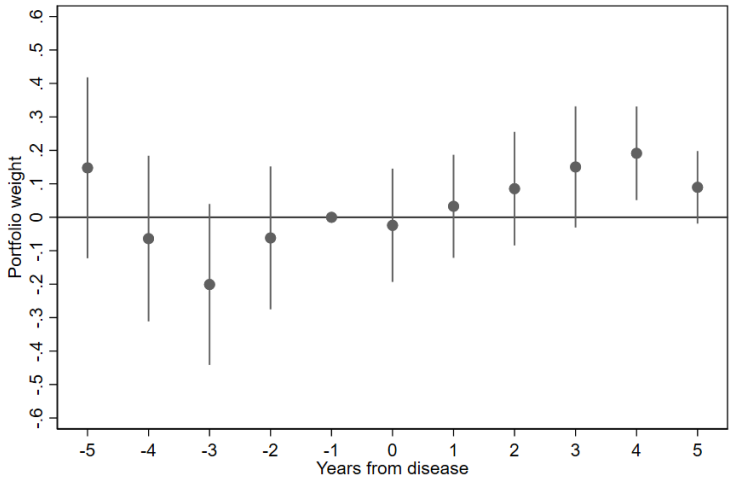


- No economically significant change in deposit amounts after the treatment: No liquidity shortage for **treated** group.
- No decrease in the risky asset share (proportion of stocks and funds in the investor's financial wealth) after the treatment: No divestment for **treated** group.

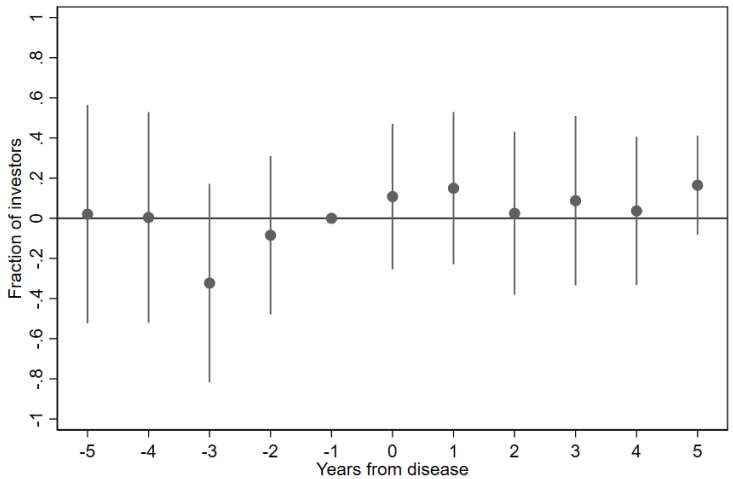
Kids' respiratory diseases and "green" stock holdings

Kids' respiratory diseases and "green" stock holdings

Portfolio weight of "green" stock



$\mathbb{1}$ {Holds "green" stock}



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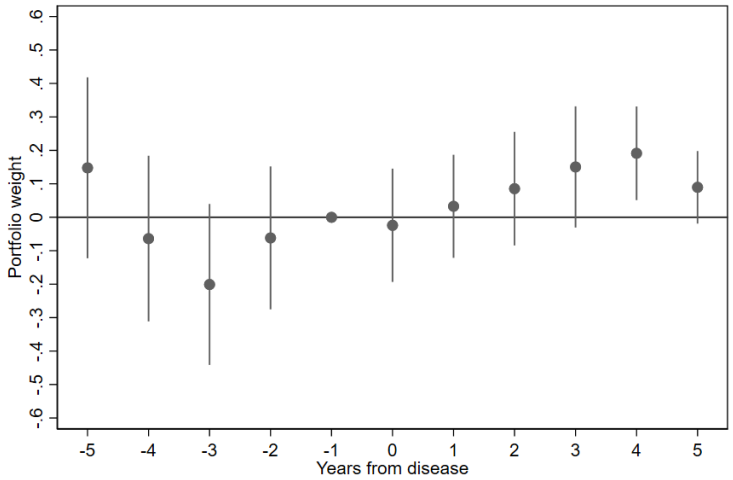

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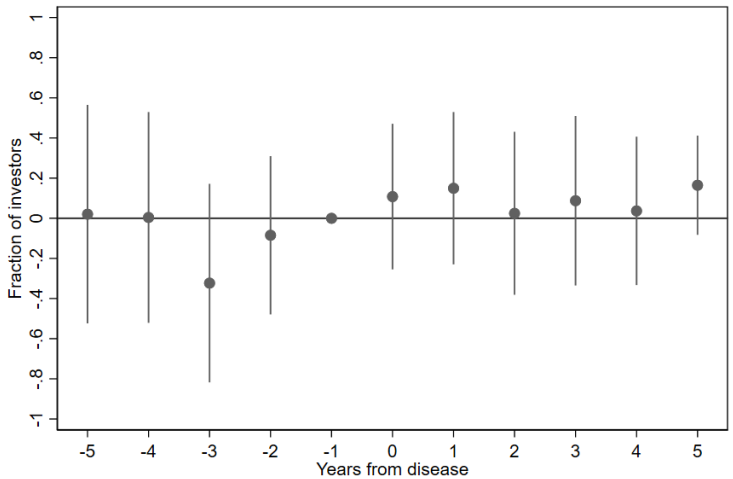


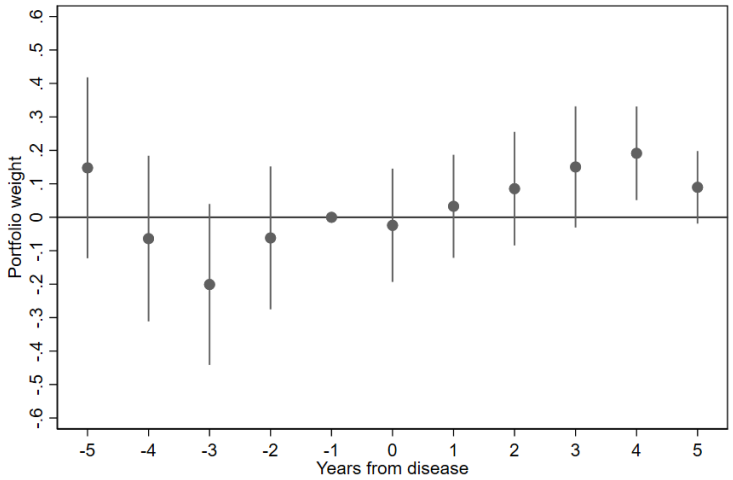
	Portf. weight	$\mathbb{1}${holds "green"}
ATT, p.p.	0.110*	0.095
	(0.061)	(0.157)
Num. obs.	758,697	758,697
Num. treated	46,184	46,184

For reference:

	Average (pre-treatment)
Portf. weight, p.p.	5.1
$\mathbb{1}${holds brown}, p.p.	13.1

Kids' respiratory diseases and "green" stock holdings

Portfolio weight of "green" stock



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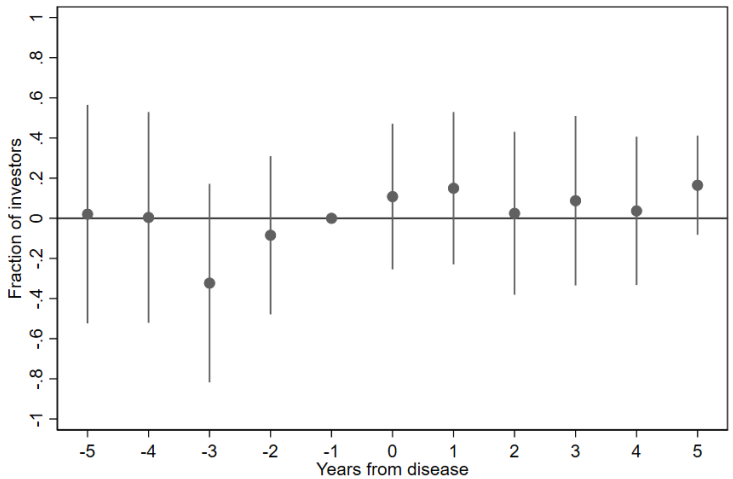

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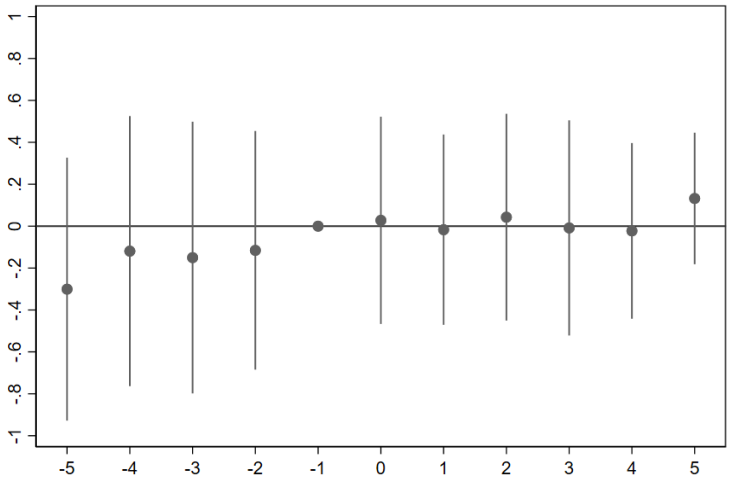
- Treated investors **increase their holdings** of "green" stocks compared to controls by 2% of the initial level (on the intensive margin).

For reference:

	Average (pre-treatment)
Portf. weight, p.p.	5.1
$\mathbb{1}${holds brown}, p.p.	13.1

Effect on ESG funds holdings

Portfolio weight of ESG funds



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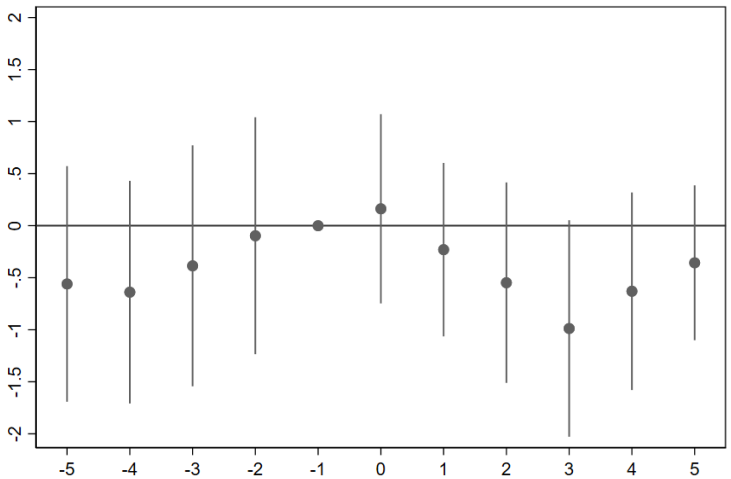

	Portf. weight	$\mathbb{1}${holds ESG}
ATT, p.p.	0.025	-0.545
	(0.187)	(0.377)
Num. obs.	236,126	236,126
Num. treated	20,137	20,137

For reference:

	Average (pre-treatment)
Portf. weight, p.p.	0.9
$\mathbb{1}${holds brown}, p.p.	2.9

Effect on ESG funds holdings

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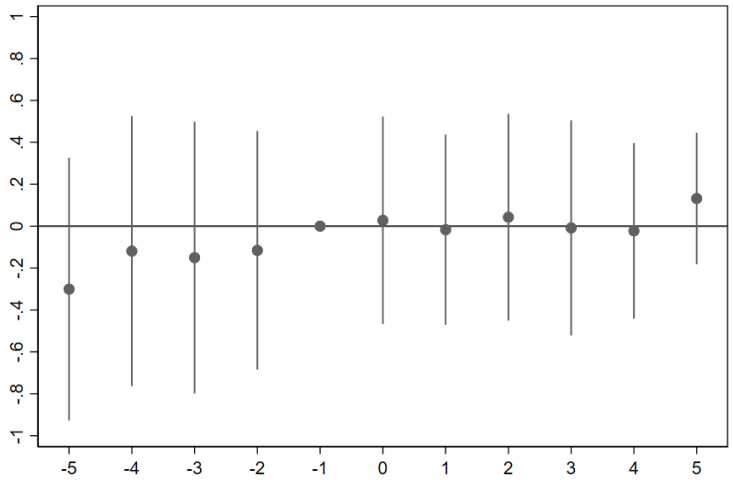

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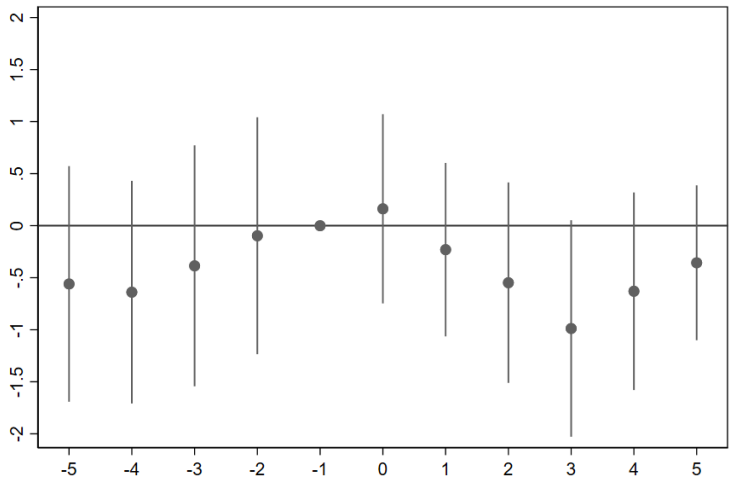

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Num. treated	20,137	20,137

- Treated investors do not significantly alter their holdings of ESG funds compared to controls.

For reference:

	Average (pre-treatment)
Portf. weight, p.p.	0.9
$\mathbb{1}${holds brown}, p.p.	2.9

Different health conditions

	Chronic		Num. hosp. visits		Num. diag		Bed days	
ATT	no	yes	1	>1	1	>1	≤ 1	>1
Portf. weight diff	0.347***	0.119	0.282***	0.345*	0.243**	0.363***	0.200*	0.421***
	(0.084)	(0.166)	(0.1)	(0.19)	(0.12)	(0.113)	(0.102)	(0.145)
$\mathbb{1}\{$"green"$\}$-$\mathbb{1}\{$"brown"$\}$	0.534***	0.308	0.433*	0.712**	0.310	0.706***	0.356	0.674***
	(0.19)	(0.325)	(0.224)	(0.333)	(0.258)	(0.214)	(0.250)	(0.265)
Num. obs.	534,047	224,650	543,811	214,886	356,414	402,283	443,641	315,056
Num. treated	32,534	13,650	32,922	13,262	21,463	24,721	26,904	19,280

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- The evidence is consistent with relatively severe cases leading to stronger results.

Investors' characteristics

	Educ. length		Parent		Big city		Parent's age	
ATT	$<$ 15.5 years	$>$ 15.5 years	father	mother	no	yes	$\leq$36	$>$36
Portf. weight diff	0.114	0.291**	0.395***	0.176	0.290***	0.311**	0.227**	0.338***
	(0.109)	(0.142)	(0.089)	(0.108)	(0.098)	(0.141)	(0.113)	(0.110)
$\mathbb{1}$\{"green"\}-$\mathbb{1}$\{"brown"\}	0.111	0.484*	0.502**	0.565**	0.396*	0.489	0.573**	0.360
	(0.253)	(0.276)	(0.214)	(0.234)	(0.204)	(0.328)	(0.28)	(0.252)
Num. obs.	417,360	341,337	452,217	306,480	495,017	259,160	400,431	358,266
Num. treated	26,006	20,178	27,682	18,502	33,525	20,499	25,509	20,675

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- Little evidence of the effects of individual heterogeneity.

Family relationships

	Live together		Other relatives	
ATT	no	yes	grandparents	aunts/uncles
Portf. weight diff	-0.620*	0.390***	0.115**	0.157*
	(0.370)	(0.089)	(0.051)	(0.092)
$\mathbb{1}\{$"green"$\}$-$\mathbb{1}\{$"brown"$\}$	-0.4511	0.628***	0.189*	0.583***
	(0.773)	(0.188)	(0.114)	(0.203)
Num. obs.	73,108	685,589	736,770	607,792
Num. treated	5,975	40,209	81,389	37,169

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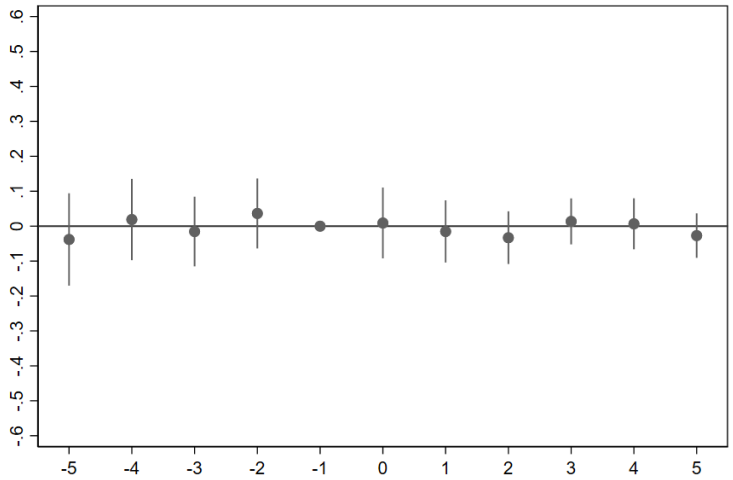
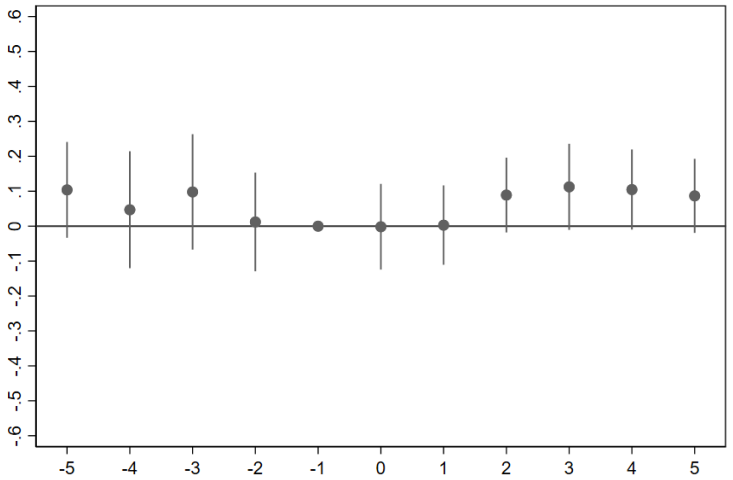
- Effects are not reserved for parents.

Investors' respiratory diseases and "green" investing

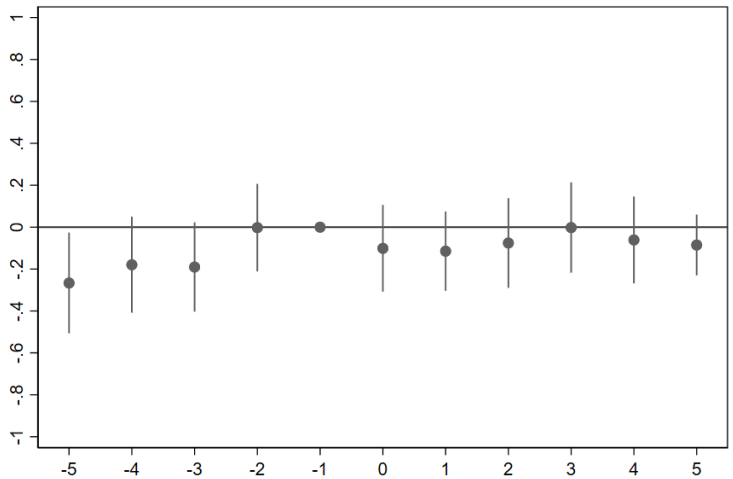
Portfolio weight of "brown" stock



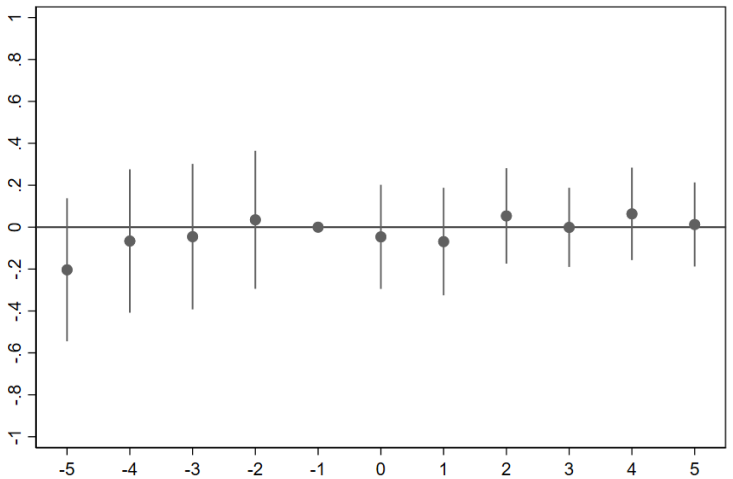
Portfolio weight of "**green**" stock



$\mathbb{1}$ {Holds "brown" stock}



$\mathbb{1}$ {Holds "**green**" stock}



Conclusion

1. Idiosyncratic experiences matter for investors' "green" preferences:
   - investors, whose children get **respiratory** diseases, **decrease** their holdings of "**brown**" stocks and **increase** their holdings of "**green**" stocks
2. Relevance to the **ecology** is important:
   - results don't hold for other categories of diseases
3. Relevance to the investor is important:
   - results are driven by investors who live with their children
   - more severe conditions trigger stronger responses
   - no effect of investors' own respiratory diseases
   - results are present for "extended family" members (uncles/aunts and grandparents)
4. Asset types matter:
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We will try to come up with a more optimistic instrument next time!