

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

S. Andersen<sup>ad</sup>   D. Chebotarev<sup>b</sup>   F. Z. Filali Adib<sup>cd</sup>   K.M. Nielsen<sup>c</sup>

<sup>a</sup>Danmarks Nationalbank

<sup>b</sup>Indiana University

<sup>c</sup>Copenhagen Business School

<sup>d</sup>BIGFI

GRASFI 2024,  
Tuesday 3<sup>rd</sup> September, 2024

# Responsible Investing is Gaining Popularity

- 1 Dramatic growth in investment approaches that consider assets' environmental, social, and governance (ESG) characteristics.

# Responsible Investing is Gaining Popularity

- ① Dramatic growth in investment approaches that consider assets' environmental, social, and governance (ESG) characteristics.



# Responsible Investing is Gaining Popularity

- 1 Dramatic growth in investment approaches that consider assets' environmental, social, and governance (ESG) characteristics.
- 2 Investors are most concerned by the “Environmental” component:

## Responsible Investing is Gaining Popularity

- ① Dramatic growth in investment approaches that consider assets' environmental, social, and governance (ESG) characteristics.
- ② Investors are most concerned by the “Environmental” component:

---

***“When comparing focus on ESG factors, 88% of global respondents ranked Environment as the priority most in focus amongst those choices today...”***

(BlackRock 2020 Global Sustainable Investment Survey)

---

## Responsible Investing is Gaining Popularity

- 1 Dramatic growth in investment approaches that consider assets' environmental, social, and governance (ESG) characteristics.
- 2 Investors are most concerned by the “Environmental” component:

---

*“When comparing focus on ESG factors, 88% of global respondents ranked Environment as the priority most in focus amongst those choices today...”*

(BlackRock 2020 Global Sustainable Investment Survey)

---

**Question:** What can affect the preference for green investing?

## Responsible Investing is Gaining Popularity

- 1 Dramatic growth in investment approaches that consider assets' environmental, social, and governance (ESG) characteristics.
- 2 Investors are most concerned by the “Environmental” component:

---

*“When comparing focus on ESG factors, 88% of global respondents ranked Environment as the priority most in focus amongst those choices today...”*

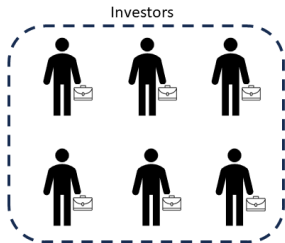
(BlackRock 2020 Global Sustainable Investment Survey)

---

**Question:** What can affect the preference for green investing?

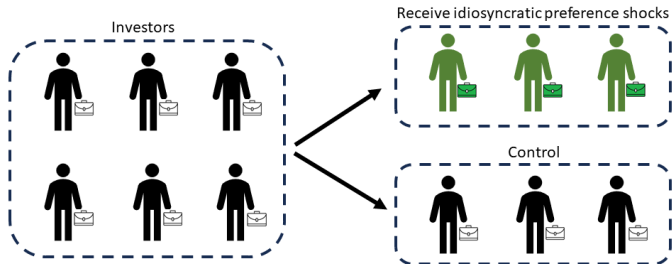
**Answer (this paper):** **Idiosyncratic personal experiences** affect individual investors' preferences.

# Ideal Experiment

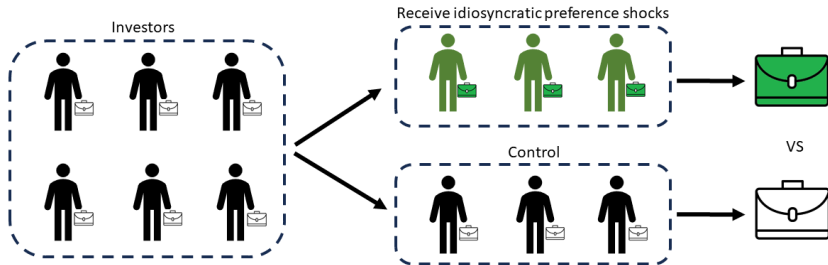




# Ideal Experiment



# Ideal Experiment



## Problems:

- 1 Observability of holdings
- 2 Random assignment (no selection into (out of) treatment)
- 3 Exclusion restriction (shocks are not informative about returns)

# Ideal experiment vs this paper

## Problems:

- 1 Observability of holdings
- 2 Random assignment (no selection into (out of) treatment)
- 3 Exclusion restriction (shocks are not informative about returns)

# Ideal experiment vs this paper

## Problems:

- 1 Observability of holdings
  - | Data from Denmark: investors' holdings, demographics, family links, etc.
- 2 Random assignment (no selection into (out of) treatment)
- 3 Exclusion restriction (shocks are not informative about returns)

# Ideal experiment vs this paper

## Problems:

- 1 Observability of holdings
  - | Data from Denmark: investors' holdings, demographics, family links, etc.
- 2 Random assignment (no selection into (out of) treatment)
- 3 Exclusion restriction (shocks are not informative about returns)
  - | Shocks to exposure: respiratory diseases of investors' children.

# Ideal experiment vs this paper

## Problems:

- 1 Observability of holdings
  - | Data from Denmark: investors' holdings, demographics, family links, etc.
- 2 Random assignment (no selection into (out of) treatment)
- 3 Exclusion restriction (shocks are not informative about returns)
  - | Shocks to exposure: respiratory diseases of investors' children.

Advantages:

  - (a) truly idiosyncratic, contain no information about the future.
  - (b) not a shock to wealth

# Ideal experiment vs this paper

## Problems:

- 1 Observability of holdings
  - | Data from Denmark: investors' holdings, demographics, family links, etc.
- 2 Random assignment (no selection into (out of) treatment)
  - | Shocks are random: selection into treatment is unlikely.
- 3 Exclusion restriction (shocks are not informative about returns)
  - | Shocks to exposure: respiratory diseases of investors' children.

### Advantages:

- (a) truly idiosyncratic, contain no information about the future.
- (b) not a shock to wealth

# 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



# 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
- ② Relevance to the **ecology** is important:
  - | results don't hold for other categories of diseases

# 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
- 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)

# 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
- 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:
  - | 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 al.'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

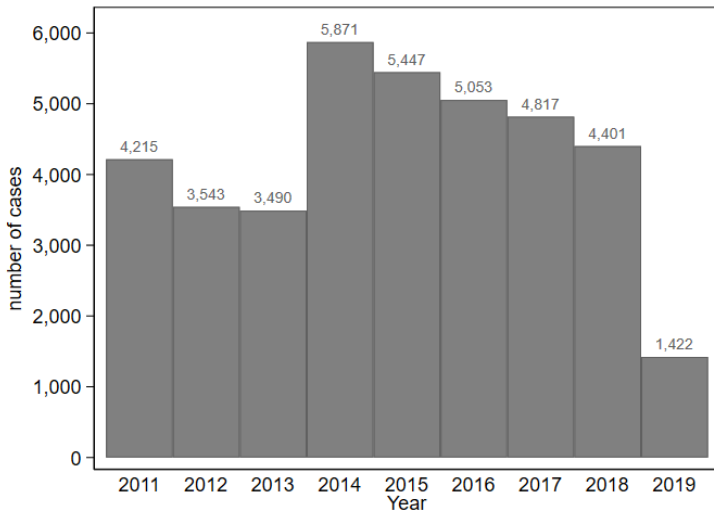
International classification of diseases, 10-th edition (ICD-10):  
codes DJ00-DJ99 - respiratory diseases.

## 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



## Summary statistics: individual characteristics

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

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

$\alpha_i$  - person fixed effect,

$\alpha_t$  - time fixed effect,

$D_{j,s} = 1$  if  $i = j, t = s$ , otherwise  $D_{j,s} = 0$ .

## Methodology: Matching and variables

- We match treatment to controls on age, education, number of kids, marital status, gender, year, municipality, and total wealth.

## Methodology: Matching and variables

- We match treatment to controls on age, education, number of kids, marital status, gender, year, municipality, and total wealth.
- We look at the following endogenous variables:
  - | Proportion of “brown” stocks in the portfolio
  - | Indicator of holding a “brown” stock (  $f$  holds “brown”  $g$  )

# Methodology: Matching and variables

- We match treatment to controls on age, education, number of kids, marital status, gender, year, municipality, and total wealth.
- We look at the following endogenous variables:
  - | Proportion of “brown” stocks in the portfolio
  - | Indicator of holding a “brown” stock (  $f$  holds “brown”  $g$  )
  - | Proportion of “green” stocks in the portfolio
  - | Indicator of holding a “green” stock (  $f$  holds “green”  $g$  )

# Methodology: Matching and variables

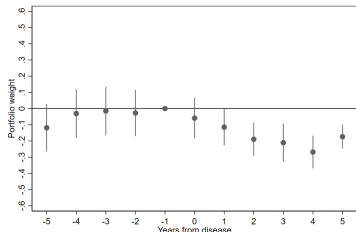
- We match treatment to controls on age, education, number of kids, marital status, gender, year, municipality, and total wealth.
- We look at the following endogenous variables:
  - | Proportion of “brown” stocks in the portfolio
  - | Indicator of holding a “brown” stock ( $f$  holds “brown”  $g$ )
  - | Proportion of “green” stocks in the portfolio
  - | Indicator of holding a “green” stock ( $f$  holds “green”  $g$ )
  - | Difference of indicators (“green” minus “brown”), difference of proportions.

# Kids' respiratory diseases and "brown" stock holdings



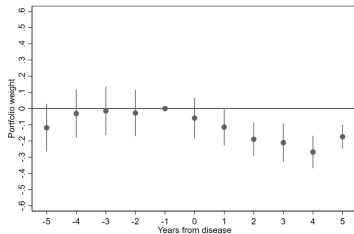
# Kids' respiratory diseases and "brown" stock holdings

## Portfolio weight of "brown" stock

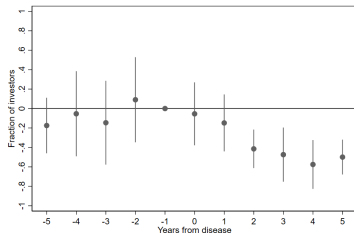


# Kids' respiratory diseases and "brown" stock holdings

## Portfolio weight of "brown" stock

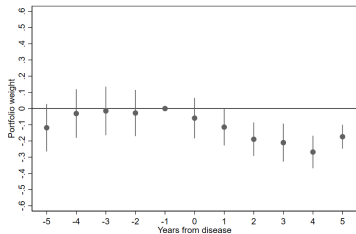


$f$  Holds "brown" stock  $g$



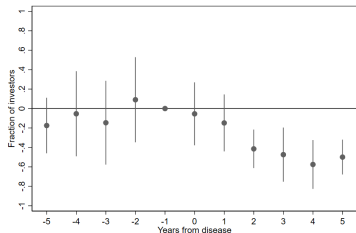
# Kids' respiratory diseases and "brown" stock holdings

## Portfolio weight of "brown" stock



	Portf. weight	$f$ holds "brown" $g$
ATT, p.p.	-0.192*** (0.042)	-0.424*** (0.096)
Num. obs.	758,697	758,697
Num. treated	46,184	46,184

## $f$ Holds "brown" stock $g$

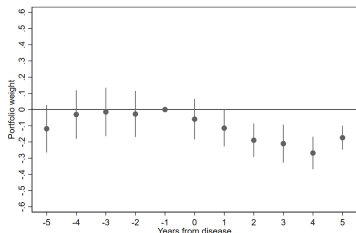


For reference:

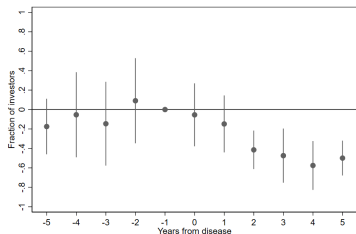
	Average (pre-treatment)
Portf. weight, p.p.	2.2
$f$ holds brown $g$ , p.p.	6.1

# Kids' respiratory diseases and "brown" stock holdings

## Portfolio weight of "brown" stock



## $f$ Holds "brown" stock $g$



	Portf. weight	$f$ holds "brown" $g$
ATT, p.p.	-0.192*** (0.042)	-0.424*** (0.096)
Num. obs.	758,697	758,697
Num. treated	46,184	46,184

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

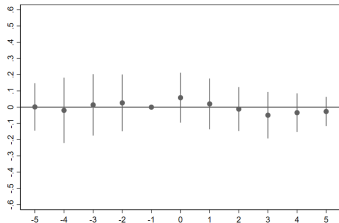
For reference:

	Average (pre-treatment)
Portf. weight, p.p.	2.2
$f$ holds brown $g$ , p.p.	6.1

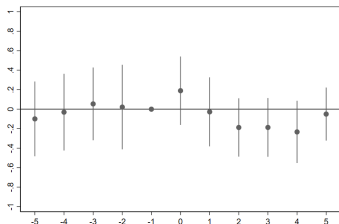
# Placebo tests

## Diseases of digestive organs

Portfolio weight of "brown" stock



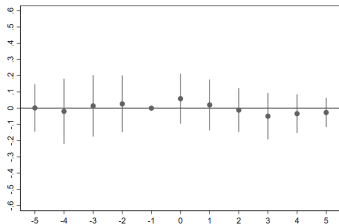
$f$  Holds "brown" stock  $g$



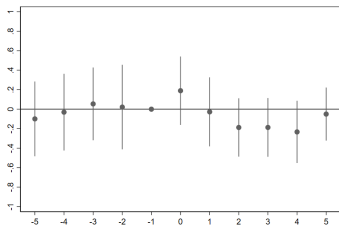
# Placebo tests

## Diseases of digestive organs

Portfolio weight of "brown" stock

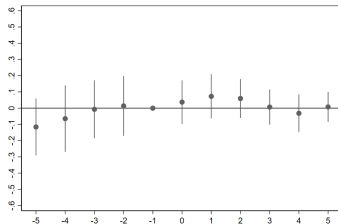


$f$  Holds "brown" stock  $g$

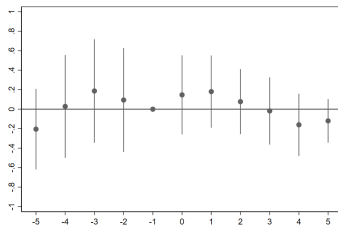


## Bones, muscles, & connect. tissues

Portfolio weight of "brown" stock

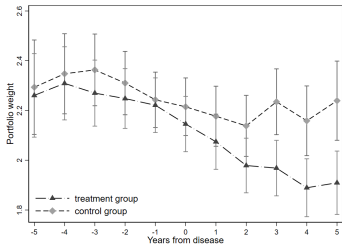


$f$  Holds "brown" stock  $g$

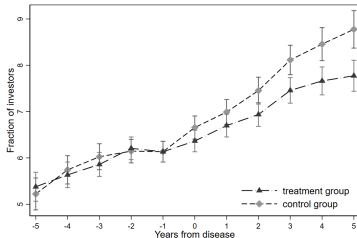


# “Brown” stock holdings: Active divestment?

## Portfolio weight of “brown” stocks

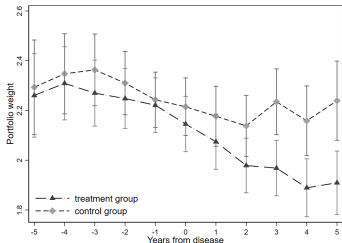


## *f* Holds a “brown” stock *g*



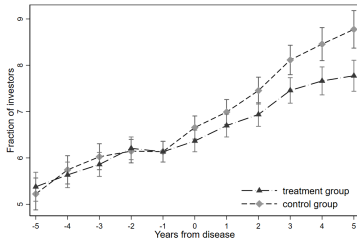
# “Brown” stock holdings: Active divestment?

## Portfolio weight of “brown” stocks



- Investors from the **control** group do not significantly decrease the portfolio weight on “brown” stocks. **Treated** investors decrease their portfolio weights on “brown” stocks.

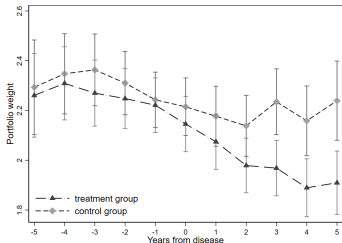
## Who holds a “brown” stock?



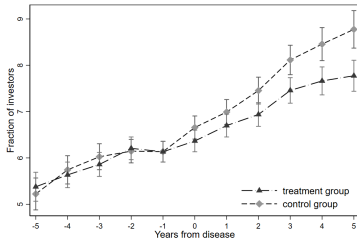


# “Brown” stock holdings: Active divestment?

## Portfolio weight of “brown” stocks



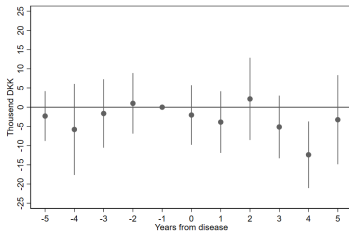
## Holds a “brown” stock<sub>g</sub>



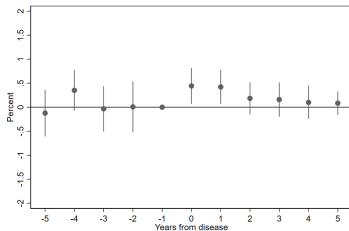
- Investors from the **control** group do not significantly decrease the portfolio weight on “brown” stocks. **Treated** investors decrease their portfolio weights on “brown” stocks.
- Investors from the **control** group increase the probability of holding a “brown” stock over time. Similarly, **treated**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

# Alternative Explanations

## Bank account holdings

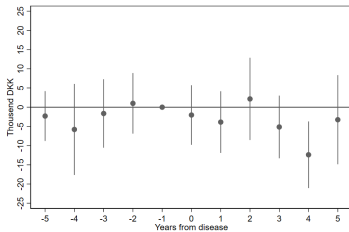


## Risky asset share



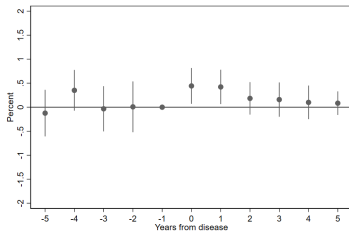
# Alternative Explanations

## Bank account holdings



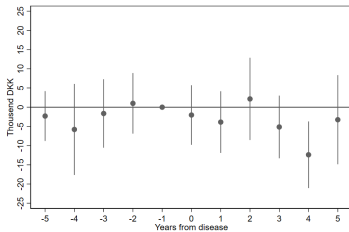
- No economically significant change in deposit amounts after the treatment: No liquidity shortage for **treated** group.

## Risky asset share

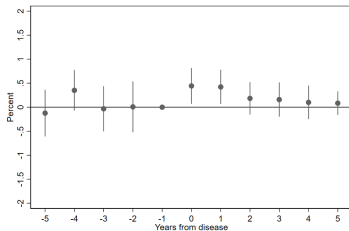


# Alternative Explanations

## Bank account holdings



## Risky asset share

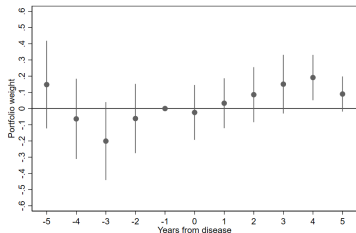


- No economically significant change in deposit amounts after the treatment: No liquidity shortage for **treated** group.
- No decrease in the risky asset share (proportion of stocks and funds in the investor's financial wealth) after the treatment: No divestment for **treated** group.

# Kids' respiratory diseases and “green” stock holdings

# Kids' respiratory diseases and “green” stock holdings

Portfolio weight of “green” stock



$f$  Holds “green” stock  $g$

# Kids' respiratory diseases and "green" stock holdings

Portfolio weight of "green" stock

	Portf. weight	1f holds "green" stock
ATT, p.p.	0.110* (0.061)	0.095 (0.157)
Num. obs.	758,697	758,697
Num. treated	46,184	46,184

1 f Holds "green" stock

For reference:

	Average (pre-treatment)
Portf. weight, p.p.	5.1
1f holds "green" stock, p.p.	13.1

# Kids' respiratory diseases and "green" stock holdings

Portfolio weight of "green" stock

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

1 f Holds "green" stock

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
1f holds "green", p.p.	13.1



# Effect on ESG funds holdings

## Portfolio weight of ESG funds

	Portf. weight	1f holds ESG
ATT, p.p.	0.025 (0.187)	-0.545 (0.377)
Num. obs.	236,126	236,126
Num. treated	20,137	20,137

## 1 f Holds ESG fund

For reference:

	Average (pre-treatment)
Portf. weight, p.p.	0.9
1f holds brown, p.p.	2.9

# Effect on ESG funds holdings

## Portfolio weight of ESG funds

	Portf. weight	1f holds ESG
ATT, p.p.	0.025 (0.187)	-0.545 (0.377)
Num. obs.	236,126	236,126
Num. treated	20,137	20,137

## 1 f Holds ESG fund

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
1f holds ESG fund, p.p.	2.9

# Different health conditions

ATT	Chronic		Num. hosp. visits		Num. diag		Bed days	
	no	yes	1	> 1	1	> 1	1	> 1
Portf. weight di	0.347*** (0.084)	0.119 (0.166)	0.282*** (0.1)	0.345* (0.19)	0.243** (0.12)	0.363*** (0.113)	0.200* (0.102)	0.421*** (0.145)
1f\green"g-1f\brown"g	0.534*** (0.19)	0.308 (0.325)	0.433* (0.224)	0.712** (0.333)	0.310 (0.258)	0.706*** (0.214)	0.356 (0.250)	0.674*** (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

## Different health conditions

ATT	Chronic		Num. hosp. visits		Num. diag		Bed days	
	no	yes	1	> 1	1	> 1	1	> 1
Portf. weight di	0.347*** (0.084)	0.119 (0.166)	0.282*** (0.1)	0.345* (0.19)	0.243** (0.12)	0.363*** (0.113)	0.200* (0.102)	0.421*** (0.145)
1f\green"g-1f\brown"g	0.534*** (0.19)	0.308 (0.325)	0.433* (0.224)	0.712** (0.333)	0.310 (0.258)	0.706*** (0.214)	0.356 (0.250)	0.674*** (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

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

# Investors' characteristics

ATT	Educ. length		Parent		Big city		Parent's age	
	< 15.5 years	> 15.5 years	father	mother	no	yes	36	> 36
Portf. weight di	0.114 (0.109)	0.291** (0.142)	0.395*** (0.089)	0.176 (0.108)	0.290*** (0.098)	0.311** (0.141)	0.227** (0.113)	0.338*** (0.110)
1f \green" g-1f \brown" g	0.111 (0.253)	0.484* (0.276)	0.502** (0.214)	0.565** (0.234)	0.396* (0.204)	0.489 (0.328)	0.573** (0.28)	0.360 (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

# Investors' characteristics

ATT	Educ. length		Parent		Big city		Parent's age	
	< 15.5 years	> 15.5 years	father	mother	no	yes	36	> 36
Portf. weight di	0.114 (0.109)	0.291** (0.142)	0.395*** (0.089)	0.176 (0.108)	0.290*** (0.098)	0.311** (0.141)	0.227** (0.113)	0.338*** (0.110)
1f \green" g-1f \brown" g	0.111 (0.253)	0.484* (0.276)	0.502** (0.214)	0.565** (0.234)	0.396* (0.204)	0.489 (0.328)	0.573** (0.28)	0.360 (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

Little evidence of the effects of individual heterogeneity.

# Family relationships

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

# Family relationships

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

Effects are not reserved for parents.



# Investors' respiratory diseases and "green" investing

Portfolio weight of "brown" stock

Portfolio weight of "green" stock

1 f Holds "brown" stock

1 f 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:
  - | no effect on ESG funds holdings

# 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:
  - | no effect on ESG funds holdings

**We will try to come up with a more optimistic instrument next time!**