Extreme Weather Events and Environmental Attitudes and Behaviour: A Large-Scale Longitudinal Approach in the UK

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Analytical Sociology: Theory and Empirical Applications
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Motivation

Climate change is happening now

> *'Recent climate changes have had widespread impacts on human and natural systems.'* (IPCC, 2014, p.2)

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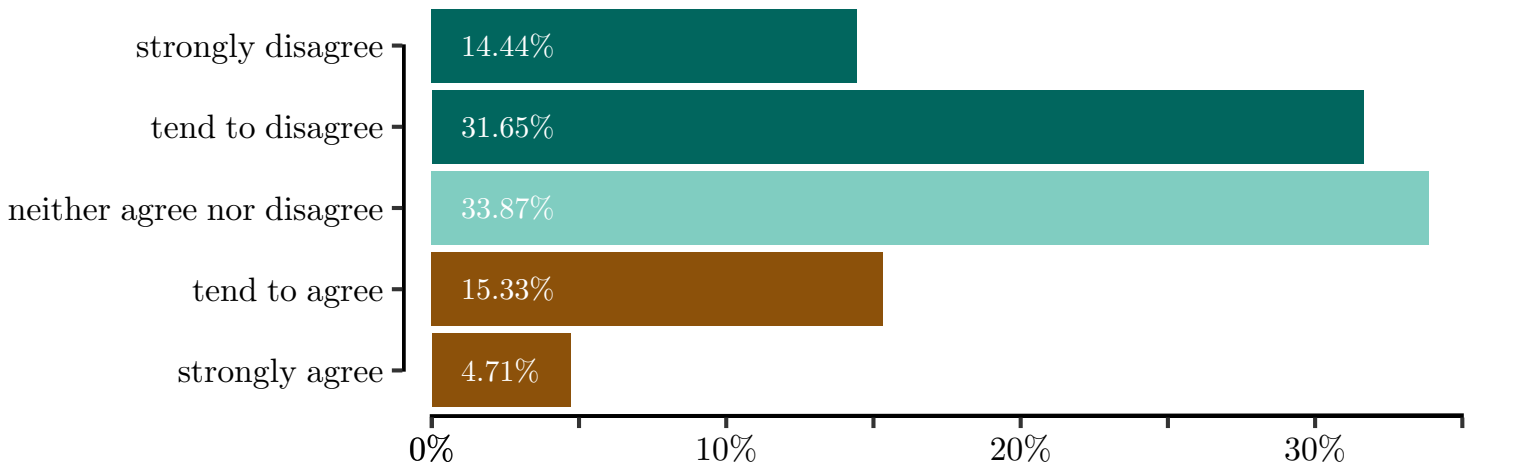
Worry about climate change in UK

The effects of climate change are too far in the future to really worry me



Understanding Society wave 4 (2012-2014), N = 29,520

Research question

Why do people not care about climate change?

- Severe impacts are distant (time & space)
- No first hand experience of climate change

But: extreme weather events will increase, also in Europe (e.g. Roudier et al., 2016)

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- Severe impacts are distant (time & space)
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But: extreme weather events will increase, also in Europe (e.g. Roudier et al., 2016)

Research question

- Does the personal exposure to extreme weather events (floods + heatwaves) increase people's belief in climate change and their pro-environmental behaviour?

Theoretical background

General assumption

- Risk assessment requires cognitive effort and motivation
- Both are a scarce resources

(e.g. Myers et al., 2013; Spence et al., 2012)

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- Risk assessment requires cognitive effort and motivation
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Experiential processing

- Increases mental accessibility of abstract climate change
- Induces stronger emotional feelings
- **Reduces the perceived spatial and temporal distance Higher risk perception**

$\Rightarrow$ New evidence used to update prior beliefs

$\Rightarrow$ Change behaviour

$\Rightarrow$ Stronger effect with spatial & temporal proximity

(e.g. Myers et al., 2013; Spence et al., 2012)

Previous findings

Meta-analyses

Hornsey et al. (2016); van Valkengoed and Steg (2019)

- Positive correlations between
  - past experience and beliefs
  - past experience and pro-environmental behaviour
- Effect size is relatively small
- Strong temporal decay

Previous findings

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Three problems (Howe et al., 2019)

- Small cross-sectional ad-hoc surveys
- Large-scale spatial patterns not random
- Self-selection into neighbourhoods

Two exceptions: Baccini and Leemann (2020); Hazlett and Mildenberger (2020)

This study

Effect of floods

- on climate change beliefs
- on pro-environmental behaviour
- Role of **spatial** proximity

Effect of heatwaves

- on climate change beliefs
- on pro-environmental behaviour
- Role of **temporal** proximity

This study

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Effect of heatwaves

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- on pro-environmental behaviour
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Methodological advances

- Nationally representative individual level data
- Account for large-scale spatial patterns
- Account for selection into 'treatment'

Individual level data

BHPS / UKHLS

- Waves BHPS 18 + UKHLS 1 and UKHLS 4 (2008-2014)
- Up to 85,447 observations and 58,841 individuals
- LSOA regional identifier (around 1,500 inhabitants)

Individual level data

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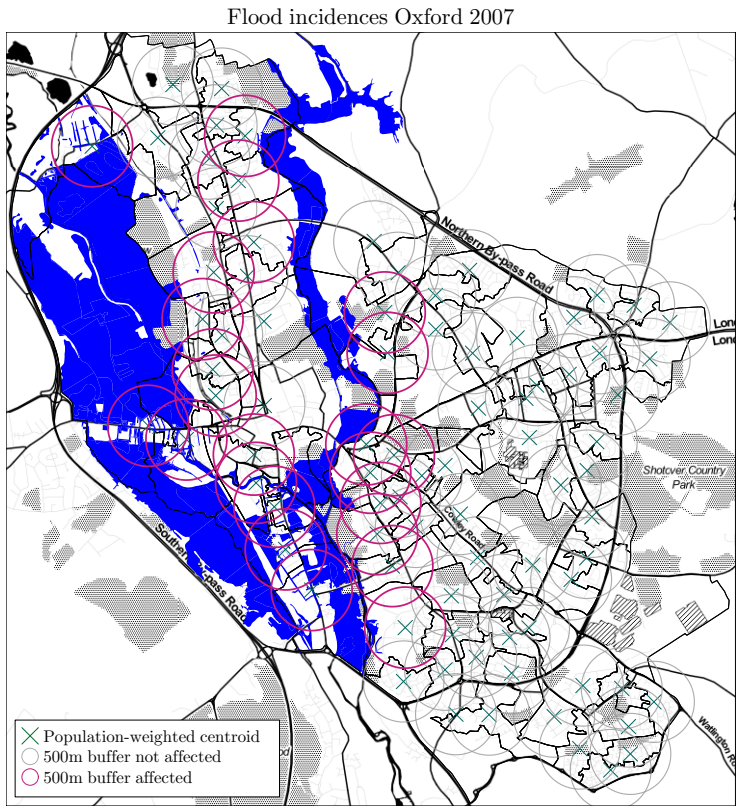
Variables

- Belief in climate change (0 / 1)
  'People in the UK will be affected by climate change in the next 30 years'
- Pro-environmental behaviour (1 - 5)
  7 items, e.g. TV on standby, switch off light, turning heating up, using own bags for shopping, do not buy because of packaging
- Controls: age (5 year intervals), sex, UK-born, ethnic group, highest education, child(ren) in the household, marital status, household income, household income squared, and political party preference

Flood indicator

Environment Agency's Recorded Flood Outlines

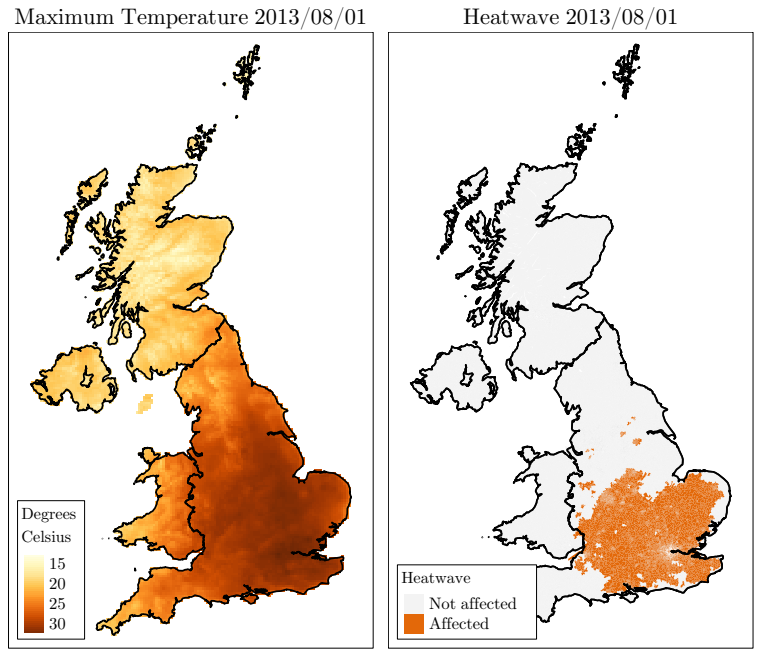
- England only
- Buffer around population weighted centroid of LSOA
- Rule: ≥ 1 hectare flooded ($10{,}000\text{m}^2$)
- Temporal cut-off: within past 2 years
- **Spatial distance**: 5km, 2km, 500m
- Merging done with all waves



Heatwave indicator

HadUK-Grid Weather data (5×5km grid)

- Entire UK
- Daily maximum temperature in LSOA
- Rule: at least 3 consecutive days $\geq 29°C$
- **Temporal distance**: 4 months, 1 month, 14 days
- Merging done with all waves



Analytical Strategy

Pooled OLS

$$y_{it} = \alpha + \tau_{it}\beta + \boldsymbol{x}_{it}\boldsymbol{\theta} + \eta_m + \eta_y + \epsilon_{it}, \quad (1)$$

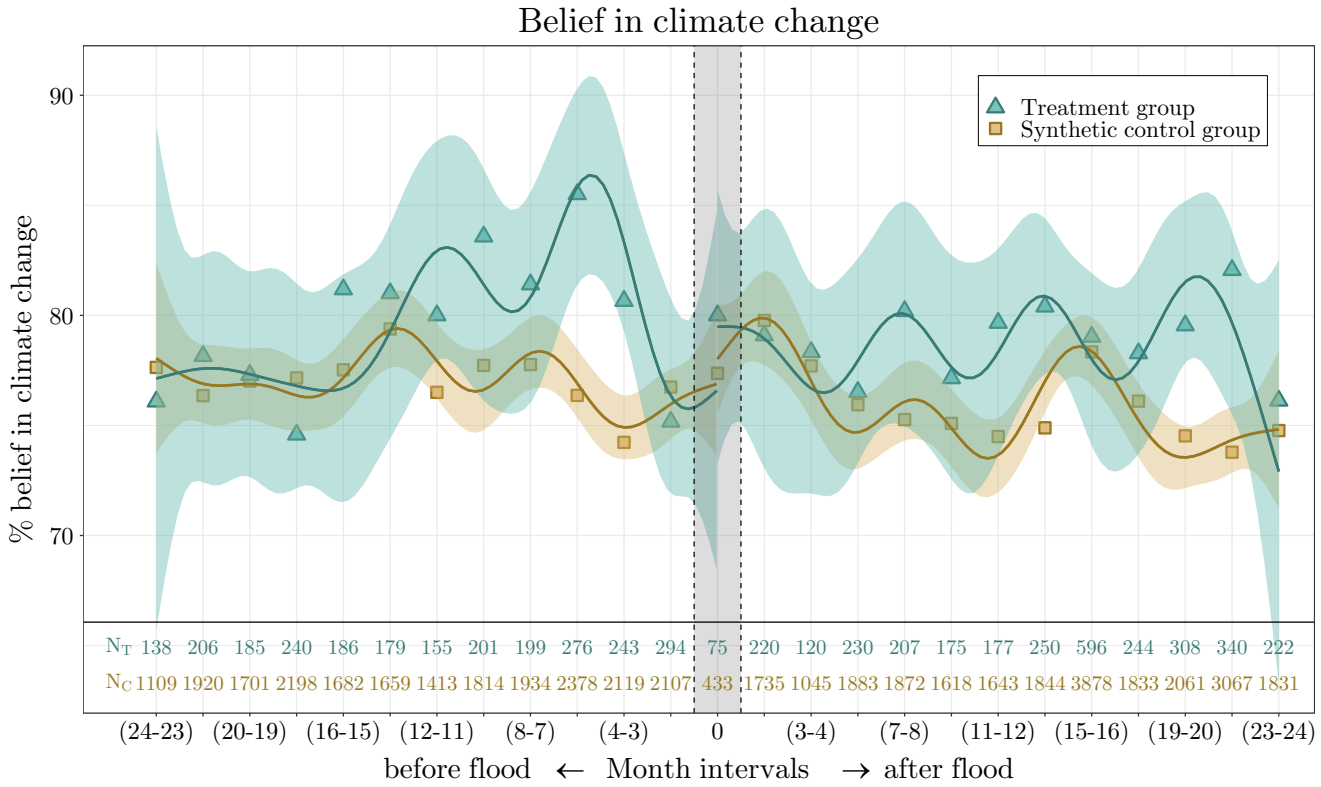
Within-person (FE)

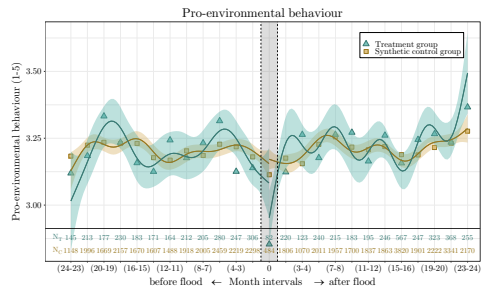
$$y_{it} = \tau_{it}\beta + \boldsymbol{z}_{it}\boldsymbol{\theta} + \alpha_i + (\eta_m + \eta_y) * \delta_i + \epsilon_{it}, \quad (2)$$

- τ_{it}: experience of extreme weather event (0/1)
- η_m and η_y: Month and year dummies
- δ_i: ever 'treated' (based on all waves)

Descriptives

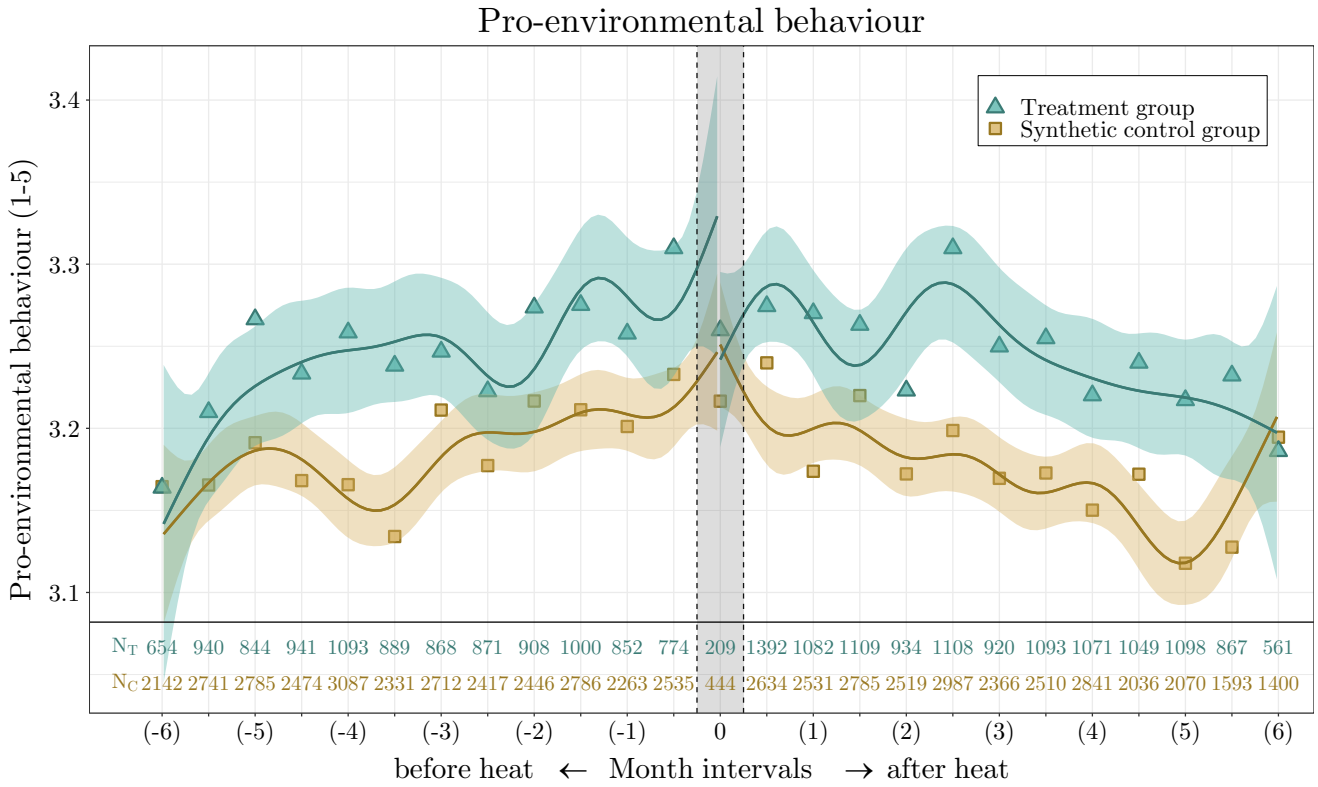
Floods and climate change belief

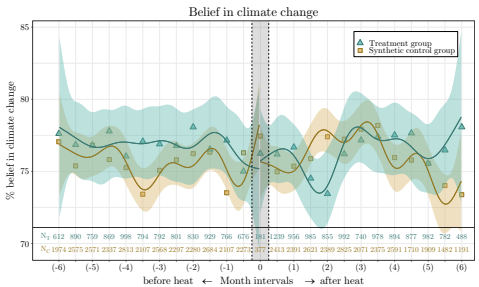




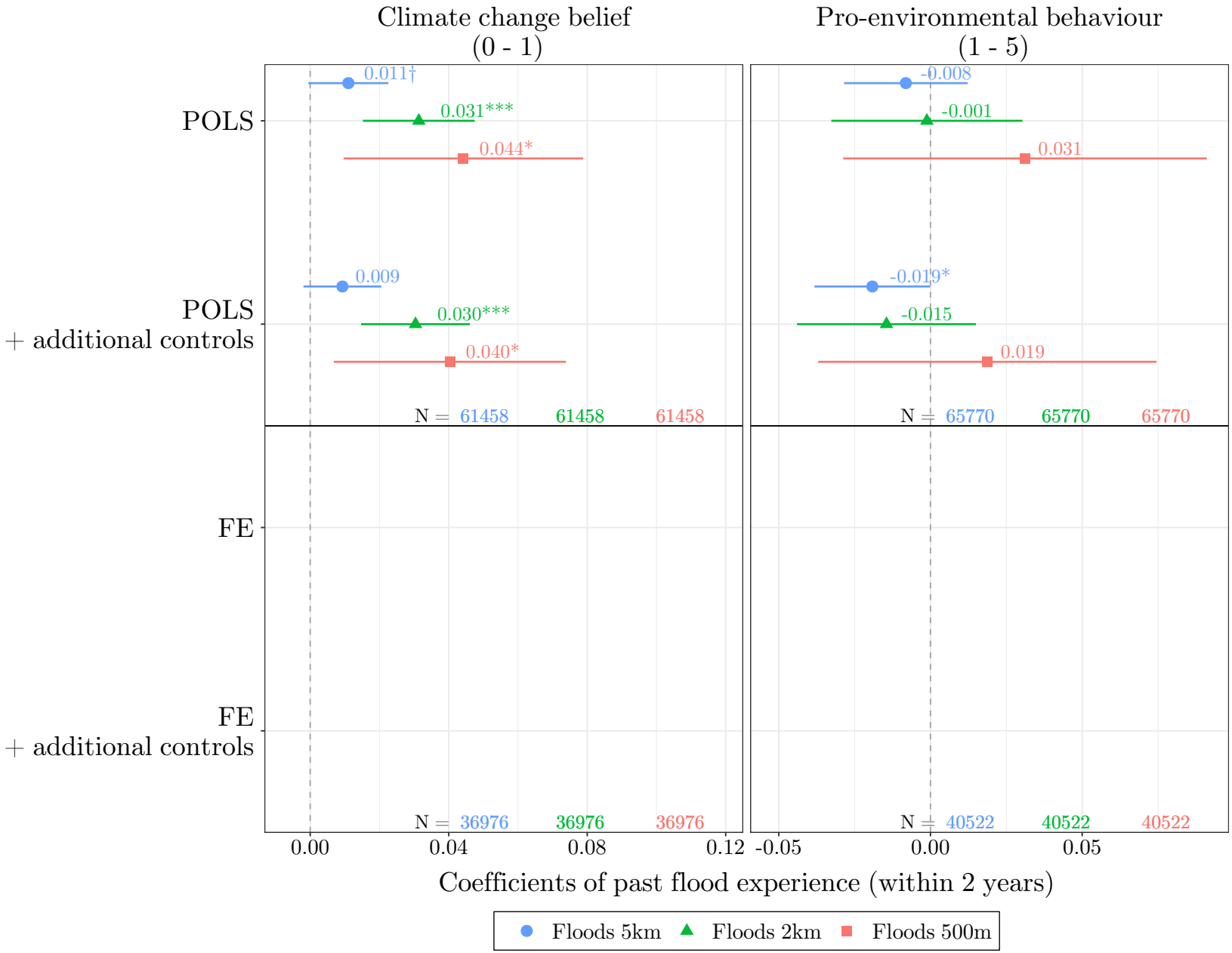
Descriptives

Heatwaves and pro-environmental behaviour





Floods


Climate change belief
(0 - 1)
Pro-environmental behaviour
(1 - 5)
POLS
POLS
+ additional controls
FE
FE
+ additional controls
0.011†
0.031***
0.044*
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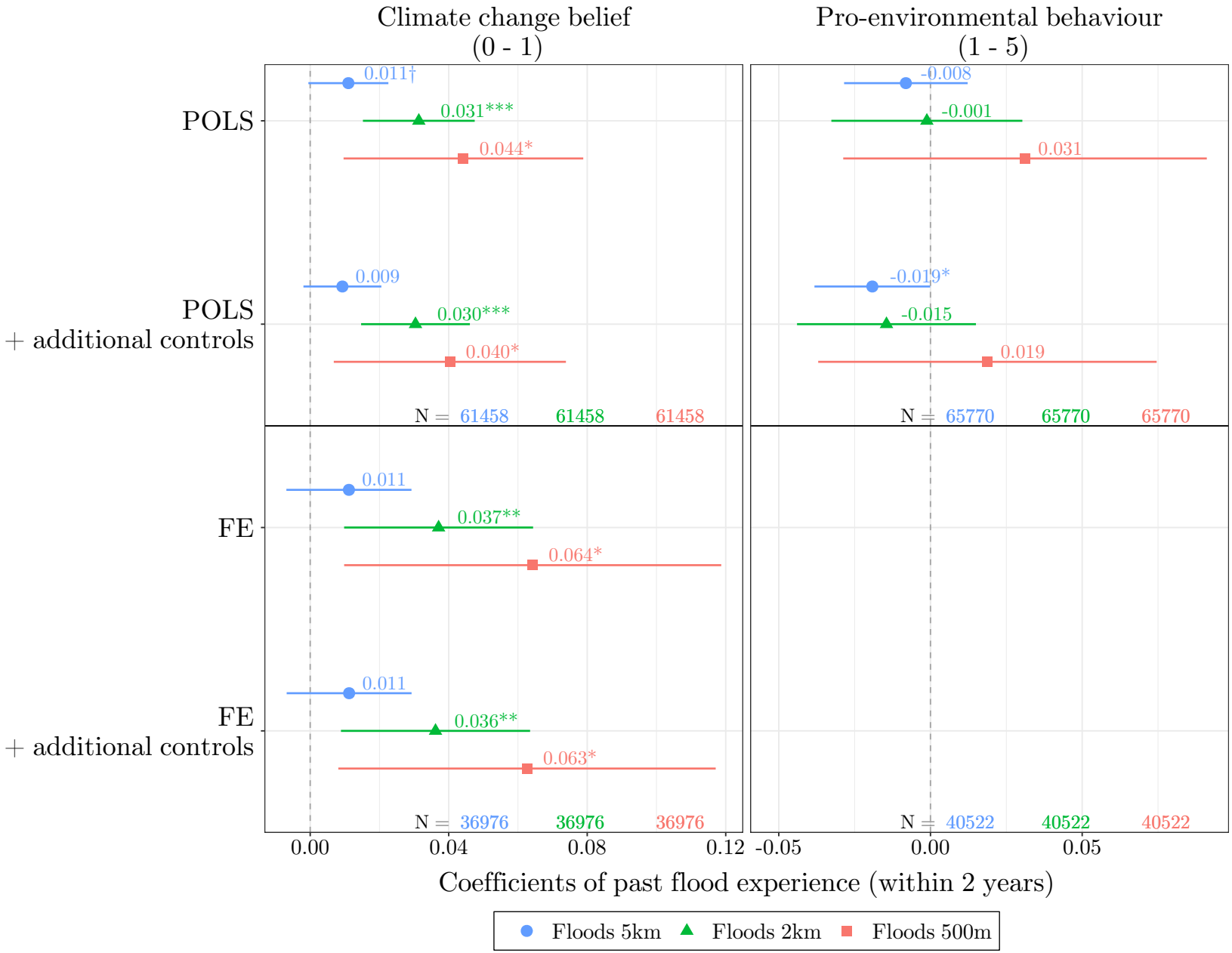
Coefficients of past flood experience (within 2 years)
Floods 5km
Floods 2km
Floods 500m

Floods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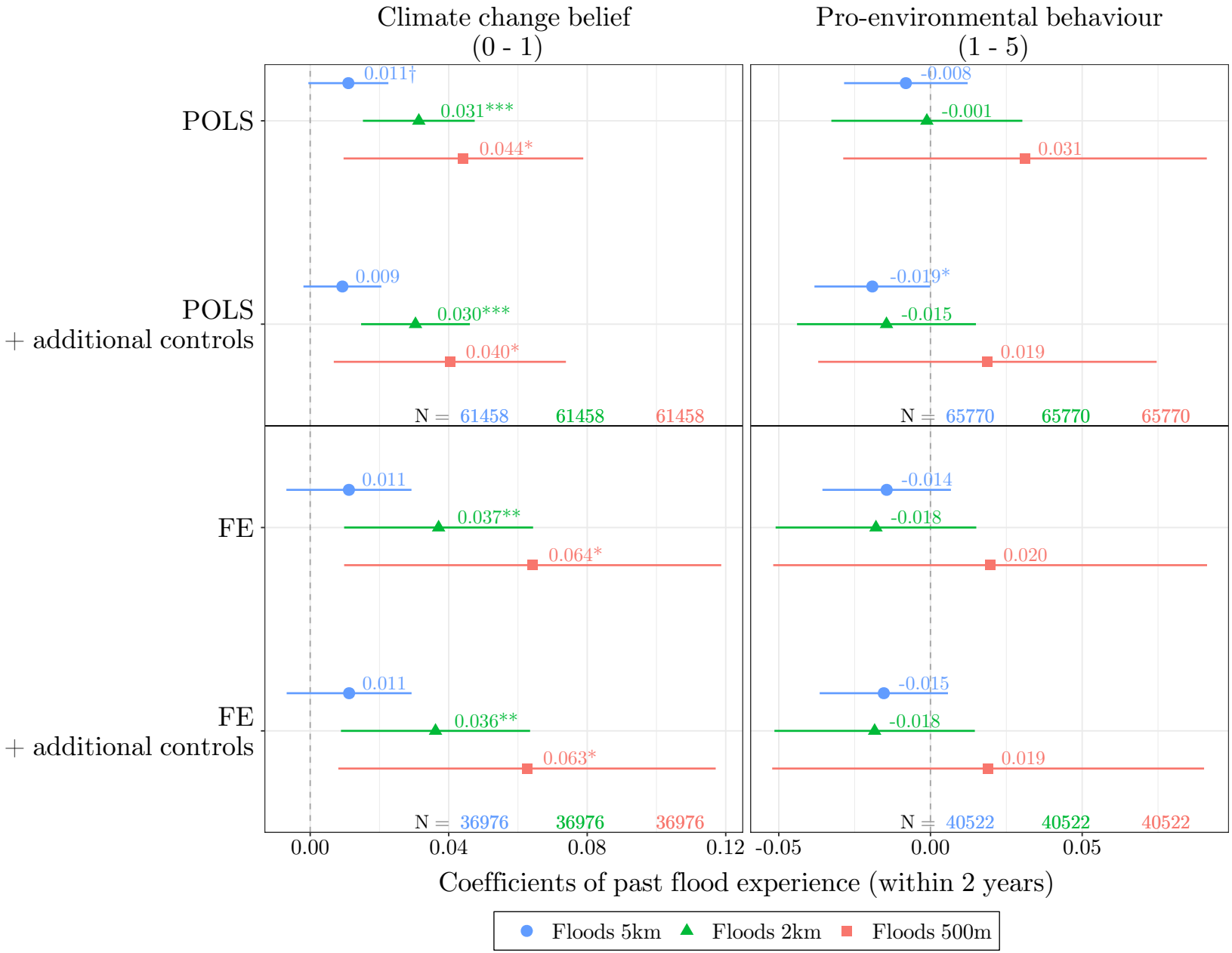
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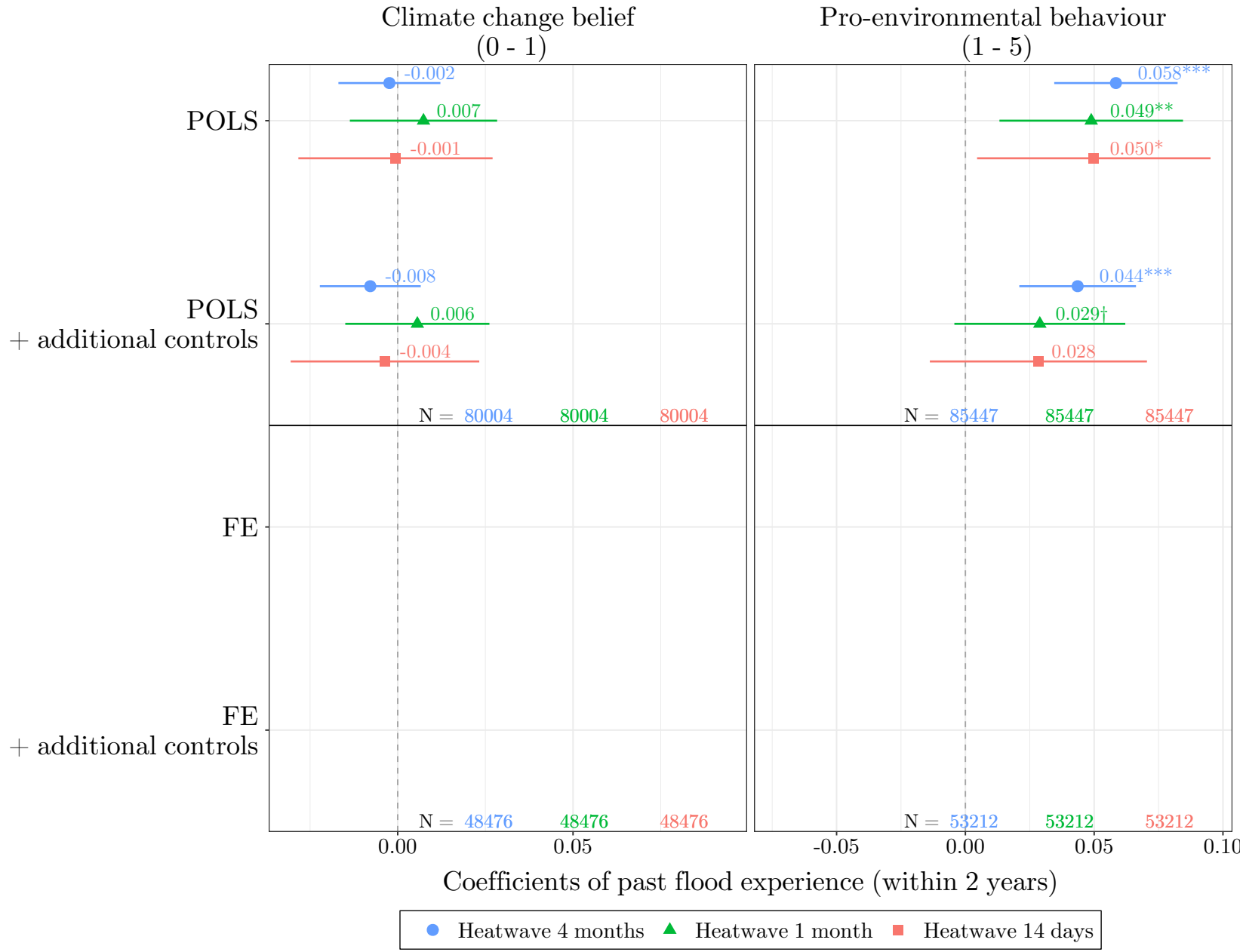
Heatwaves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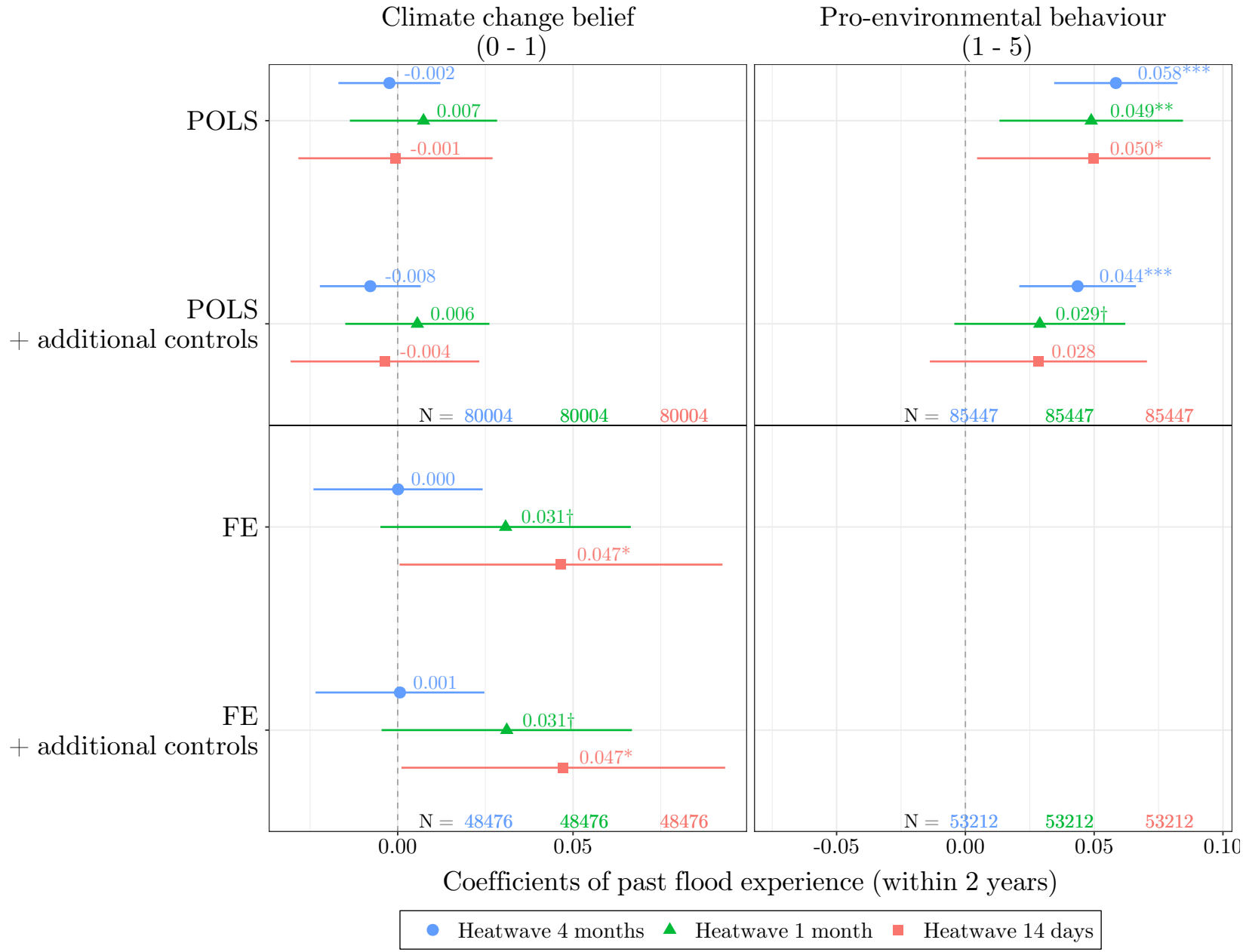
Heatwave 4 months
Heatwave 1 month
Heatwave 14 days

Heatwaves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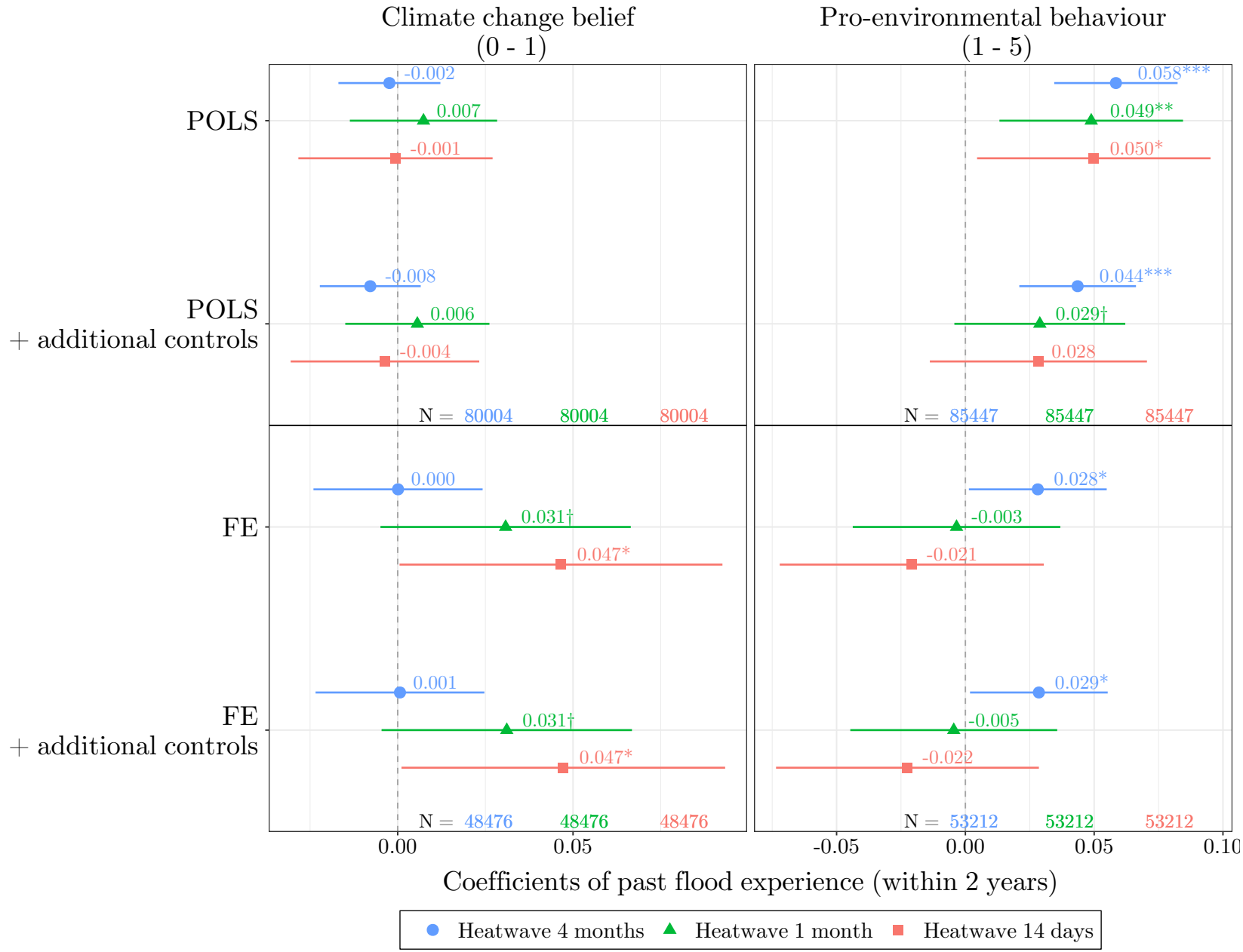
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Conclusions

Exposure to extreme weather events

- Increases belief in climate change
- Effect increases with spatial and temporal proximity
- Substantial effect size: 8.1% (for floods 500m)
- But: low incidence rate of 0.9%

$\Rightarrow$ Overall sample mean effect: + 0.1%-points

$\Rightarrow$ **Strong spatial and temporal decay**

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$\Rightarrow$ Overall sample mean effect: + 0.1%-points

$\Rightarrow$ **Strong spatial and temporal decay**

Exposure to extreme weather events

- Does **not** chance environmental behaviour
- Effect sizes are negligible
- Independent of proximity

Thank you very much!

Baccini, L. and Leemann, L. (2020), Do natural disasters help the environment? How voters respond and what that means, *Political Science Research and Methods*, 60:1–17.

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Spence, A., Poortinga, W., and Pidgeon, N. (2012), The psychological distance of climate change, *Risk Analysis*, 32(6):957–972.

van Valkengoed, A. M. and Steg, L. (2019), Meta-analyses of factors motivating climate change adaptation behaviour, *Nature Climate Change*, 9(2):158–163.

Working paper available and happy to share!

Theoretical background

Some doubts about experiential learning

- Motivated reasoning
- Attribution of past events to abstract climate change

(e.g. Brügger et al., 2015; Druckman and McGrath, 2019)

Theoretical background

Some doubts about experiential learning

- Motivated reasoning
- Attribution of past events to abstract climate change

and about proximity

- Aversive arousal / feeling of resignation
- Proximate threats activate immediate needs / values
- Proximate threats induce defensive behaviours

(e.g. Brügger et al., 2015; Druckman and McGrath, 2019)

Sample 1

Table: Estimation sample 1, summary statistics

Statistic	N	Mean	St. Dev.	Min	Max
Climate change belief	61,458	0.761	0.426	0	1
Flood affected (500m)	61,458	0.009	0.097	0	1
Flood affected (2km)	61,458	0.046	0.210	0	1
Flood affected (5km)	61,458	0.112	0.315	0	1
Age	61,458	46.204	17.918	16	100
Sex (female)	61,458	0.547	0.498	0	1
Migration background	61,458	0.147	0.354	0	1
Child(ren) in household	61,458	0.342	0.474	0	1
Household income (in thousand)	61,458	3.633	3.331	0.000	86.703
Ethnic background					
Any White	61,458	0.836	0.371	0	1
Mixed	61,458	0.019	0.138	0	1
Asian	61,458	0.093	0.290	0	1
Black	61,458	0.045	0.206	0	1
Other	61,458	0.008	0.089	0	1
Highest education					
GCSE etc	61,458	0.218	0.413	0	1
Degree	61,458	0.238	0.426	0	1
Other higher degree	61,458	0.114	0.317	0	1
A-level etc	61,458	0.204	0.403	0	1

Sample 2

Table: Estimation sample 2, summary statistics

Statistic	N	Mean	St. Dev.	Min	Max
Pro-environmental behaviour	65,770	3.217	0.680	1.000	5.000
Flood affected (500m)	65,770	0.009	0.095	0	1
Flood affected (2km)	65,770	0.045	0.207	0	1
Flood affected (5km)	65,770	0.113	0.316	0	1
Age	65,770	46.695	17.710	16	100
Sex (female)	65,770	0.565	0.496	0	1
Migration background	65,770	0.172	0.377	0	1
Child(ren) in household	65,770	0.349	0.477	0	1
Household income (in thousand)	65,770	3.551	3.273	0.000	86.703
Ethnic background					
Any White	65,770	0.808	0.394	0	1
Mixed	65,770	0.019	0.138	0	1
Asian	65,770	0.109	0.312	0	1
Black	65,770	0.054	0.226	0	1
Other	65,770	0.010	0.097	0	1
Highest education					
GCSE etc	65,770	0.214	0.410	0	1
Degree	65,770	0.234	0.423	0	1
Other higher degree	65,770	0.112	0.315	0	1
A-level etc	65,770	0.195	0.396	0	1

Sample 3

Table: Estimation sample 3, summary statistics

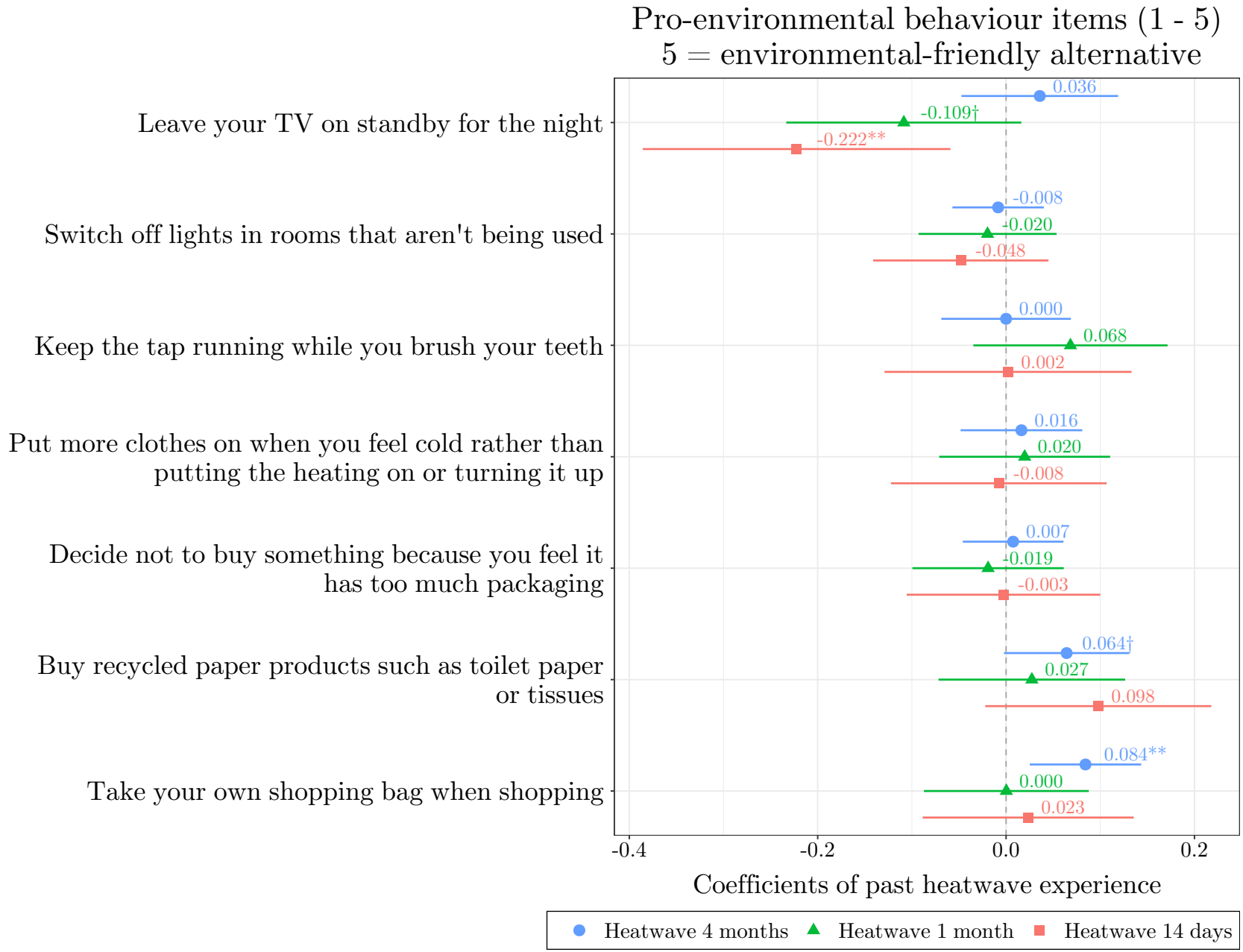
Statistic	N	Mean	St. Dev.	Min	Max
Climate change belief	80,004	0.766	0.423	0	1
Heatwave affected (14 days)	80,004	0.016	0.125	0	1
Heatwave affected (1 month)	80,004	0.028	0.165	0	1
Heatwave affected (4 months)	80,004	0.069	0.254	0	1
Age	80,004	46.660	17.967	16	100
Sex (female)	80,004	0.551	0.497	0	1
Migration background	80,004	0.124	0.330	0	1
Child(ren) in household	80,004	0.338	0.473	0	1
Household income (in thousand)	80,004	3.553	3.253	0.000	92.486
Ethnic background					
Any White	80,004	0.869	0.338	0	1
Mixed	80,004	0.016	0.125	0	1
Asian	80,004	0.074	0.262	0	1
Black	80,004	0.035	0.183	0	1
Other	80,004	0.007	0.082	0	1
Highest education					
GCSE etc	80,004	0.216	0.412	0	1
Degree	80,004	0.227	0.419	0	1
Other higher degree	80,004	0.115	0.319	0	1
A-level etc	80,004	0.207	0.405	0	1

Sample 4

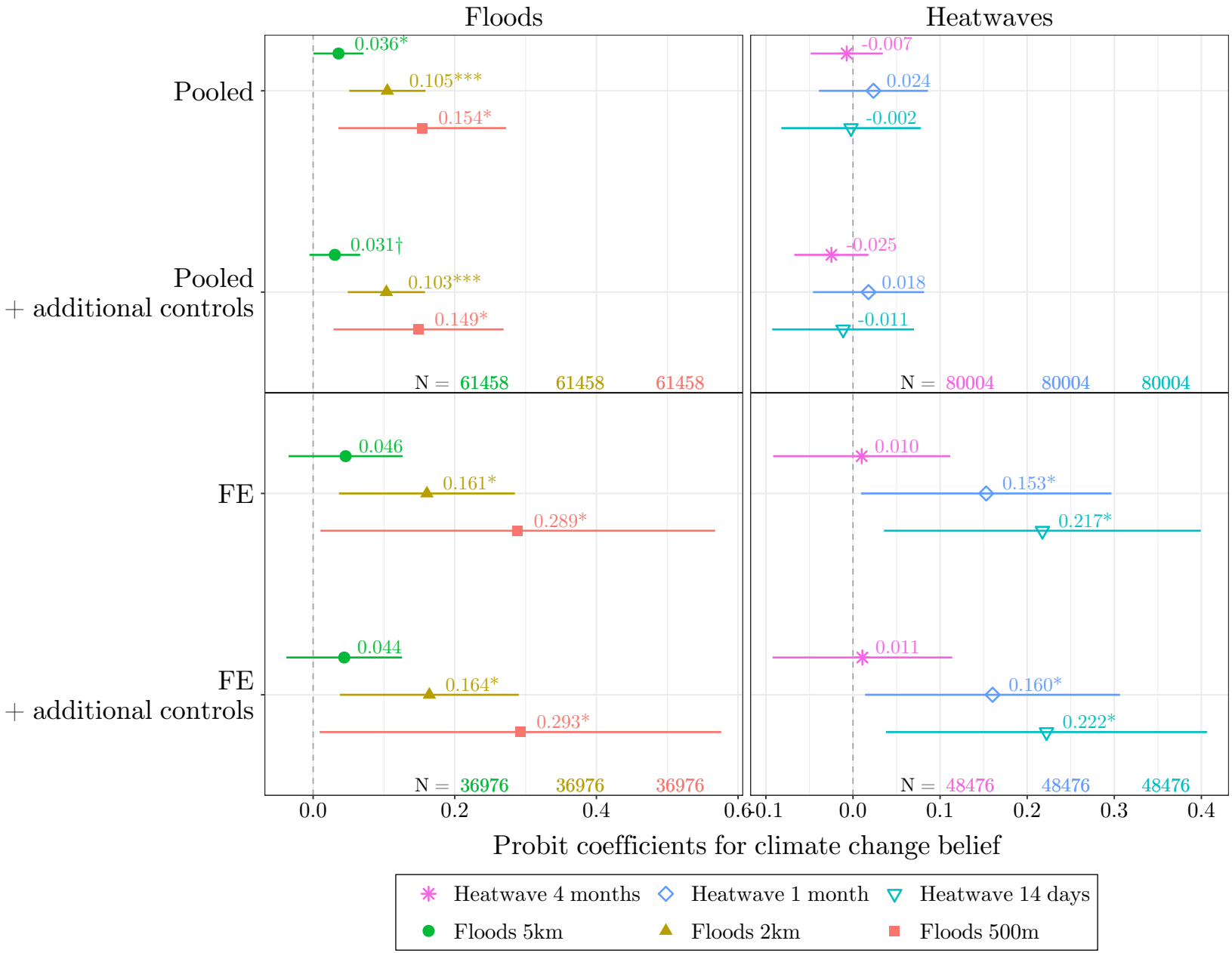
Table: Estimation sample 4, summary statistics

Statistic	N	Mean	St. Dev.	Min	Max
Pro-environmental behaviour	85,447	3.201	0.679	1.000	5.000
Heatwave affected (14 days)	85,447	0.017	0.129	0	1
Heatwave affected (1 month)	85,447	0.029	0.169	0	1
Heatwave affected (4 months)	85,447	0.073	0.261	0	1
Age	85,447	47.227	17.765	16	100
Sex (female)	85,447	0.569	0.495	0	1
Migration background	85,447	0.144	0.351	0	1
Child(ren) in household	85,447	0.343	0.475	0	1
Household income (in thousand)	85,447	3.477	3.192	0.000	92.486
Ethnic background					
Any White	85,447	0.847	0.360	0	1
Mixed	85,447	0.016	0.125	0	1
Asian	85,447	0.087	0.281	0	1
Black	85,447	0.042	0.201	0	1
Other	85,447	0.008	0.089	0	1
Highest education					
GCSE etc	85,447	0.211	0.408	0	1
Degree	85,447	0.222	0.416	0	1
Other higher degree	85,447	0.114	0.317	0	1
A-level etc	85,447	0.198	0.399	0	1

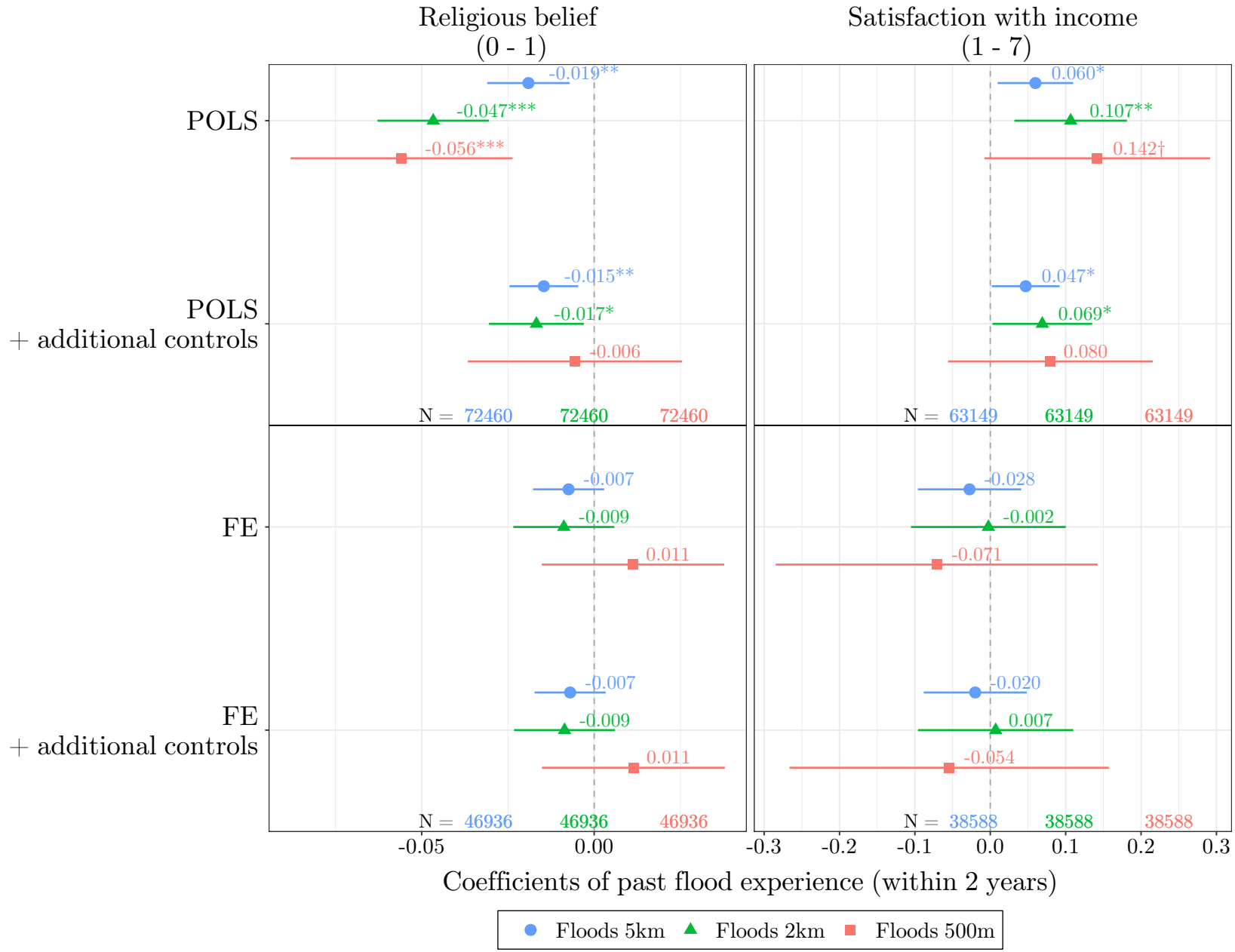
Pro-environmental behaviour items



Climate change belief: probit models



Placebo tests: floods



Placebo test: heatwaves