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Do protests influence environmental attitudes? Evidence from Extinction Rebellion

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Abstract

Protests are frequently used to raise public awareness of environmental challenges and increase support for pro-environmental behavior and policy. In this paper we examine the influence of protests on environmental attitudes, focusing on Extinction Rebellion's April 2019 campaign of civil disobedience in the UK. Using individual-level survey data collected around the time of the protest, we exploit its exogeneity to the timing of survey response, to compare attitudes towards sustainable lifestyles, perceptions of own environmental impact, support for pro-environmental policy and behavior, and views about the severity and imminence of environmental crises, before and after the protest. There is evidence that the protest is related to lower probability of opposing pro-environmental behavior and policy, and lower willingness to pay a premium for environmentally friendly consumption. We do not find evidence that the protest alienated the public from sustainable lifestyles, influenced perceptions of personal environmental impact, or views about the imminence and severity of environmental crises. Results suggest the need for systematic study of the impact of environmental protests on the general public's environmental attitudes and behaviors.

1. Introduction

Protest has long tradition in local, national and international environmental movements (Lester and Hutchins 2009, Dalton 2015). With activities ranging from rallies, boycotts and civil disobedience (Kyllönen 2014, Burton 2004, Bugden 2020), to social media activism (Uldam 2013, Scherman *et al* 2015), environmentalists have mobilized to protest against air pollution (Kyllönen 2014), fracking and mining (Lloveras *et al* 2021, Urkidi 2010), new infrastructure development (Schaffer Boudet 2011, He *et al* 2016, Rootes and Leonard 2009, Scherhauer *et al* 2021, Botetzagias and Karamichas 2009), and climate change (Thackeray *et al* 2020, Wahlström *et al* 2013, Bugden 2020, Martiskainen *et al* 2020), among others. Environmental interest groups expect protests will motivate decision makers to adopt greener policies, increase the issue salience of environmental challenges and affect consumer attitudes and behaviors (Thackeray *et al* 2020, Lenox and Eesley 2009, Fisher 2019, Giacomini and Turner 2015). Protests tend to coincide with periods of increased environmental concern (Urkidi 2010, He *et al* 2016, Schaffer Boudet 2011, Botetzagias and Karamichas 2009), but despite their extensive use systematic evidence of their effectiveness in influencing the general public's environmental attitudes and perceptions is scarce.

Here we empirically examine the relationship between environmental protests and views on personal environmental impact, perceptions on the imminence and severity of environmental crises, and attitudes towards pro-environmental behavior and policy. We focus on the immediate influence of a large and lengthy protest organized in 2019 by Extinction Rebellion (XR) in the UK. XR is a UK-founded environmental movement currently represented in 80 countries, employing protest and nonviolent mass civil disobedience to raise awareness of contemporary environmental challenges and compel governments into action in support of biodiversity conservation and climate change mitigation (Gunningham 2019, 2020, Melia 2021, Gardner *et al* 2022,

GINANJAR and MUBARROK 2020). XR first appeared in October 2018 declaring ‘open rebellion’ against the UK government (BBC News 2018). Their first major campaign of mass civil disobedience took place between 15 and 25 April 2019, when XR occupied five sites across central London (Yamin 2019). Activities and blockades were attended by thousands of supporters causing significant disruption leading to around 1,130 arrests. The protest’s environmental motivation, scale, and methods received extensive coverage in UK (Taylor and Gayle 2019, Warrell and Pickard 2019, Daily Mail 2019, BBC News 2019) and international media (Le Monde 2019, Jenkins 2019, Barclay 2019). After the protest, the UK government and many of the country’s local authorities declared a ‘climate emergency’ to highlight the threat of climate change (Taylor 2020). Using individual-level survey data collected while the April 2019 XR campaign of civil disobedience was ongoing, we exploit the exogeneity of the protest to the timing of survey response, to estimate its immediate influence on attitudes, comparing between individuals responding before and after the 11-day event. This paper contributes to the literature on the relationship between protest and pro-environmental attitudes by assessing the influence of a large environmental protest and pointing to the need for closer investigation of activism’s influence on the general public’s attitudes and behavior.

While an extensive literature examines the individual and aggregate determinants of activism (Wallis and Loy 2021, Schulte *et al* 2020, Kutlaca *et al* 2020, Drury and Reicher 2000, Dono *et al* 2010, Schmitt *et al* 2019, Mohai 1992, Matejova and Merkley 2021, Dalton 2015, Klomp and de Haan 2013, Weaver 2008, McFarlane and Hunt 2006), few studies have explored the impact of protest on the general public’s attitudes and behaviors. Wallace *et al* (2014) and Branton *et al* (2015) find that the influence of the 2006 US immigration reform protests on Latinos’ political attitudes, perceptions of government efficacy and attitudes towards immigration, vary with sociodemographic background, proximity to the protests and protest magnitude. Rucht (1999) shows that the strength of the environmental movement is correlated with environmental attitudes in European countries, while Giugni (2007) in a time series analysis finds little evidence that average environmental attitudes in the US were affected by environmentally-themed protests. Closer to our study, Swim *et al* (2019) compare attitudes immediately before and after the 2019 March for Science, finding some evidence that marches can encourage participation in social movements. A small empirical literature explores the impact of private political actions including protests and boycotts on firm behavior and performance (Baron 2001). Environmentally-motivated boycotts can encourage S&P 500 firms to adopt environmental production standards, but firms may delay action until they receive signals of impending protest (Gupta and Innes 2014), while the likelihood that polluting firms will abide by activists’ demands decreases with the size of their cash reserves and magnitude of their environmental footprint (Lenox and Eesley 2009). Evidence on the impact of protest on policy and environmental outcomes is mixed. Muñoz *et al* (2018) find a negative relationship between the frequency of pro-environmental protest and US states emissions, and Grant and Vasi (2017) show that local environmental NGOs are related to lower CO₂ emissions in the US. On the other hand there is no evidence to support that protests increase the likelihood of approving environmental legislation (Olzak and Soule 2009). To our knowledge the present paper is the first to empirically examine the relationship between a large scale environmental protest and individual-level environmental attitudes in the short term.

2. Data and methods

We used data from wave 10 of the Understanding Society UK Household Longitudinal Study (UKHLS) led by the Institute for Social and Economic Research at the University of Essex, containing information from over 30,000 respondents¹ (University of Essex 2021). Wave 10 of the UKHLS contains a series of questions that can be used to approximate attitudes towards the environment and environmental policy. The survey collects information on the appeal of sustainable lifestyles asking respondents’ level of agreement with: (1) ‘Being green is an alternative lifestyle, it’s not for the majority’. To assess respondents’ perceptions of their personal environmental impact, the UKHLS asks their level of agreement with: (2) ‘My behaviour and everyday lifestyle contribute to climate change’, and (3) ‘Which of these would you say best describes your current lifestyle? a. Do nothing environmentally friendly, b. One or two things, c. Few things, d. Mostly environmentally friendly, e. Everything environmentally friendly’. To capture respondents’ attitudes towards pro-environmental behavior and policy the survey asks whether they agree or disagree with: (4) ‘It’s not worth me doing things to help the environment if others don’t do the same’, (5) ‘I would be prepared to pay more for environmentally-friendly products’, and (6) ‘It’s not worth the UK trying to combat climate change, because other countries will just cancel out what we do’. Finally, the survey collects information on respondents’ perceptions on the severity and imminence of environmental crises asking their agreement or disagreement with: (7) ‘The so-called ‘environmental crisis’ facing humanity has been greatly exaggerated’, (8) ‘If things continue on their current course, we will soon experience a major environmental disaster’, and (9) ‘The effects of climate change are too far

¹ Information on data collection protocols and ethics approvals can be found at <https://www.understandingsociety.ac.uk/>.

in the future to really worry me'. Available responses are on a 4-point scale ('Agree Strongly, Agree, Disagree and Disagree Strongly') for the first statement, and on a 5-point scale ('Agree Strongly, Tend to Agree, Neither Agree or Disagree, Disagree and Disagree Strongly') for the remaining statements. We use the responses to these questions to construct a set of binary variables indicating subjects who 'Tend to Agree', 'Agree' or 'Strongly Agree' with each statement. From statement (3) we construct a binary variable indicating those that respond 'Mostly' or 'Everything environmentally friendly'. These variables serve as the outcomes of interest in our analysis.

XR's April 2019 campaign of civil disobedience occurred while data collection for the UKHLS was ongoing. As the UKHLS reports the exact response date for each participant, we can assess the immediate relationship between the protest and environmental attitudes employing an event study approach that compares attitudes between individuals responding before and after the 11-day protest. Our approach requires that the timing of UKHLS survey response is orthogonal to the timing of the XR protests. As it is implausible that respondents would systematically arrange their survey participation around the protest we expect this to hold. To minimize the possibility the estimated influence of the protest is confounded by other events, the baseline analysis restricts the sample to individuals responding in the 30 days before the start, and the 30 days after the end of the campaign. To gain some insight on the visibility of the XR's protest to the general public, we examined Google search intensity for the term 'Extinction Rebellion' between 15 March and 15 May 2019. Appendix A discusses the possibility that other events such as the Earth Day might affect our results. We estimated the following equation:

$$P(Y_i = 1) = \alpha + \gamma_s + \beta_1 XR_i + \beta_2 C_i + I_t + \epsilon_i \quad (1)$$

where Y_i is an attitudinal indicator for individual i , and XR_i is binary indicating individuals responding to the UKHLS after the protest. Matrix C_i contains controls for individual-level characteristics that may influence pro-environmental attitudes, including indicators for age in 10 year bands, indicators for income quintiles, a female indicator, an in-employment indicator, an urban status indicator, a higher educational attainment indicator, and indicators for recent experience with volunteering and for the presence of children in the household (Poortinga *et al* 2019, Dono *et al* 2010, Hunter *et al* 2004). γ_s is a set of region-of-residence indicators capturing region-specific determinants of environmental attitudes including local environmental conditions, climate, and aggregate economic and social conditions. I_t includes day-of-week and month indicators to capture within-week cyclicity and seasonality in pro-environmental attitudes. Finally ϵ_i is an error term. To simplify interpretation of results from models containing interaction terms (Greene 2010), we report estimates from linear probability models. In all cases we also show identical average marginal effects from probit regressions in the appendix. The coefficient of interest β_1 captures the influence of responding in the UKHLS during the 30 days after the end of the XR campaign on individual attitudes. We report standard errors clustered at the survey response date level (Cameron and Miller 2015). As we estimate the effect of the protest on more than one outcomes, we also report p-values adjusted for multiple hypothesis testing (Simes 1986).

The majority of the XR's April 2019 campaign of civil disobedience activities were focused in London. The uneven distribution of the potential disruption accompanying the protest raises the possibility that its influence varies with the respondents' region of residence. At the same time, individual response to the protest may vary with the subjects' opportunity cost of time and with their attitudes towards social activism. To assess whether the influence of the XR protest varies with respondents' proximity to the protest, opportunity cost of time and history of social activism we estimated:

$$P(Y_i = 1) = \alpha + \gamma_s + \beta_1 XR_i + \beta_2 XR_i \times Z_i + \beta_4 C_i + I_t + \epsilon_i \quad (2)$$

where Y_i is the outcome of interest, XR_i is the treatment indicator, and C_i and I_t are the set of controls as described earlier. We estimate equation (2) when Z_i is (i) a binary variable indicating residents of the Greater London area, (ii) the in-employment indicator and (iii) the volunteering indicator. In each case coefficient β_2 captures the difference in the influence of the XR campaign, (i) between individuals residing in and out of Greater London, (ii) between individuals in and out of employment, and (iii) between individuals that have and have not volunteered time to social causes in the last 12 months.

To test the estimates' sensitivity to the choice of the sample we repeated the analysis expanding and contracting the time window around the XR protest to 60 and 15 days on either side of the protest. To further assess the results' validity we performed a placebo test, replicating the baseline analysis to test for the influence of a hypothetical protest occurring between 15 April 2018 and 25 April 2018.

3. Results

3.1. Sample descriptive characteristics and public interest in XR

Table 1 shows averages and standard deviations for the control and outcome variables, for the full sample and the groups of respondents in the 30 days before, and the 30 days after the XR protest. Approximately 57% of the

Table 1. Descriptive statistics.

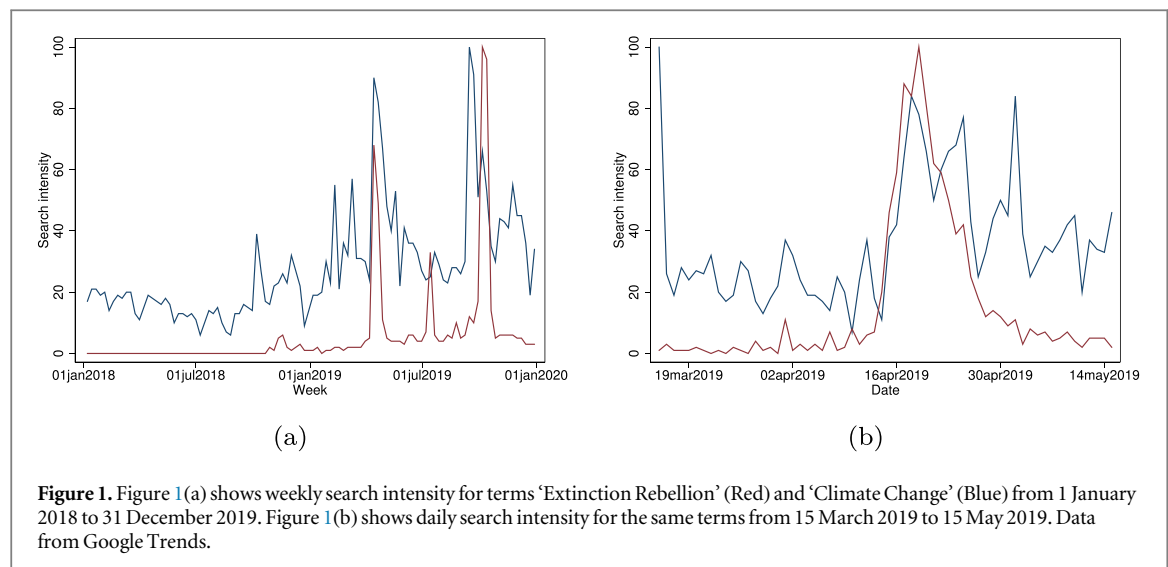
	Full Sample			Pre-XR			Post-XR			t-stat
	Mean	St.Dev.	Obs.	Mean	St.Dev.	Obs.	Mean	St.Dev.	Obs.	
Control Variables										
Employed	0.57	0.50	2108	0.58	0.49	1028	0.56	0.50	1080	0.91
Female	0.56	0.50	2108	0.55	0.50	1028	0.56	0.50	1080	0.14
Income	4359.42	3283.75	2108	4418.55	3455.11	1028	4303.13	3112.46	1080	0.81
Age 16-24	0.11	0.32	2108	0.12	0.32	1028	0.11	0.31	1080	1.02
Age 25-34	0.12	0.32	2108	0.11	0.31	1028	0.13	0.13	1080	1.35
Age 35-44	0.16	0.36	2108	0.16	0.36	1028	0.16	0.36	1080	0.01
Age 45-54	0.20	0.40	2108	0.22	0.41	1028	0.18	0.38	1080	2.42
Age 55-64	0.16	0.37	2108	0.15	0.36	1028	0.18	0.38	1080	1.44
Age 65-74	0.15	0.36	2108	0.15	0.36	1028	0.16	0.36	1080	0.55
Age 75-84	0.08	0.27	2108	0.08	0.27	1028	0.08	0.28	1080	0.30
Age 85+	0.02	0.13	2108	0.02	0.13	1028	0.02	0.13	1080	0.35
Higher Education	0.40	0.49	2108	0.41	0.49	1028	0.40	0.49	1080	0.40
Children in Household	0.26	0.44	2108	0.26	0.44	1028	0.26	0.44	1080	0.08
Urban	0.77	0.42	2108	0.79	0.41	1028	0.75	0.43	1080	1.98
Volunteer	0.19	0.39	2108	0.18	0.38	1028	0.19	0.40	1080	1.03
Outcome Variables										
Green lifestyle not suitable for the majority	0.47	0.50	1979	0.45	0.50	967	0.50	0.50	1012	2.63
Behaviour contributes to climate change	0.50	0.50	2017	0.47	0.50	985	0.52	0.50	1032	2.13
Current lifestyle is environmentally friendly	0.19	0.39	2013	0.20	0.40	982	0.17	0.38	1031	1.67
Not worth changing behavior	0.21	0.41	2014	0.22	0.41	983	0.20	0.40	1031	0.77
Willing to pay more for green goods	0.47	0.50	2017	0.46	0.50	985	0.48	0.50	1032	1.03
Not worth UK combating climate change	0.20	0.40	2014	0.21	0.41	982	0.19	0.39	1032	1.06
Environmental crisis is greatly exaggerated	0.19	0.39	2013	0.19	0.39	983	0.19	0.39	1030	0.18
Soon experience environmental disaster	0.61	0.49	2016	0.59	0.49	984	0.63	0.48	1,032	2.09
Climate change too far in the future	0.16	0.36	2015	0.17	0.37	984	0.15	0.35	1031	1.31

Note. Data from wave 10 of the UKHLS. All variables except for income are binary. All outcome variables are binary indicating respondents that ‘Strongly Agree’ or ‘Agree’ with the statements as described in the Data and Methods section.

sample are in full-time employment, 56% are women, 40% have higher education qualifications and 77% live in an urban location. Average age is 50 years while 19% of respondents had volunteered time to social causes in the last 12 months. Pre- and post-XR respondent groups are equivalent in terms of observed sociodemographic characteristics. On the other hand, respondents after the protest’s end, are more likely to agree that being green is an alternative lifestyle not suitable for the majority, believe that their behavior contributes to climate change, and that an environmental disaster is imminent.

To approximate the public’s awareness of the protest and gain some insight on the relationship between the protest and public interest for environmental challenges, we turn to data from Google Trends. Figure 1(a) shows weekly Google search intensity for ‘Extinction Rebellion’ (red line) and ‘Climate Change’ (blue line) from 1 January 2018 to 31 December 2019². Public interest for XR as measured by Google trends appeared in late 2018 with the XR’s declaration of ‘open rebellion’. Interest for XR spiked in the days of the April 2019 protest and dipped soon after. The spike in interest for XR coincides with increased interest for climate change. Figure 1(b) records daily search intensity for the two terms, from 15 March to 15 May 2019. The pattern of interest in XR follows the timing of the protest, with above average interest between 15 and 30 April. Interest for XR in April 2019 coincides with a noticeable increase in the interest for climate change.

² Data on Google search intensity were accessed at <https://trends.google.com/trends/>.



3.2. Main results

Table 2 shows OLS coefficient estimates from equation (1), assessing the XR campaign’s influence on each of the 9 indicators. Coefficients on XR capture the difference in the probability UKHLS participants declare an attitude, between individuals responding during the 30 days before and the 30 days after the protest. Table B1 in appendix B shows identical average marginal effects from probit regressions of equation (1). We do not find evidence of a negative relationship between the XR protest and public attitudes towards sustainable lifestyles: the estimated influence of the protest on the probability respondents agree that green lifestyles are unsuitable for the majority is close to zero and statistically insignificant (column 1). At the same time, we do not find evidence that the protest is related to respondents’ perceptions of their personal impact on climate change (column 2) or on the environment in general (column 3)³.

There is mixed evidence regarding the relationship between the campaign and attitudes towards pro-environmental behavior. Exposure to the XR campaign is related to a 6 percentage point decrease in the probability of opposing pro-environmental behavior at the individual level (column 4). On the other hand, the protest is related to a large and statistically significant decrease in the probability subjects are willing to pay a green premium for environmentally friendly consumption: exposure to the XR campaign decreases the probability respondents are willing to pay extra for environmentally friendly goods by 12.6 percentage points (column 5). Responding after the protest also appears to improve attitudes towards climate policy. Specifically, the protest is related to a 5.6 percentage point decrease in the probability of opposing climate change policy (column 6).

Finally, we do not find evidence that the protest is associated with changing perceptions about the severity (column 7) or imminence of environmental crises (column 8) and climate change impacts (column 9).

With regards to the remaining controls, significant associations appear between environmental attitudes, and respondents sex, higher educational attainment and recent experience of volunteering.

3.3. The influence of the XR protest across groups

Panel A of table 3 shows estimates from equation (2) examining the influence of exposure to the XR campaign across respondents residing in and out of the Greater London area where the majority of the protests took place. The coefficient on XR captures the influence of the protest on respondents residing outside London. The coefficient on $XR \times London$ captures the difference in the influence of the protest between London residents and others. There is some evidence that living close to the main focus of the protest moderates its influence. London residents post-XR are more likely to agree that green lifestyles are not suitable for the majority compared to others (column 1). They are also more likely to agree that the effects of climate change are far in the future compared to residents outside the region (column 9). Similarly, living in London dampens magnitude of the relationship between exposure to the protest and willingness to approve of pro-environmental behavior at the individual level, and the probability of approving of pro-environmental policy, compared to residents in the rest of the country (columns 4 and 6 respectively).

³ An *a priori* power analysis suggests that the minimum sample size required with a small effect size (following Cohen (2013)), significance level=0.05, power=0.8 and 37 predictors is 395 observations.

Table 2. XR protest and environmental attitudes.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
XR	−0.013 (0.028) [0.734]	−0.010 (0.037) [0.799]	−0.034 (0.029) [0.381]	−0.060* (0.028) [0.117]	−0.126** (0.038) [0.018]	−0.056** (0.019) [0.018]	−0.037 (0.026) [0.30]	−0.081 (0.045) [0.18]	−0.026 (0.036) [0.594]
Employed	−0.006 (0.031)	0.050* (0.024)	−0.023 (0.024)	−0.036 (0.025)	−0.007 (0.026)	−0.004 (0.024)	−0.030 (0.024)	−0.012 (0.026)	−0.012 (0.024)
Female	−0.022 (0.018)	0.028 (0.020)	0.003 (0.018)	−0.050** (0.018)	0.044* (0.020)	−0.072*** (0.019)	−0.074*** (0.015)	0.055* (0.022)	−0.027 (0.017)
Income £0–£1,710	0.040 (0.043)	−0.064 (0.042)	0.009 (0.032)	0.018 (0.026)	−0.100* (0.046)	0.027 (0.032)	0.027 (0.028)	−0.021 (0.041)	0.068 (0.036)
Income £1,711–£2,686	0.009 (0.043)	−0.060 (0.039)	0.035 (0.033)	0.018 (0.033)	−0.077 (0.045)	0.068 (0.041)	−0.002 (0.028)	0.017 (0.036)	0.059 (0.034)
Income £3,887–£5,665	0.008 (0.034)	−0.006 (0.041)	−0.034 (0.029)	0.010 (0.035)	0.002 (0.043)	0.019 (0.030)	0.025 (0.032)	0.030 (0.034)	−0.009 (0.028)
Income £5,666+	−0.105** (0.037)	0.031 (0.038)	−0.065* (0.026)	0.007 (0.029)	0.068 (0.038)	0.011 (0.032)	−0.011 (0.031)	0.063 (0.035)	−0.030 (0.024)
Age 16–24	0.055 (0.045)	0.065 (0.046)	−0.001 (0.032)	0.040 (0.037)	0.036 (0.048)	−0.046 (0.033)	−0.067 (0.038)	0.050 (0.040)	0.050 (0.038)
Age 25–34	0.011 (0.041)	−0.064 (0.039)	−0.058** (0.021)	−0.034 (0.035)	−0.014 (0.036)	−0.050 (0.034)	−0.058 (0.031)	−0.025 (0.041)	−0.011 (0.023)
Age 35–44	−0.083* (0.041)	0.027 (0.038)	−0.047 (0.025)	0.002 (0.034)	−0.015 (0.038)	−0.025 (0.033)	−0.053* (0.025)	0.028 (0.043)	−0.000 (0.027)
Age 55–64	0.026 (0.051)	−0.004 (0.039)	0.012 (0.029)	0.005 (0.029)	0.017 (0.039)	0.033 (0.029)	−0.040 (0.035)	0.018 (0.034)	−0.010 (0.032)
Age 65–74	0.091 (0.048)	0.079* (0.038)	0.043 (0.034)	0.019 (0.033)	0.094 (0.047)	0.050 (0.031)	−0.011 (0.036)	−0.008 (0.035)	−0.025 (0.031)
Age 75–84	0.127** (0.046)	0.019 (0.050)	0.134** (0.043)	0.010 (0.048)	0.102* (0.049)	0.106* (0.049)	0.035 (0.051)	0.005 (0.058)	0.100* (0.046)
Age 85+	0.076 (0.103)	−0.180* (0.079)	0.205* (0.088)	0.072 (0.091)	0.108 (0.074)	0.126 (0.084)	−0.009 (0.082)	−0.011 (0.085)	0.270** (0.091)
Children in household	0.094** (0.032)	0.060 (0.034)	0.027 (0.025)	−0.019 (0.024)	−0.011 (0.035)	−0.014 (0.024)	0.027 (0.027)	0.000 (0.028)	0.001 (0.021)
Urban	0.015 (0.026)	−0.007 (0.027)	−0.037* (0.018)	0.021 (0.021)	−0.023 (0.031)	0.032 (0.020)	0.028 (0.021)	−0.015 (0.027)	0.005 (0.016)
Higher educational attainment	−0.190*** (0.022)	0.131*** (0.024)	0.034 (0.021)	−0.041* (0.020)	0.104*** (0.025)	−0.099*** (0.018)	−0.076*** (0.018)	0.075** (0.024)	−0.043* (0.021)
Volunteer	−0.109*** (0.027)	0.066* (0.029)	0.010 (0.020)	−0.047* (0.021)	0.091** (0.029)	−0.034 (0.022)	−0.022 (0.023)	0.039 (0.032)	−0.038* (0.018)
Observations	1,979	2,017	2,005	2,014	2,017	2,014	2,005	2,016	2,015

Note. Each column shows Ordinary Least Squares estimates from equation (1), using information from the sample of individuals responding to the UKHLS in the 30 days before the start, and the 30 days after the end of the April 2019 protest. The main independent variable is XR, indicating individuals responding in the 30 days after the end of the protest. All models control for region of residence. Omitted categories are: Not in employment, Male, Income £2,687–£3,886, Age 45–54, No children in household, Rural, No higher educational attainment, Not volunteered in the last 12 months. Dependent variables indicate those responding ‘Agree’ or ‘Strongly Agree’ to: (1) Do you agree or disagree that being green is an alternative lifestyle, it’s not for the majority? (2) My behaviour and everyday lifestyle contribute to climate change. (3) My current lifestyle is environmentally friendly. (4) It’s not worth me doing things to help the environment if others don’t do the same. (5) I would be prepared to pay more for environmentally-friendly products. (6) It’s not worth the UK trying to combat climate change, because other countries will just cancel out what we do. (7) The so-called ‘environmental crisis’ facing humanity has been greatly exaggerated. (8) If things continue on their current course, we will soon experience a major environmental disaster. (9) The effects of climate change are too far in the future to really worry me. Standard errors clustered at the level of the day of response in parentheses. P-values adjusted for multiple hypothesis testing in square brackets.

*** $p < 0.001$.

** $p < 0.01$.

* $p < 0.05$.

Panel B of table 3 reports estimates from equation (2), assessing whether the influence of XR varies across individuals that are in and out of employment. The coefficient on XR captures the protest’s influence on respondents that are not in employment, while the coefficient on $XR \times Employed$ captures the difference in the

Table 3. Heterogeneous influence of the XR protest on attitudes.

Panel A	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
XR	−0.033 (0.031)	−0.009 (0.040)	−0.041 (0.029)	−0.081* (0.031)	−0.128** (0.042)	−0.073*** (0.019)	−0.039 (0.028)	−0.080 (0.048)	−0.049 (0.037)
XR × London	0.132* (0.062)	−0.005 (0.058)	0.049 (0.046)	0.127* (0.061)	0.012 (0.075)	0.108* (0.053)	0.014 (0.056)	−0.006 (0.065)	0.143** (0.053)
London	0.093 (0.066)	−0.003 (0.065)	0.022 (0.060)	−0.077 (0.047)	0.086 (0.074)	−0.116* (0.058)	−0.077 (0.064)	0.182* (0.080)	−0.008 (0.056)
Observations	1,979	2,017	2,005	2,014	2,017	2,014	2,005	2,016	2,015
Panel B	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
XR	−0.001 (0.043)	0.014 (0.047)	−0.077* (0.033)	−0.080* (0.032)	−0.158*** (0.044)	−0.074* (0.031)	−0.006 (0.037)	−0.046 (0.053)	−0.015 (0.045)
XR × Employed	−0.021 (0.051)	−0.041 (0.047)	0.075 (0.038)	0.034 (0.039)	0.055 (0.044)	0.032 (0.039)	−0.053 (0.036)	−0.060 (0.052)	−0.019 (0.036)
Employed	0.005 (0.036)	0.071* (0.035)	−0.062* (0.029)	−0.054 (0.030)	−0.036 (0.032)	−0.021 (0.032)	−0.003 (0.032)	0.019 (0.041)	−0.002 (0.032)
Observations	1,979	2,017	2,005	2,014	2,017	2,014	2,005	2,016	2,015
Panel C	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
XR	−0.018 (0.029)	0.005 (0.037)	−0.035 (0.030)	−0.070* (0.030)	−0.122** (0.039)	−0.051* (0.022)	−0.036 (0.031)	−0.093 (0.047)	−0.030 (0.038)
XR × Volunteer	0.024 (0.053)	−0.072 (0.050)	0.007 (0.041)	0.048 (0.042)	−0.021 (0.056)	−0.024 (0.041)	−0.003 (0.045)	0.061 (0.059)	0.016 (0.038)
Volunteer	−0.121*** (0.034)	0.103** (0.033)	0.006 (0.025)	−0.072* (0.029)	0.102** (0.037)	−0.021 (0.032)	−0.021 (0.033)	0.008 (0.038)	−0.047 (0.026)
Observations	1,979	2,017	2,005	2,014	2,017	2,014	2,005	2,016	2,015

Note. Each column in each panel shows Ordinary Least Squares estimates from equation (1), using information from the sample of individuals responding to the UKHLS in the 30 days before the start, and the 30 days after the end of the April 2019 protest. The main independent variable XR indicates individuals responding after the start of the protest. All models include the full set of controls as described in the methods section. Dependent variables indicate those responding ‘Agree’ or ‘Strongly Agree’ to: (1) Do you agree or disagree that being green is an alternative lifestyle, it’s not for the majority? (2) My behaviour and everyday lifestyle contribute to climate change. (3) My current lifestyle is environmentally friendly. (4) It’s not worth me doing things to help the environment if others don’t do the same. (5) I would be prepared to pay more for environmentally-friendly products. (6) It’s not worth the UK trying to combat climate change, because other countries will just cancel out what we do. (7) The so-called ‘environmental crisis’ facing humanity has been greatly exaggerated. (8) If things continue on their current course, we will soon experience a major environmental disaster. (9) The effects of climate change are too far in the future to really worry me.. Standard errors clustered at the level of the day of response in parentheses.

*** $p < 0.001$.

** $p < 0.01$.

* $p < 0.05$.

influence of the protest for the employed, relative to others. There is no evidence that the protest’s influence varies systematically with employment status.

Finally, we test whether the influence of the protest varies across individuals with and without recent history of social activism. Estimates in panel C of table 3 do not suggest that the protest had heterogeneous influence across respondents who did, and did not volunteer time to social causes in the last 12 months.

3.4. Robustness

To assess the results’ sensitivity to the choice of the sample, we repeat the analysis estimating equation (1) when restricting and expanding the time window around the XR protest to 15 and 60 days respectively. Estimates reported in table 4 are qualitatively and quantitatively similar to the baseline results in table 2. Results are identical when estimating probit instead of linear probability models (table B2 in the appendix B).

To further assess the results’ validity we perform a placebo test repeating the baseline analysis to test the influence of a hypothetical protest occurring between 15 April 2018 and 25 April 2018. Figure 2 shows estimates from equation (1) for all attitudinal indicators. As expected, there is no evidence that individual environmental attitudes responded to the placebo protest. Figure B1 in appendix B shows similar average marginal effects from probit regressions.

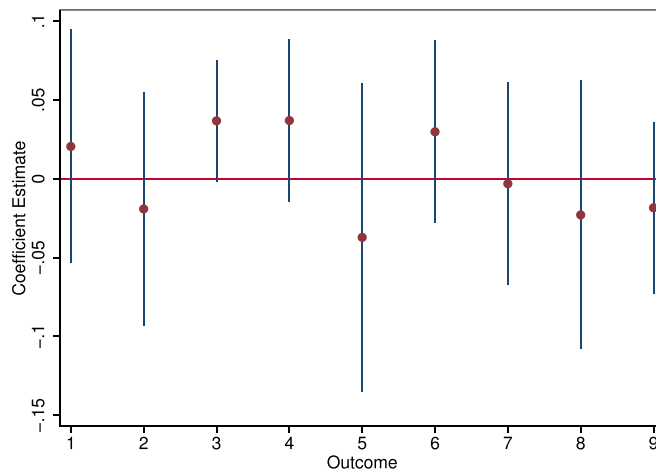


Figure 2. The influence of a placebo XR protest. Data from wave 10 of the UKHLS. Each point shows an estimate of the placebo XR protest's influence on a different indicator. Bars show 95% confidence intervals. Models use information from respondents on the 30 days before 15 April 2018 and the 30 days after 25 April 2018. All models control for region of residence and the set of sociodemographic and economic characteristics.

Table 4. XR protest and environmental attitudes: Estimates from equation (1) for different time windows.

Panel A	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
XR	0.004 (0.031) [0.905]	−0.005 (0.030) [0.905]	−0.023 (0.030) [0.578]	−0.068** (0.021) [0.009]	−0.115*** (0.030) [0.005]	−0.056** (0.015) [0.005]	−0.046 (0.025) [0.171]	−0.064 (0.050) [0.318]	−0.038 (0.022) [0.171]
Observations	1,073	1,092	1,084	1,087	1,092	1,086	1,084	1,086	1,090
Panel B	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
XR	−0.020 (0.029) [0.501]	−0.026 (0.037) [0.501]	−0.039 (0.027) [0.237]	−0.055 (0.034) [0.211]	−0.126** (0.045) [0.054]	−0.059* (0.024) [0.077]	−0.037 (0.024) [0.211]	−0.089 (0.047) [0.186]	−0.035 (0.034) [0.396]
Observations	4,066	4,142	4,135	4,142	4,143	4,137	4,114	4,143	4,141

Note. Each column in each panel shows Ordinary Least Squares estimates from a equation (1). Models in panels A and B use information from the samples of individuals responding to the UKHLS in the 15 and 60 days before the start and after the end of the April 2019 protest respectively. The main independent variable *XR* indicates individuals responding in the 15 and 60 days after the end of the protest for panels A and B respectively. All models include the full set of controls. Dependent variables indicate those responding 'Agree' or 'Strongly Agree' to: (1) Do you agree or disagree that being green is an alternative lifestyle, it's not for the majority? (2) My behaviour and everyday lifestyle contribute to climate change. (3) My current lifestyle is environmentally friendly. (4) It's not worth me doing things to help the environment if others don't do the same. (5) I would be prepared to pay more for environmentally-friendly products. (6) It's not worth the UK trying to combat climate change, because other countries will just cancel out what we do. (7) The so-called 'environmental crisis' facing humanity has been greatly exaggerated. (8) If things continue on their current course, we will soon experience a major environmental disaster. (9) The effects of climate change are too far in the future to really worry me. Standard errors clustered at the level of the day of response in parentheses. P-values adjusted for multiple hypothesis testing in square brackets.

*** $p < 0.001$.

** $p < 0.01$.

* $p < 0.05$.

4. Discussion and conclusion

This paper examines the relationship between environmental protests and individual environmental attitudes, focusing on the case of the XR campaign of civil disobedience that took place in the UK in April 2019. Using survey data collected while the XR campaign was ongoing and exploiting the exogeneity of the protest to the timing of data collection, we estimate models comparing attitudes towards green lifestyles, pro-environmental behavior and climate policy, and perceptions on the severity of environmental crises, between individuals that responded to the survey before and after the 11-day protest. We find some evidence that the XR protest influenced the public's attitudes towards sustainable behavior and their willingness to approve of climate change mitigation policy. On the other hand, we do not find evidence that exposure to the XR protest is related to respondents' perceptions of the imminence or severity of environmental crises, or their views about their personal environmental and climate impact.

We find that exposure to the protest is simultaneously related to lower probability of opposing pro-environmental behavior and climate policy, and to lower probability respondents are willing to pay a premium for environmentally-friendly consumption. This may appear contradictory as post-protest respondents are in principle more supportive of pro-environmental behavior and policy but at the same time less willing to incur additional associated costs. This pattern is nevertheless consistent with XR's support of radical economic change (Stuart 2022), and its focus on the responsibility of national governments for environmental conservation and climate change mitigation (Buzogány and Scherhauser 2022). The focus and framing of the XR protest can plausibly crowd out individual's willingness to incur extra costs associated with pro-environmental consumption, shifting the responsibility for conservation to governments and firms. This suggests that a protest's framing can determine the direction of its influence on public attitudes and lead to unanticipated consequences. For example, by reducing the public's willingness to pay extra for environmentally-friendly goods the protest may lower the appeal of sustainable production signaling producers of limited opportunities for marketing green products. Furthermore, the protest may lead to underestimating the perceived value of sustainability and influence the design of environmental policy, if policy makers approximate the benefit of sustainable consumption with the additional cost the public is willing to bear for green products.

While the exact mechanisms driving the results cannot be precisely characterized given the data available, it is plausible that the observed relationships between the protest and willingness to support pro-environmental behavior and climate policy are due to the increased availability of environmental information and exposure to pro-environmental messaging during the time of the protest. Using civil disobedience techniques, the XR campaign increased its appeal to news media (Bugden 2020, Oliver and Meyer 1999), realizing extensive coverage of its activities and messaging that stressed the need for environmental policy and behavioral change (Taylor and Gayle 2019, Daily Mail 2019, BBC News 2019). Information-seeking and interest for climate change as captured by Google Trends data, increased during the time of the protest (figure 1) suggesting a plausible link between the campaign and environmental awareness. However, while the timing of the XR protest coincides with increased information seeking, our results do not suggest that the XR protest affected individual perceptions of personal environmental or climate impact, or the perceived severity and imminence of environmental crises. This implies that protests' influence may not be homogeneous across environmental attitudes plausibly depending on subjects' prior knowledge and awareness of environmental challenges. For example, the marginal impact of a protest on perceptions about the severity of environmental crises may be lower in populations with already high levels of environmental awareness.

Protests can highlight differences among groups with contrasting collective identities and lifestyles (Drury and Reicher 2000, Polletta and Jasper 2001, Klandermans 2014), and cause costly disruption for non-participants, potentially alienating public opinion from environmentalists, their message, and way of life. We do not find evidence that the XR protest negatively affected the image of sustainable lifestyles. Nevertheless there is some evidence that proximity to the protest and associated disruption can moderate its positive influence on attitudes, as London residents after the protest appear more negative towards green lifestyles, pro-environmental behavior, and climate policy. In this respect, our results agree with findings of Wallace *et al* (2014) and Branton *et al* (2015), showing that temporal and spatial proximity to a protest can influence its impact on attitudes.

When assessing the results it is worth keeping in mind the study's limitations. Estimates are based on a relatively small sample of about 2,000 observations. Future work should explore opportunities for studying the influence of environmental protest events using natural experiments with larger samples to enhance confidence in the results. Our results rely on comparing individual environmental attitudes before the start and after the end of the April 2019 XR protest. While the timing of individual survey response is orthogonal to the protest's timing, it is possible that other events occurring during or after the protest may influence estimates. Finally it merits mentioning that the results of the present study cannot be extended to different protests occurring at other times or under different circumstances. However, the results add to the evidence base on the relationship between environmental protests and individual environmental attitudes.

Encouraging pro-environmental attitudes can contribute towards addressing environmental challenges directly by influencing individual behavior, and indirectly by increasing public support for sustainability policy. Environmentalists frequently use protests to disseminate pro-environmental messages, influence attitudes, and promote green policy adoption. Our results suggest that protests may not always deliver their intended outcomes, and can have unanticipated influence on individual environmental attitudes. The environmental movement may need to design protests and related interventions carefully, aiming to maximize their impact on attitudes. This would involve characterizing the targeted environmental attitudes, the intended audiences, the context in which protests take place, as well as evaluating the mechanisms over which protests are expected to influence attitudes. Protests often involve substantial costs for protestors and non-participants alike. For example participants in a disruptive protest can risk prosecution by the authorities, while both groups may incur loss income. At the same time the distribution of costs is not uniform across the population. Activists should

acknowledge that disparities in the cost distribution may result to heterogeneity in the influence of protests across the targeted population. The resulting tradeoffs need to be evaluated to ensure protests have the intended aggregate effect on attitudes. In this context, systematically assessing the influence of protests on the public's pro-environmental attitudes and behaviors can inform the environmental movement of their effectiveness in meeting objectives, and contribute to developing effective communication strategies.

Acknowledgments

We thank three anonymous Referees for useful comments and suggestions. Any remaining errors or omissions are ours.

Data availability statement

The data generated and/or analysed during the current study are not publicly available for legal/ethical reasons but are available from the corresponding author on reasonable request.

Appendix A

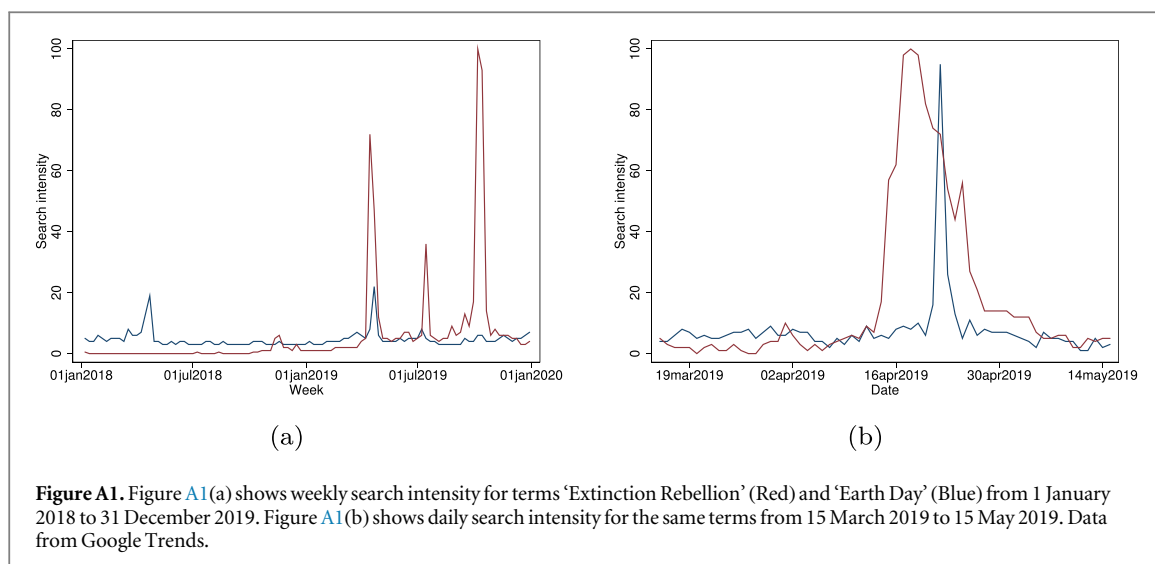
It is possible that the Earth Day observance occurring in late April affects our results. To assess this we compare the visibility of the Earth Day observance against the XR campaign of civil disobedience. Figure A1(a) shows weekly google search intensity for the terms 'Extinction Rebellion' (red) and 'Earth Day' (blue) from 1/1/2018 to 31/12/2019. Figure A1(b) shows the daily search intensity for these terms from 15 March 2019 to 15 May 2019. In both cases interest in XR appears to exceed interest for Earth Day. Figure A1(b) further suggests that interest in XR spans the entire period of the protest while interest in the Earth Day peaks on a single Day.

We further examine news coverage in high circulation UK newspapers for the two events. Table A1 shows the count of news items on 'Extinction Rebellion' and 'Earth Day' between 1 April 2019 and 1 May 2019. The coverage of the extinction rebellion protests significantly exceeds coverage for the Earth Day. Furthermore, there is little evidence that environmentally themed observances influence environmental attitudes (Kountouris 2022).

Table A1. Extinction Rebellion and Earth Day mentions in popular news media.

	Extinction Rebellion	Earth Day
Financial Times	13	0
The Guardian	65	5
Daily Mail	39	22
The Times	13	0
The Sun	12	4

Note. The table shows the count of mentions of 'Extinction Rebellion' and 'Earth Day' in popular UK news media between 1 April 2019 and 1 May 2019.



Appendix B

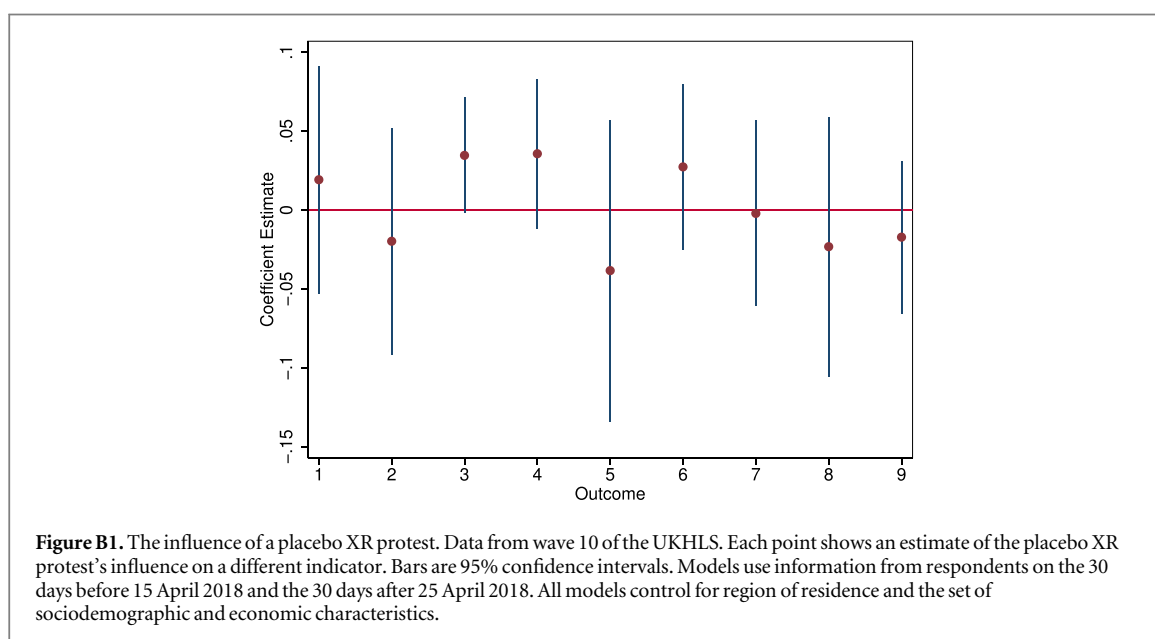


Table B1. XR protest and environmental attitudes: average marginal effects from probit regressions.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
XR	−0.013 (0.027) [0.729]	−0.009 (0.037) [0.816]	−0.033 (0.030) [0.402]	−0.056* (0.029) [0.147]	−0.127*** (0.038) [0.009]	−0.054** (0.019) [0.018]	−0.034 (0.023) [0.245]	−0.079 (0.043) [0.149]	−0.029 (0.035) [0.522]
Employed	−0.004 (0.030)	0.050* (0.024)	−0.022 (0.025)	−0.035 (0.025)	−0.007 (0.026)	−0.003 (0.025)	−0.031 (0.025)	−0.011 (0.026)	−0.012 (0.024)
Female	−0.021 (0.018)	0.029 (0.020)	0.004 (0.018)	−0.050** (0.018)	0.044* (0.020)	−0.073*** (0.019)	−0.076*** (0.015)	0.055** (0.021)	−0.028 (0.017)
Income £0–£1,710	0.037 (0.042)	−0.064 (0.042)	0.011 (0.031)	0.016 (0.025)	−0.100* (0.046)	0.030 (0.030)	0.025 (0.027)	−0.021 (0.041)	0.066 (0.035)
Income £1,711–£2,686	0.007 (0.042)	−0.060 (0.039)	0.035 (0.033)	0.020 (0.032)	−0.079 (0.044)	0.066 (0.039)	0.001 (0.027)	0.017 (0.035)	0.057 (0.033)
Income £3,887–£5,665	0.007 (0.034)	−0.005 (0.041)	−0.033 (0.029)	0.009 (0.035)	0.002 (0.043)	0.021 (0.029)	0.026 (0.032)	0.030 (0.034)	−0.010 (0.027)
Income £5,666+	−0.109** (0.036)	0.032 (0.038)	−0.067* (0.026)	0.005 (0.029)	0.068 (0.038)	0.011 (0.033)	−0.012 (0.031)	0.063 (0.035)	−0.034 (0.024)
Age 16–24	0.056 (0.044)	0.064 (0.045)	−0.002 (0.033)	0.036 (0.035)	0.036 (0.047)	−0.042 (0.031)	−0.069 (0.036)	0.049 (0.039)	0.047 (0.038)
Age 25–34	0.013 (0.041)	−0.063 (0.038)	−0.060** (0.021)	−0.037 (0.036)	−0.013 (0.035)	−0.053 (0.034)	−0.059 (0.031)	−0.024 (0.040)	−0.012 (0.024)
Age 35–44	−0.084* (0.040)	0.027 (0.038)	−0.047* (0.024)	0.002 (0.035)	−0.015 (0.037)	−0.027 (0.034)	−0.056* (0.025)	0.027 (0.043)	−0.003 (0.028)
Age 55–64	0.027 (0.051)	−0.004 (0.038)	0.013 (0.029)	0.003 (0.029)	0.018 (0.039)	0.031 (0.028)	−0.043 (0.035)	0.018 (0.034)	−0.013 (0.033)
Age 65–74	0.091 (0.047)	0.079* (0.037)	0.043 (0.035)	0.014 (0.033)	0.096* (0.047)	0.046 (0.032)	−0.013 (0.037)	−0.007 (0.035)	−0.026 (0.030)
Age 75–84	0.127** (0.045)	0.021 (0.049)	0.128** (0.044)	0.006 (0.046)	0.105* (0.048)	0.096 (0.049)	0.030 (0.051)	0.006 (0.057)	0.083 (0.046)
Age 85+	0.075 (0.098)	−0.193* (0.087)	0.197* (0.088)	0.063 (0.086)	0.110 (0.074)	0.113 (0.081)	−0.012 (0.079)	−0.010 (0.082)	0.243** (0.091)
Children in household	0.094** (0.031)	0.060 (0.033)	0.029 (0.029)	−0.022 (0.024)	−0.009 (0.035)	−0.018 (0.026)	0.028 (0.028)	0.002 (0.028)	−0.004 (0.023)
Urban	0.014 (0.026)	−0.007 (0.027)	−0.038* (0.019)	0.022 (0.021)	−0.023 (0.031)	0.033 (0.019)	0.029 (0.022)	−0.015 (0.026)	0.006 (0.017)
Higher educational attainment	−0.191*** (0.022)	0.130*** (0.024)	0.035 (0.021)	−0.040* (0.020)	0.104*** (0.025)	−0.099*** (0.018)	−0.077*** (0.017)	0.075** (0.024)	−0.043* (0.021)
Volunteer	−0.108*** (0.027)	0.065* (0.029)	0.010 (0.020)	−0.048* (0.021)	0.091** (0.029)	−0.032 (0.022)	−0.021 (0.023)	0.039 (0.032)	−0.038* (0.018)
Observations	1,979	2,017	2,005	2,014	2,017	2,014	2,005	2,016	2,015

Note. Each column shows average marginal effects from probit regressions of equation (1). The main independent variable XR indicates individuals responding to the UKHLS in the 30 days after the end of the protest. All models include region of residence controls. Omitted categories are: Not in employment, Male, Income £2,687–£3,886, Age 45–54, No children in household, Rural, No higher educational attainment, Not volunteered in the last 12 months. Dependent variables indicate those responding ‘Agree’ or ‘Strongly Agree’ to: (1) Do you agree or disagree that being green is an alternative lifestyle, it’s not for the majority? (2) My behaviour and everyday lifestyle contribute to climate change. (3) My current lifestyle is environmentally friendly. (4) It’s not worth me doing things to help the environment if others don’t do the same. (5) I would be prepared to pay more for environmentally-friendly products. (6) It’s not worth the UK trying to combat climate change, because other countries will just cancel out what we do. (7) The so-called ‘environmental crisis’ facing humanity has been greatly exaggerated. (8) If things continue on their current course, we will soon experience a major environmental disaster. (9) The effects of climate change are too far in the future to really worry me. Standard errors clustered at the level of the day of response in parentheses. P-values adjusted for multiple hypothesis testing in square brackets.

*** $p < 0.001$.

** $p < 0.01$.

* $p < 0.05$.

Table B2. XR protest and environmental attitudes: Average marginal effects from probit regressions, for different time windows.

Panel A	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
XR	0.006 (0.030) [0.893]	−0.004 (0.030) [0.893]	−0.018 (0.031) [0.735]	−0.068** (0.021) [0.003]	−0.117*** (0.031) [0.000]	−0.057*** (0.016) [0.000]	−0.042 (0.023) [0.126]	−0.063 (0.048) [0.278]	−0.042 (0.023) [0.121]
Observations	1,073	1,092	1,084	1,087	1,092	1,086	1,084	1,086	1,090
Panel B	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
XR	−0.019 (0.028) [0.497]	−0.025 (0.036) [0.497]	−0.039 (0.028) [0.245]	−0.052 (0.034) [0.227]	−0.126** (0.044) [0.036]	−0.056* (0.024) [0.086]	−0.035 (0.021) [0.2025]	−0.087 (0.045) [0.159]	−0.037 (0.034) [0.369]
Observations	4,066	4,142	4,135	4,142	4,143	4,137	4,114	4,143	4,141

Note. Each column in each panel shows average marginal effects from a probit regression of equation (1). Models in panels A and B use information from individuals responding to the UKHLS in the 15 and 60 days before the start and after the end of the April 2019 protest respectively. The main independent variable XR indicates individuals responding in the 15 and 60 days after the end of the protest for panels A and B respectively. All models include the full set of controls. Dependent variables indicate those responding ‘Agree’ or ‘Strongly Agree’ to: (1) Do you agree or disagree that being green is an alternative lifestyle, it’s not for the majority? (2) My behaviour and everyday lifestyle contribute to climate change. (3) My current lifestyle is environmentally friendly. (4) It’s not worth me doing things to help the environment if others don’t do the same. (5) I would be prepared to pay more for environmentally-friendly products. (6) It’s not worth the UK trying to combat climate change, because other countries will just cancel out what we do. (7) The so-called ‘environmental crisis’ facing humanity has been greatly exaggerated. (8) If things continue on their current course, we will soon experience a major environmental disaster. (9) The effects of climate change are too far in the future to really worry me. Standard errors clustered at the level of the day of response in parentheses. P-values adjusted for multiple hypothesis testing in square brackets.

*** $p < 0.001$.

** $p < 0.01$.

* $p < 0.05$.

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