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Analysis



Pro-environmental behavior and environmentalist movements: Evidence from the identification with *Fridays for Future*

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ABSTRACT

This paper empirically tests the impact of pro-environmental identity on environmental behavior by priming study participants with their previously stated attitude towards the environmentalist movement *Fridays for Future*. On the basis of a large-scale survey experiment including the incentivized choice between a voucher for a flight or a train ride, we find evidence that respondents who receive such an identity prime are more likely to behave in line with the movement's moral principles in that they take the train. The largest treatment effect is found for respondents with a negative attitude towards the movement, which is consistent with moral balancing. Our results suggest that pro-environmental behavior may be enhanced by reminding individuals of their attitude towards environmental matters.

1. Introduction

Standard economic theory assumes that individual behavior is driven by preferences over outcomes and the resulting material utility. In a pioneering article, Akerlof and Kranton (2000) introduce a theory that includes the so-called affective utility associated with identity-confirming actions, such as pro-environmental or, more generally, pro-social behavior, into the utility function. To disentangle the impact of identity[1] on behavior from preferences over outcomes, experimental research has since resorted to priming, that is, temporarily increasing the salience of an identity (Benjamin et al., 2010) — for an overview on priming in economics, see Cohn and Maréchal (2016). Using priming in the context of pro-environmental behavior, Panzone et al. (2021), for instance, show that reminding study participants of their previous pro-environmental behavior leads to more sustainable purchases.

Adding to this strand of research, this paper investigates the impact of the identification with the environmentalist movement *Fridays for Future* on pro-environmental behavior and develops a theoretical model, presented in Appendix A, in which individuals derive affective utility from pro-environmental behavior.[2] This affective utility is higher when moral concerns are more salient. Thus, an increase in the salience of pro-environmental identity should lead to more pro-environmental behavior.

Empirically applying this model to a large-scale online survey in which an experiment with an incentivized choice was embedded, nearly 6000 German household heads had to decide on whether they would prefer to win a voucher for a train ride or a flight, which was won by one out of 50 participants. Half of the sample was randomly assigned to a treatment group whose subjects were reminded of their previously stated attitude towards *Fridays for Future* immediately before making their voucher decision. These subjects were then asked to actively confirm or revoke this attitude. Following the experimental literature on the impact of identity on behavior, this reminder served as an identity prime that temporarily increased the salience of pro-environmental identity.

While our study contributes to recent economic research on pro-environmental behavior, such as Antinyan and Corazzini (2025), Mundaca and Wamsler (2025), Pace et al. (2025), Raineau et al. (2025),

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[1] By identity, we mean "an individual's sense of self defined by [...] a range of affiliations (e.g., ethnicity) and social roles" (American Psychological Association, 2018). This definition is usually used in behavioral economic research and related disciplines (Akerlof and Kranton, 2005; Bénabou and Tirole, 2016; Bertrand et al., 2015; Chen and Li, 2009; Diamond, 2020; Kahan, 2013; Nigbur et al., 2010; Qasim et al., 2019; Stets and Burke, 2000; Van Bavel and Pereira, 2018).

[2] Recent psychological research on pro-environmental behavior distinguishes between intent-orientated and impact/outcome-orientated behavior (Lange, 2024; see Nielsen et al. (2022) for an application where this distinction is important). Based on this terminology, we investigate intent-orientated behavior, but for simplicity, in what follows, we only refer to pro-environmental behavior.

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Suri et al. (2025), our empirical findings indicate that subjects of the treatment group, who were reminded of their previously stated attitude towards *Fridays for Future*, are more likely to choose the train voucher than those of the control group, who did not receive such a reminder. These results suggest that pro-environmental behavior may be enhanced by reminding individuals of their own attitude.

The subsequent section explains the experimental design and hypothesis. Section 3 provides a detailed description of the data, while Section 4 presents the empirical results. Section 5 analyzes heterogeneous treatment effects, the last section discusses the results and concludes.

2. Experimental design and hypothesis

Drawing on an incentivized online survey experiment conducted in Germany in late 2019, we apply the theoretical model presented in Appendix A to the context of pro-environmental behavior and individuals' identification with the environmentalist movement *Fridays for Future*. In the model, individuals decide between a selfish and a pro-social action, where the selfish action yields larger material utility and the pro-social action implies a larger affective utility. The importance of affective utility for total utility depends on the individual's awareness of her identity concerns. The empirical application consists in a discrete choice task in which respondents had to decide on whether they would prefer to win a voucher worth 40 euros either for a flight or for a railway trip, the latter of which is more environmentally benign and, hence, socially preferred.[3] One out of 50 survey participants was randomly selected to win such a voucher.

For many trips, the plane is frequently the faster and more convenient option than the train. Recently, though, because of its high contribution to climate change, flying has been discredited by an anti-flying movement that is spearheaded by *Fridays for Future*. The anti-flying agenda was particularly pushed by Greta Thunberg, the central figure of *Fridays for Future*, who received enormous attention from the media for avoiding a flight to the UN climate summit in New York in 2019.[4] Instead, for environmental reasons, even for the very long trip from Europe to the USA, she took a boat. At other instances, she preferred taking the train (CNN, 2019).

At the beginning of the survey, we elicited the respondents' general attitude towards the *Fridays for Future* protests by asking the following question: "Currently, in many cities students are protesting for more climate protection every Friday both during and outside school hours. What is your attitude towards these so-called *Fridays for Future* protests?". The response to this question is measured on a 5-point Likert scale, indicating the degree of support for the protests — see Question A13 in the appendix for the response options.

Half of the sample was randomly assigned to the treatment group. Immediately before deciding upon the type of voucher, either for a train or plane trip, subjects of the treatment group were reminded of their general attitude towards *Fridays for Future* they had stated a few questions before and were asked to confirm or revoke this attitude. Conditional on their previously stated attitude, subjects of the treatment group were asked: "Would you agree that, overall, you don't support[/have a neutral attitude towards/support] the *Fridays for Future* movement?". While the control group did not receive any such questions, the treatment was designed to arouse cognitive dissonance, that is, to raise the respondents' awareness about the inner conflict between the morally appropriate behavior, i.e. taking the train, and the more convenient choice of taking the plane, thereby also increasing their awareness of their identity concerns. Since the theoretical model predicts that individuals are more likely to behave pro-socially the higher their awareness of their identity concerns, we arrive at the following hypothesis: Subjects of the treatment group are more likely to choose the train voucher than subjects of the control group.

While the implications of the treatment depend on the respondents' previously stated attitude and are, therefore, endogenous, the prime itself is exogenous because assignment to the treatment group was random and, thus, allows for a causal analysis of the hypothesis. In that sense, our study is similar to research that relies on social comparisons as a treatment (Allcott, 2011; Byrne et al., 2018; Ayres et al., 2013; Ferraro and Miranda, 2013; Ferraro and Price, 2013), where treatment assignment is exogenous as well, but the implications of the treatment are contingent on how well the individual fares in the social comparison.

3. Data

Our analysis relies on data collected by the survey institute *forsa*.[5] *forsa* maintains a panel of about 100,000 members, being representative of the German-speaking population. For participation in the survey, panelists receive a small incentive in the form of bonus points that they can exchange for vouchers or lottery tickets of a charitable organization. Bonus points can also be donated to a charity. For more information on *forsa*, see http://www.forsa.com. The survey was addressed to household heads, defined as those individuals who are responsible for the household's financial decisions. Data collection is based on a state-of-the-art tool that allows panelists to retrieve and return the questionnaire from home or from mobile devices connected to the internet. The survey could be interrupted and resumed at any time. Respondents in our survey tend to be older, wealthier, and more educated than the average of the German population (see Table D.5 in the appendix). This implies that the results of our study are only valid for this particular sample and cannot be extrapolated to the entire German population.

The survey period spanned from October 16 to November 6, 2019. 6549 household heads were recruited to fill in the questionnaire. Out of these, 553 dropped out prior to the experiment or refused to participate in it and 48 did not provide their attitude towards the *Fridays for Future* protests, such that the sample size for the experiment amounts to 5948 respondents. Dropout rates do not differ significantly between treatment and control group, implying that selection bias is not an issue.

Our data reveals that supporting the *Fridays for Future* movement is strongly correlated with other indicators of subjects' environmental attitudes. For instance, Fig. C.1 presented in the appendix illustrates that respondents who have a positive attitude towards *Fridays for Future* are more likely to score higher on a scale measuring general pro-environmentalist attitude than other respondents.[6] It is likewise not surprising that *Fridays for Future* supporters are more inclined towards the Green party (Fig. C.2) than non-supporters.

[3] The voucher was valid either for the German Railways (*Deutsche Bahn*) or the website of Flightgift, where flights from a large variety of airlines can be booked.

[4] The origin of the *Fridays for Future* movement dates back to August 2018, when Greta Thunberg decided to strike for climate protection outside the Swedish Parliament on each school day. She was soon joined by youth from all around the world, leading to a global strike movement (Fridays for Future, 2022). In Germany, the first protest was organized in September 2018. Thereafter, the movement grew substantially, comprising a total of 1.4 million protesters across more than 550 cities in September 2019 (Neuber and Gardner, 2020).

[5] Relevant survey questions are provided in Appendix B. Tables D.1 to D.4 explain how survey questions were transformed for the analysis. For a further description as well as access to the data see Matejko and Sommer (2022).

[6] Pro-environmental attitudes are measured by a shorter variant of the original Diekmann and Preisendörfer scale (2003). Originally, it contains nine items from the three spheres: affective, cognitive, and conative. We opted for a short variant of four questions to reduce the amount of questions for respondents. Our short scale is composed of items a, b, c, and d of Question KU3 (see Appendix B), and its Cronbach's alpha is 0.7849.

Table 1
Means of a variety of attitudes towards the *Fridays for Future* movement.

	# Obs.	Whole Sample	Treatment group	Control group	t statistics
Train voucher	5948	0.772	0.791	0.753	−3.559
Attitude towards Fridays for Future:	*5948*				
Negative attitude		0.309	0.306	0.311	0.381
Neutral attitude		0.233	0.238	0.229	−0.820
Positive attitude		0.458	0.456	0.460	0.342
Should protest only in free time:	*5914*				
disagree		0.274	0.269	0.279	0.892
neutral		0.083	0.082	0.084	0.227
agree		0.643	0.649	0.637	−0.961
OK to skip classes:	*5913*				
disagree		0.490	0.484	0.497	0.962
neutral		0.097	0.097	0.098	0.095
agree		0.412	0.419	0.406	−1.034
Question of intergenerational justice:	*5912*				
disagree		0.144	0.140	0.147	0.791
neutral		0.111	0.112	0.110	−0.212
agree		0.745	0.748	0.743	−0.484
Students should rather change their own behavior:	*5896*				
disagree		0.286	0.288	0.285	−0.296
neutral		0.146	0.146	0.147	0.073
agree		0.567	0.566	0.569	0.218

Note: t statistics for testing the equality of means across treatment and control groups are reported in last column.

Table 2
Means of socio-demographic characteristics.

	# Obs.	Whole sample	Treatment group	Control group	*t*-statistic
Female	5607	0.418	0.407	0.428	1.587
Age	5607	56.316	56.291	56.341	0.119
At least technical college	5444	0.327	0.330	0.325	−0.407
Employed	5571	0.516	0.507	0.525	1.337
Children < 14 years in household	5882	0.151	0.154	0.148	−0.588
Distance to nearest airport in km	5939	34.2	34.1	34.3	0.331
Flyers	5948	0.696	0.685	0.706	1.736
Environmentalist attitude	5349	3.647	3.653	3.641	−0.497
Inclination towards Green party	5380	0.192	0.187	0.198	1.038
Area of residence:	*5897*				
Urban area		0.359	0.365	0.353	−0.927
Peri-urban area		0.432	0.427	0.436	0.690
Rural area		0.209	0.208	0.210	0.253
Type of nearest airport:	*5939*				
Large airport		0.710	0.705	0.715	0.861
Medium airport		0.290	0.295	0.285	−0.861
Household size:	*5929*				
1 person		0.269	0.274	0.264	−0.851
2 persons		0.473	0.465	0.481	1.236
3 persons		0.136	0.137	0.135	−0.188
4 persons		0.090	0.090	0.091	0.242
≥ 5 persons		0.031	0.035	0.028	−1.404
Net household income:	*4939*				
Income < 1200 Euro		0.076	0.079	0.073	−0.881
Income 1200–2700 Euro		0.361	0.371	0.350	−1.512
Income 2700–4200 Euro		0.337	0.331	0.343	0.898
Income ≥ 4200		0.226	0.219	0.234	1.280

Note: t statistics for testing the equality of means across treatment and control groups are reported in the last column. Environmentalist attitude is an index variable of items a, b, c, and d of Question KU3.

The summary statistics, reported in Tables 1 and 2, indicate that randomization was successful. Attitudes towards *Fridays for Future*, socio-economic characteristics, distance to the nearest airport, and pro-environmentalist attitude are very similar for the treatment and control group.

Tables 1 and 2 further show that socio-economic characteristics and attitudes are not available for all respondents because some either dropped out of the survey or chose the "no answer"-option for some questions. With more than 1000 observations for which the information is not available, net household income has the largest number of missing values.

4. Empirical results

The outcome of interest in this study is the probability that an individual chooses the train voucher. This probability can be estimated through a linear probability model (LPM), a binary probit model, or a binary logit model. Define $y_i = 1$ if individual i chooses the train voucher and $y_i = 0$ if she chooses the flight voucher. The LPM assumes that the probability that $y_i = 1$ is given by

$$\Pr(y_i = 1) = \alpha + \beta_1 treat_i + \beta_2 FfF_i + \gamma^T x_i + \epsilon_i, \quad (1)$$

where $treat_i$ is a dummy variable indicating whether the individual was assigned to the treatment group, FfF_i is a categorical variable for the individual's attitude towards *Fridays for Future* with a neutral

attitude as the reference category, x_i is a vector of covariates that might have an influence on voucher choice (see Tables D.1 to D.4 for further details), and ϵ_i denotes the idiosyncratic error term. $\Pr(y_i = 1)$ is then estimated by ordinary least squares. One advantage of the LPM is that coefficient estimates can be directly interpreted as marginal effects. One drawback is that $\Pr(y_i = 1)$ is not restricted to $[0, 1]$, which means that the LPM does not always provide a valid description of the probability $\Pr(y_i = 1)$. However, it often gives a good approximation (Wooldridge, 2010). Therefore, we use LPMs in our main specifications. Average marginal effects derived from binary logit models reported in Tables D.10 and D.13 confirm these results.

Claiming that subjects of the treatment group are more likely to choose the train voucher than subjects of the control group, the hypothesis derived in Section 2 can easily be tested on the basis of a t-test on the difference between the shares of train vouchers across treatment and control group, as the assignment to these experimental groups was random. The coefficient estimate of 0.0387 of the regression without any covariates, presented in the first column of Table 3, corresponds to such a t-test: Relative to the control group, the share of respondents who opt for the train voucher is significantly higher in the treatment group, whose subjects were asked to confirm or revoke their previously stated attitude towards *Fridays for Future* immediately before making their traveling decision. In fact, the share of train vouchers is about 3.9 percentage points higher in the treatment group than in the control group, an effect that is statistically significant at the 1% significance level, thereby confirming our hypothesis. Given the simplicity of the reminder treatment, this is a sizeable effect. This effect increases to 4.3 percentage points when further control variables that might have an influence on travel mode choice are added — see the second and the third columns of Tables 3 and D.9.

However, column (4) of the same tables shows that this increase in effect size is due to a composition effect of the sample for which information on all covariates is available. In particular, Table D.11 in the appendix shows that the treatment effect is stronger among respondents who completed the entire survey and especially those who provided information about their net household income. The first result might imply that pro-environmental identity has a larger influence on their decisions for individuals who are more interested in energy policy (the broad topic of the survey). The second result is more difficult to interpret, because it is unobservable whether individuals with particularly high or low income refuse to provide information. Tables D.6 and D.7 provide summary statistics on socio-economic characteristics and attitudes for respondents who are included in the estimation sample with covariates. Respondents for whom information on all relevant covariates is available have a more positive attitude towards *Fridays for Future*, both in general and concerning specific aspects, than respondents who drop out of the estimation sample with covariates (see Table D.6). In addition, they are less likely to be female, more educated, have a stronger pro-environmental attitude, and are more likely to be inclined towards the Green party. There are also statistically significant differences in household size and net household income (see Table D.7). These differences in observed characteristics may be an additional explanation for the increased treatment effect in the estimation sample with covariates.

Additionally conducting a χ^2-test as a robustness check, the test results confirm the statistically significant relationship between the treatment and the likelihood of choosing the train voucher (see Table D.8 in the appendix).

A potential concern regarding our results might be the presence of experimenter demand effects. These effects are present if study participants behave in a way they think the experimenter expects them to do (Zizzo, 2010). However, while de Quidt et al. (2018) show that experimenter demand effects are usually only modest, our experiment combines two features that minimize the risk for experimenter demand effects. First, the discrete choice task was incentivized. Second, we conducted an online experiment, implying that there was only minimal contact between study participants and the experimenters. In fact, Mummolo and Peterson (2019) find that online surveys are highly robust to experimenter demand effects. In their experiments, even financial incentives and the disclosure of the research objective fail to produce consistent experimenter demand effects.

Another concern might be that study participants who regularly use both the train and the plane may view the two vouchers as perfectly fungible. Yet, previous research has shown that people engage in mental accounting, i. e. they create separate budgets for different activities. Money attributed to a certain budget is perceived to be an imperfect substitute for money in other accounts, thus violating the principle of fungibility (Thaler, 1985, 1999). This has been verified in empirical studies. For example, in a restaurant setting, Abeler and Marklein (2017) show that providing a voucher for beverages increases expenditures in this category more than an unlabeled voucher. In our setting, it is therefore likely that respondents use their voucher for the trip that it was assigned to in the framing of the experiment.

5. Exploratory heterogeneity analysis

Depending on an individual's previously stated attitude towards *Fridays for Future*, the content of the prime of randomly reminding subjects of their previously stated attitude may differ by attitude and, hence, we expect heterogeneous treatment effects. In that sense, our study is comparable to studies that include social comparison as a central component of their treatment, such as home energy reports, whose effects vary depending on how well the individual fares in the social comparison (Allcott, 2011; Byrne et al., 2018; Ayres et al., 2013; Ferraro and Miranda, 2013; Ferraro and Price, 2013).

To estimate heterogeneous treatment effects, we add the interaction term of treatment assignment and attitude towards *Fridays for Future* to the regression Eq. (1):

$$Pr(y_i = 1) = \alpha + \beta_1 treat_i + \beta_2 FfF_i + \beta_3 treat_i \cdot FfF_i + \gamma^T x_i + \epsilon_i. \quad (2)$$

The heterogeneity of the treatment effects becomes evident from Table 4, where the reference category comprises subjects who had expressed a neutral attitude towards the *Fridays for Future* protests: Relative to participants who had expressed a neutral attitude, the treatment effect is about 6.5 (column (2)) to 7.5 (column (1)) percentage points stronger among subjects who had stated a negative attitude towards the *Fridays for Future* protests. By contrast, the effect is not significantly stronger for respondents who had stated a positive attitude, as becomes evident from the coefficient estimates on the interaction term consisting of the treatment indicator and the indicator of a positive attitude. However, Table 5 shows that the treatment effect is significantly different from zero for respondents who had stated a positive attitude.

At first glance, the strong treatment effect for participants with a negative a-priori attitude towards *Fridays for Future* may appear puzzling. However, with about 74%, the share of train vouchers is still lower among treated individuals with a negative attitude towards *Fridays for Future* than among untreated individuals with a positive or neutral attitude (81% and 75%, respectively, — see Table 5). This suggests that the majority of respondents with a positive attitude for whom taking the train is an option on their next trip already chose the train voucher without the treatment.

With Tables 6 and 7, we further demonstrate that the treatment effect among respondents with a negative attitude is at least partly driven by those who did not confirm their previously stated attitude when receiving the reminder treatment: First, with about 18% (Table 6), the share of respondents who did not confirm their attitude (rows "Revoke" and "No answer") is largest among those who had indicated a negative attitude, whereas it is smallest for those with a positive attitude (7.3%). Second, among those with a previously stated negative attitude, with a share of 77.5%, the proportion of train vouchers is higher for those who did not confirm the negative attitude than for those who confirmed it (73.6%) — see Table 7, where the share of train

Table 3
Results of a linear probability model on the likelihood to choose the train voucher.

	(1)		(2)		(3)		(4)	
	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.
Treatment	0.0387**	(0.0109)	0.0388**	(0.0108)	0.0434**	(0.0109)	0.0483**	(0.0123)
Positive attitude	–	–	0.0760**	(0.0137)	0.0171	(0.0147)	0.0744**	(0.0156)
Negative attitude	–	–	−0.0485**	(0.0157)	−0.0269	(0.0166)	−0.0519**	(0.0182)
Constant	0.7527**	(0.0079)	0.7328**	(0.0129)	0.6163**	(0.0495)	0.7341**	(0.0149)
Covariates	No		No		Yes		No	
Observations	5948		5948		4513		4513	
Adjusted R^2	0.002		0.019		0.221		0.020	

Note: * and ** indicate statistical significance at the 5% and 1% level, respectively. Covariates are gender, age, college degree, employment, income, household size, children, area of residence (urban/rural), distance to nearest airport, type of nearest airport, pro-environmental attitude, and frequency of air travel and long-distance trips by train. The number of observations decreases from column (2) to column (3) because of missing values in the covariates. Column (4) uses the same sample as column (3), but without controlling for covariates.

Table 4
Heterogeneous treatment effects by previously stated attitude towards *Fridays for Future* resulting from a linear probability model on the likelihood to choose the train voucher.

	(1)		(2)		(3)	
	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.
Treatment	0.0031	(0.0232)	0.0214	(0.0238)	0.0346	(0.0267)
Positive attitude	0.0620**	(0.0197)	0.0139	(0.0206)	0.0796**	(0.0228)
Negative attitude	−0.0866**	(0.0228)	−0.0592*	(0.0240)	−0.0833**	(0.0268)
Treatment * Positive attitude	0.0271	(0.0273)	0.0057	(0.0280)	−0.0107	(0.0312)
Treatment * Negative attitude	0.0753*	(0.0315)	0.0645*	(0.0320)	0.0624	(0.0364)
Constant	0.7511**	(0.0167)	0.6265**	(0.0514)	0.7410**	(0.0196)
Covariates	No		Yes		No	
Observations	5948		4513		4513	
Adjusted R^2	0.019		0.222		0.021	

Note: * and ** indicate statistical significance at the 5% and 1% level, respectively. The reference category are respondents with a neutral attitude towards *Fridays for Future*. Covariates are gender, age, college degree, employment, income, household size, children, area of residence (urban/rural), distance to nearest airport, type of nearest airport, pro-environmental attitude, and frequency of air travel and long-distance trips by train. The number of observations decreases from column (1) to column (2) because of missing values in the covariates. Column (3) uses the same sample as column (2), but without controlling for covariates.

Table 5
Results of t-tests on the likelihood to choose the train voucher. Treatment effects by attitude towards *Fridays for Future*.

Attitude towards	Treated		Control		Difference between
Fridays for Future	# Obs.	Share	# Obs.	Share	treated and control
Negative attitude	918	0.743	918	0.664	0.078**
Neutral attitude	712	0.754	675	0.751	0.003
Positive attitude	1366	0.843	1359	0.813	0.030*
Total	2996	0.791	2952	0.753	0.039**

Note: * and ** indicate statistical significance at the 5% and 1% level, respectively.

Table 6
Shares of respondents who confirm or revoke their previously stated attitude (Only treatment group).

	Confirm		Revoke		No answer		Total	
	# Obs.	Share	# Obs.	Share	# Obs.	Share	# Obs.	Share
Negative Attitude	758	0.826	134	0.146	26	0.028	928	1
Neutral Attitude	604	0.848	88	0.124	20	0.028	712	1
Positive Attitude	1279	0.936	38	0.028	49	0.036	1366	1
Total	2641	0.882	260	0.087	95	0.032	2996	1

Table 7
Share of respondents who choose the train voucher by whether respondents confirm or do not confirm their previously stated attitude (Only treatment group).

Attitude	Confirm		Do not confirm[a]		t-test		Total	
	# Obs.	Share	# Obs.	Share	Diff.	*p*-value	# Obs.	Share
Negative Attitude	558	0.736	124	0.775	0.039	0.307	682	0.743
Neutral Attitude	455	0.753	82	0.759	0.006	0.895	537	0.754
Positive Attitude	1085	0.848	67	0.770	−0.078	0.052	1152	0.843
Total	2098	0.794	273	0.769	−0.025	0.269	2371	0.791

[a] "Do not confirm" comprises respondents who actively revoked their previously stated attitude and those who chose the "no answer" option.

vouchers in the treatment group is broken down by the answer to the treatment question, that is, whether or not respondents confirm their previously stated attitude.

Although puzzling at first glance, we argue that the heterogeneous treatment effects are in line with the theories of moral balancing (Nisan and Horenczyk, 1990) and conscience accounting (Gneezy et al., 2014). According to these theories, individuals balance moral and immoral actions against each other, trying to maintain a satisfactory moral self-image (Ploner and Regner, 2013).[7] In other words, individuals are more likely to behave morally right after having violated a social norm and vice versa. As the public debate in Germany was dominated in the survey year 2019 by climate politics, and *Fridays for Future* received a lot of media coverage, expressing a negative attitude towards the protests may be interpreted as a violation of a social norm. When subjects of the treatment group are reminded of their violation of the social norm by previously stating a negative attitude towards *Fridays for Future*, respondents may feel guilty and may try to compensate the feeling of guilt by choosing the morally superior alternative for traveling, that is, the train. Similarly, they may refrain from confirming their attitude. By contrast, respondents who are reminded of their previously stated positive attitude towards *Fridays for Future* may conclude that they have already behaved morally and may, thus, feel less pressured by the prime to choose the morally superior transport mode. This can explain the large difference in treatment effects between the groups with a previously stated positive attitude and a previously stated negative attitude.

6. Discussion and conclusion

In this article, we have used an incentivized experiment to analyze whether individuals who are reminded of their attitude towards a pro-environmental movement are more likely to behave pro-environmentally thereafter. The experiment was embedded in a large-scale survey, in which nearly 6000 German household heads had to decide on whether they would prefer to win a voucher for a train ride or for a flight.

Exploiting the information about the identification with the environmentalist movement *Fridays for Future*, half of the sample was randomly assigned to a treatment group, whose subjects were reminded of their previously stated attitude towards *Fridays for Future* immediately before making their trip decision and were asked to actively confirm or revoke this attitude. We find that respondents who received a reminder of their previously stated attitude towards the *Fridays for Future* movement are significantly more likely to choose the environmentally benign transport mode, here the train rather than the plane, than respondents who do not receive a reminder.

Our results can be explained by the literature on identity, impure altruism, self-signaling, cognitive dissonance, and the theory of planned behavior, with the latter three concepts originating from psychology.[8] The theory of impure altruism (Andreoni, 1990, 1995) assumes that individuals not only derive material utility from a public good, but also obtain affective utility from their own contribution to the public good or disutility from creating a negative externality. In the context of our experiment, individuals derive *warm glow* from choosing the train and *cold prickle* from choosing the plane. The strength of these affections depends on the individual's awareness of the environmental externalities of her travel mode choice, which is reinforced by the reminder of her attitude towards *Fridays for Future*.

Self-signaling theory assumes that (i) individuals are not fully aware of their true moral identity, which they infer from their past actions, and (ii) individuals derive affective utility from having a positive self-image (Bénabou and Tirole, 2011; Bodner and Prelec, 2003; Bénabou and Tirole, 2016). Therefore, when deciding upon an action, in addition to material utility, an individual also takes into account the affective utility that results from the implications that an action has for the self-image (Bénabou and Tirole, 2011). In the context of our experiment, the more an individual cares about her self-image, because its salience was increased through an identity prime, the more likely she is to act in line with the values corresponding to her desired self-image.[9]

In a similar vein, pro-environmental behavior can serve to reduce cognitive dissonance, because the reminder treatment raised the respondents' awareness about the inner conflict between the morally appropriate behavior, i.e. taking the train, and the more convenient choice of taking the plane.[10]

The theory of planned behavior (Ajzen, 1991) posits that behavior is influenced by attitudes. Priming individuals with their own attitude – as we do with our reminder treatment – might lead to a temporarily stronger influence of attitudes on behavior. In the end, our empirical results suggest that to increase pro-environmental or, more generally, pro-social behavior, it may be sufficient to remind individuals of their own attitude.

While we see our article as a first step in this research direction, we strongly encourage its replication in both similar and different contexts, not least because outcomes are often context-dependent (Allcott, 2015; Dehejia et al., 2019; Vivalt, 2020). Therefore, the question arises as to whether our results are transferable to other pro-social behaviors, such as giving to charity, donating blood, or voting, and it might be a fruitful avenue for further research to investigate whether such behavior can be increased by reminding individuals of their attitude.

CRediT authorship contribution statement

Daniela Flörchinger: Writing – original draft, Writing – review & editing, Conceptualization, Methodology, Investigation, Formal analysis, Data curation. **Manuel Frondel:** Writing – review & editing, Conceptualization, Investigation, Methodology, Project administration, Funding acquisition. **Stephan Sommer:** Writing – review & editing, Conceptualization, Funding acquisition, Methodology, Project administration. **Mark A. Andor:** Writing – review & editing, Conceptualization, Funding acquisition.

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[7] The theory of moral balancing has been confirmed in numerous empirical studies — see e. g. Nisan and Horenczyk (1990), Monin and Miller (2001), Ploner and Regner (2013), Gneezy et al. (2014), as well as Blanken et al. (2015) for a meta-analysis.

[8] See Bem (1972) on the self-perception theory, Festinger (1962) on cognitive dissonance, as well as Ajzen (1991) on the theory of planned behavior.

[9] Self-image is a psychological concept denominating an individual's "[...] view or concept of oneself. [It] is a crucial aspect of an individual's personality that can determine [...] a sense of general well-being" (American Psychological Association, 2021).

[10] In Appendix A we provide a theoretical model embedding our analysis into the theories of self-signaling and cognitive dissonance.

Declaration of competing interest

The authors acknowledge financial support from the TRR 391: Spatio-temporal Statistics for the Transition of Energy and Transport (520388526) of the German Research Foundation (DFG), within Project C03, "Monitoring of the Mobility Transition: Data and Methods" and by the Federal Ministry of Education and Research (BMBF) under grant 03SFK5C0-2 (Kopernikus Project ARIADNE 2), and grant 01LA1823A (Project Eval-Map II). These sources of financial support are also stated in the funding statement of the article. The authors declare that they have no additional relevant or material financial interests that relate to the research described in this paper.

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Appendix A. Theoretical model

To theoretically analyze how priming influences the decision between a pro-social and a selfish action, we develop a straightforward three-period model. Sharing central assumptions of the model by Bénabou and Tirole (2011), our model of identity assumes that people care about "who they are" and infer their identity from past actions. The model is grounded in the theory of cognitive dissonance, because individuals have an incentive to choose an action that is in line with their desired self-view, just to avoid discrepancies between their actions and their self-image. Otherwise, such a discrepancy would lead to cognitive dissonance. Another central assumption is that individuals are uncertain about their moral identity, i. e. the strength of their moral concerns, and take their prior decisions as signals to make inferences about their true identity.

Our model entails several simplifications: While Bénabou and Tirole (2011) distinguish between numerous reasons of why individuals care about their self-image, our analysis is limited to the case of self-esteem, in which individuals intrinsically care about their identity. Pro-social behavior serves here as a signal about the individual's true identity, but does not contribute to the accumulation of social capital in subsequent periods. Similarly, an individual's belief about her identity has no impact on her behavior in subsequent periods. A further simplification is that we assume that utility is independent of the individual's true identity, which implies that the cost of pro-social behavior – in terms of a reduced material utility – is the same for everyone. Another difference is that we allow for the decision for an action and the action itself to take place in different time periods.

A.1. Model setup

In our three-period model (see Fig. A.1), at $t = 0$, individuals choose between a selfish and a pro-social action $a \in \{S, P\}$, where S designates the selfish and P the pro-social action for which it is common knowledge that it is socially preferable. Using the example from our empirical application, S corresponds to the flight and P to the train ride. The action may be implemented immediately or, as it is the case in our experiment, in a later time period $t = 2$, and it yields material utility $U(a)$. In $t = 1$ individuals experience affective utility $V(\hat{v})$ from their self-image $\hat{v}$. The affective utility $V(\hat{v})$ results from the individuals' intention to "be true to myself" in their decisions, to "maintain my integrity", to "not betray my values", to "be able to look at myself in the mirror", etc. (Bénabou and Tirole, 2011).

It is assumed that $U(S) > U(P)$ and, hence, rational individuals would choose $a = S$ if moral concerns and considerations about the self-image play no role at all, that is, if $V = 0$. By contrast, given that action P is socially preferable, a purely altruistic individual would always choose P.

For the sake of simplicity, it is assumed that there are only two possible levels of self-image, indicated by $\hat{v} \in \{v_L, v_H\}$ with $v_H > v_L$ and $v_H > 0$.

If an individual has chosen the pro-social option P, she will consider herself to be of the high-moral type v_H and if she has chosen the selfish action S, she will think of herself as the low-moral type v_L:

$$\hat{v}(P) = v_H > v_L = \hat{v}(S). \tag{A.1}$$

When deciding on which action to take, in addition to material utility U, individuals are supposed to take into account the affective utility V:

$$V(\hat{v}) \equiv s\hat{v}, \text{with } s > 0, \frac{\partial V}{\partial \hat{v}} > 0, \tag{A.2}$$

where the affective utility V depends on the self-image $\hat{v}$ that an individual has at $t = 1$ and s measures the importance of the self-image $\hat{v}$ for affective utility. s depends on the individual's awareness of identity considerations and is assumed to be situation-dependent, that is, it can be varied exogenously, for instance, by increasing the salience of social categories through priming, as it is done in our experiment with the reminder on the attitude towards *Fridays for Future*. Note that if self-image were to be completely irrelevant and, hence, $s = 0$, affective utility V would vanish. To rule out this extreme case, we assume $s > 0$.

Denoting total intertemporal utility evaluated a $t = 0$ by W, W is given by

$$W(a) \equiv \frac{V(\hat{v})}{1+r} + \frac{U(a)}{(1+r)^2}, \tag{A.3}$$

where $r > 0$ is the discount rate of future utility.

A.2. Behavior

At $t = 0$, a rational individual solves the intertemporal utility maximization problem

$$\max_{a \in \{S,P\}} W(a) \tag{A.4}$$

by comparing $W(S)$ and $W(P)$. The difference in intertemporal utility W between choosing action P and S yields the incentive I to behave pro-socially:

$$\begin{aligned} I &\equiv W(P) - W(S) \\ &= \frac{V\left(\hat{v}(P)\right)}{1+r} + \frac{U(P)}{(1+r)^2} - \left[\frac{V\left(\hat{v}(S)\right)}{1+r} + \frac{U(S)}{(1+r)^2}\right] \\ &= s\frac{v_H}{1+r} + \frac{U(P)}{(1+r)^2} - s\frac{v_L}{1+r} - \frac{U(S)}{(1+r)^2} \\ &= s\frac{[v_H - v_L]}{1+r} + \frac{U(P) - U(S)}{(1+r)^2}. \end{aligned} \tag{A.5}$$

If $I > 0$, there is an incentive to behave pro-socially and, hence, the individual chooses $a = P$. Otherwise, the individual chooses $a = S$. It becomes evident from Expression (A.5) that individuals are more likely to behave pro-socially the larger the material utility $U(P)$ from the pro-social action P is.

Incentive I can be interpreted as a function of the importance s of the self-image. The total differential ΔI of I is

$$\Delta I = \frac{\partial I}{\partial s} \cdot \Delta s = \frac{[v_H - v_L]}{1+r} \Delta s. \tag{A.6}$$

If $I < 0$ and ΔI is so large that $I + \Delta I > 0$, this implies a switch from the selfish action, $a = S$, to the pro-social action, $a = P$.

From Expression (A.6), the following proposition can be derived.

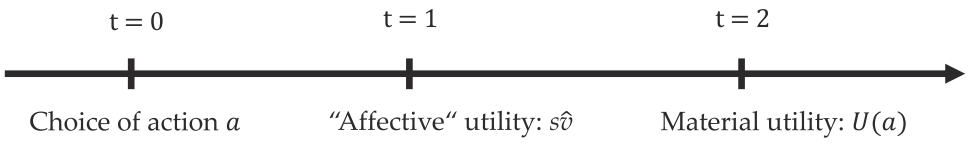

Fig. A.1. Timing of our three-period model.

Proposition: An individual is more likely to behave pro-socially the more important her self-image is for her affective utility V, that is, the larger s is.

Proof. From Expression (A.6) follows that if $\Delta s > 0$, then $\Delta I = \frac{(v_H - v_L)}{1+r}\Delta s > 0$, as $v_H > v_L$. □

Appendix B. Relevant survey questions

In addition to the survey questions, we received information on gender, age, municipality code and ZIP code.

A. General

Question A1: How many people, i.e. adults and children, are currently living permanently in your household?

- Numeric field (Allowed input: 1–19)
- No answer

IF HOUSEHOLD SIZE (A1) > 1

Question A2: How many children under 14 years are currently living in your household?

- Numeric field (Allowed input: 1–19)
- No answer

Question A11: How often do you take long-distance trips (500 km or more) by train?

- More than 5 times per year
- 3 to 5 times per year
- Once or twice per year
- Less than once per year
- Never
- Don't know/No answer

Question A12: How often do you travel by plane?

- More than 5 times per year
- 3 to 5 times per year
- Once or twice per year
- Less than once per year
- Never
- Don't know/No answer

Question A13: Currently, students in many cities are protesting for more climate protection every Friday during and outside school hours. What is your attitude towards these so-called "Fridays for Future" protests?

- (1) I don't like them at all
- (2) I don't like them
- (3) neither in favor nor I don't like them
- (4) I'm in favor
- (5) I'm totally in favor
- Don't know/No answer

Question A14: Please indicate the extent to which you agree with the following statements about the "Fridays for Future" protests.

Items (randomized):

a. Students have the right to protest for climate protection. However, this should not be done during school hours, but during their free time.
b. Students have the right to protest for climate protection during school hours as well. Otherwise, they would not get the necessary attention from politicians and the public.
c. The protests have an important political function. In this way, the students show that the children's future also depends on the climate policy decisions of today's adults and is thus a question of intergenerational justice.
d. The importance of the protests is overrated. Behavioral changes of the students for climate protection would be more important and effective.

Scale:

- fully agree
- rather agree
- neither agree nor disagree
- rather disagree
- fully disagree
- don't know/no answer

KOMP. Experiment

Question KOMP1: Do you plan to take a private trip within the next year using either the train or the plane? (Note: Please do not consider a trip where you would take a car (either as a driver or passenger) or a bus).

- Yes
- No
- Don't know/ No answer

If respondent is in the treatment group FfF:

Question KOMP2: *Filtering into different groups depending on answer to Question A13.*

For participants who answered Question A13 with 1 or 2.

Would you agree that, overall, you do not support the "Fridays for Future" movement?

- Yes
- No
- Don't know/ No answer

For participants who answered Question A13 with 3.

Would you agree that, overall, you have a neutral attitude towards the "Fridays for Future" movement?

- Yes
- No
- Don't know/ No answer

For participants who answered Question A13 with 4 or 5.

Would you agree that, overall, you support the "Fridays for Future" movement?

- Yes
- No
- Don't know/ No answer

If KOMP1 = Yes

In the following, you can win a travel voucher worth 40 euros for your upcoming trip. The winners will be selected randomly. One out of 50 respondents will receive a voucher. You can choose whether you would prefer to receive a flight voucher or a rail voucher for your trip, should you be one of the winners. Flight vouchers can be redeemed via the Flightgift website with more than 300 different airlines, while rail vouchers can be redeemed with *Deutsche Bahn AG*.

If KOMP1 = No

Imagine that you are planning to take a private trip using either the train or the plane. In the following, you can win a travel voucher worth 40 euros for your upcoming trip. The winners will be selected randomly. One out of 50 respondents will receive a voucher. You can choose whether you would prefer to receive a flight voucher or a rail voucher for your trip, should you be one of the winners. Flight vouchers can be redeemed via the Flightgift website with more than 300 different airlines, while rail vouchers can be redeemed with *Deutsche Bahn AG*.

For everyone:

Question KOMP3: If you are among the winners, which voucher do you choose?

- Flight voucher worth 40 euros
- Train voucher worth 40 euros

PV: Psychological Control Variables

The order of questions in this section was randomized

Now we would like to ask you some more questions about the environment in general.

Question KU3

To what extent do you personally agree with the following statements?

Scale:

- Fully agree (5)
- Rather agree (4)
- Neither agree nor disagree (3)
- Rather disagree (2)
- Fully disagree (1)
- Don't know/no answer

Items (randomized):

a. It worries me to think about the environmental conditions our children and grandchildren will probably have to live in.
b. There are natural limits to growth that our industrialized world has long since reached or exceeded.
c. Environmental protection should be a priority for Germany, even if it interferes with economic growth.
d. In order to preserve our natural resources, we must all be prepared to limit our standard of living.
e. Through targeted tax and other measures, the state should ensure that more environmentally friendly and less environmentally harmful things are produced.
f. When buying food and beverages, I regularly buy organic products.
g. I am regularly involved in environmental protection and nature conservation.

SOE. Socioeconomic Characteristics

Finally, please answer a few questions about yourself. Your data will be treated absolutely confidentially in accordance with the data protection regulations.

Question SO2: What is your highest vocational training or (technical) college degree?

- No degree
- Apprenticeship or vocational internship of at least 12 months
- Vocational preparation year
- Apprenticeship, vocational training in the dual system
- Preparatory service for the intermediate civil service in public administration
- Vocational qualification from a vocational school/college, completion of a 1-year school in the healthcare sector
- 2- or 3-year school of health care
- Technical college degree (master craftsman, technician or equivalent degree)
- Vocational academy, technical academy
- Degree from a university of applied administrative sciences
- University of applied sciences degree, also engineering degree
- Degree from a university, scientific college, art college
- Doctorate
- No answer

Question SO3: Which of the following applies to you? Please select only one answer option.

- I am employed or working (incl. trainees, persons on parental leave or partial retirement)
- I am a pupil
- I am a student
- I am a pensioner or retiree
- I live from income from capital assets, renting or leasing
- I receive maintenance/allowances from my spouse, partner, parents, relatives or other persons — including persons from outside the household.
- I am a housewife/ husband or take care of children and/or persons in need of care.
- I receive unemployment benefit I
- I receive unemployment benefit II or social benefits (Hartz IV benefits)
- I receive social welfare or basic income support in old age or in case of reduced earning capacity
- None of the above options applies to me
- No answer

Question SO6: What is the total monthly net income of your household? This is the sum of wages, salaries, income from self-employment, or pensions after deduction of taxes and social security contributions. Please also include income from public assistance, income from renting, leasing, housing allowance, child benefit and other income.

- less than 700 Euro
- 700 to less than 1200 Euro
- 1200 to less than 1700 Euro
- 1700 to less than 2200 Euro
- 2200 to less than 2700 Euro
- 2700 to less than 3200 Euro
- 3200 to less than 3700 Euro
- 3700 to less than 4200 Euro
- 4200 to less than 4700 Euro
- 4700 to less than 5200 Euro
- 5200 to less than 5700 Euro
- 5700 Euro and more
- No answer

Question SO8: In Germany, many people tend to vote for a particular political party for a long time, although they also vote for different parties from time to time. How about you: Are you – in general – inclined toward a particular party? And if so, which one?

- CDU/CSU
- SPD
- AfD
- FDP
- The Left Party
- Bündnis 90/The Greens
- Another party
- No party
- Don't know/no answer

Appendix C. Figures

See Figs. C.1 and C.2.

Appendix D. Tables

See Tables D.1–D.13.

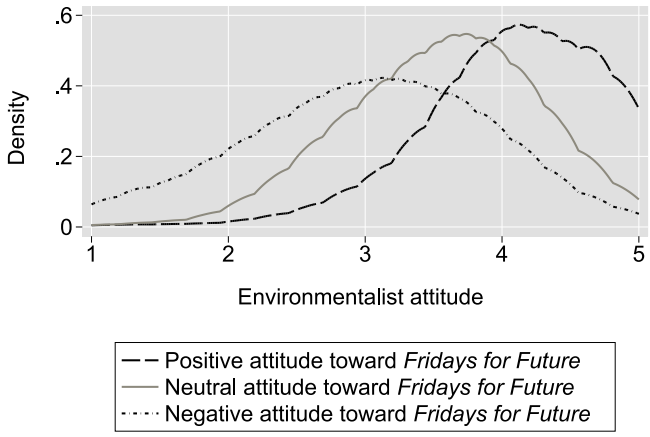

Fig. C.1. General pro-environmentalist attitude by attitude towards *Fridays for Future*.

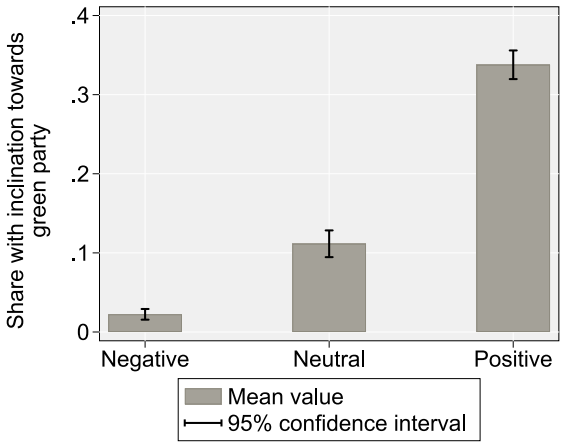

Fig. C.2. Inclination towards Green Party by attitude towards *Fridays for Future*.

Table D.1
Variable descriptions — Experimental variables.

Variable	Question	Description
Treatment		Dummy variable indicating whether the participant is in the treatment group.
FFF Attitude	A13	Categorical variable indicating whether the participant has a positive (is totally in favor, is in favor), neutral (is neither in favor nor does not like them), or negative (does not like them, does not like them at all) attitude toward the "Fridays for Future" protests.
FFF Confirm	KOMP2	Dummy variable indicating whether the participant confirms their attitude expressed in question A13 toward "Friday for Future" protest after receiving treatment.
FFF Revoke	KOMP2	Dummy variable indicating whether the participant revokes their attitude expressed in question A13 toward "Friday for Future" protest after receiving treatment.
FFF No Answer	KOMP2	Dummy variable indicating whether the participant neither confirms nor revokes their attitude expressed in question A13 toward "Friday for Future" protest after receiving treatment.
Train Voucher	KOMP3	Dummy variable indicating whether the participant prefers a train voucher worth 40€ over a flight voucher.

Table D.2
Variable descriptions — Socio-economics.

Variable	Question	Description
College Degree	SO2	Dummy variable indicating whether the participant visited a vocational or technical academy, holds a degree from a university (of applied sciences), scientific or art college, an engineering degree or a doctorate.
Employed	SO3	Dummy variable indicating whether the participant is employed or working (incl. trainees, persons on parental leave or partial retirement).
Household income	SO6	Categorical variable indicating the participant's monthly net household income. Differentiation between low (below 1200€), medium (between 1200€ and 2700€), high (2700€ and 4200€) and very high (above 4200€) income.
Household Size	A1	Numeric variable indicating how many persons live in the participant's household.
Child < 14 years	A2	Dummy variable indicating whether a child below the age of 14 lives in the participant's household.
Green Party	SO8	Dummy variable indicating whether the participant is – in general – inclined toward the party Bündnis 90/The Greens.
Age		Numeric variable indicating the participant's age.
Female		Dummy variable indicating whether the participant is a woman.
Area of Residence		Categorical variable indicating whether the municipality the participant resides in is considered urban, peri-urban or rural.
Distance to Airport		Numerical variable indicating the Euclidean distance between the centroid of the participant's municipality and the nearest airport.
Large Airport		Dummy variable indicating whether the nearest airport is large.

Table D.3
Variable descriptions — General questions and attitudes towards *Fridays for Future*.

Variable	Question	Description
Flyers	A12	Dummy variable indicating whether individuals sometimes travel by plane.
Students should protest only in free time	A14	Categorical variable indicating whether the participant agrees (fully, rather), neither agrees nor disagrees, or disagrees (rather, totally) that students have a right to protest, but only in their free time.
OK to Skip Class	A14	Categorical variable indicating whether the participant agrees (fully, rather), neither agrees nor disagrees, or disagrees (rather, totally) that students have a right to protest during school hours as well.
Question of intergenerational justice	A14	Categorical variable indicating whether the participant agrees (fully, rather), neither agrees nor disagrees, or disagrees (rather, totally) that the FFF protests have an important political function as climate policy is a question of intergenerational justice.
Students should rather change their own behavior	A14	Categorical variable indicating whether the participant agrees (fully, rather), neither agrees nor disagrees, or disagrees (rather, totally) that the importance of the protests is overrated and students should rather change their own behavior.

Table D.4
Variable descriptions — Psychological controls.

Variable	Question	Description
Environ. Attitude	KU3 Items a, b, c, d	Numeric variable summarizing the participant's agreement to the following statements: *"It worries me to think about the environmental conditions our children and grandchildren will probably have to live in."*, *"There are natural limits to growth that our industrialized world has long since reached or exceeded."*, *"Environmental protection should be a priority for Germany, even if it interferes with economic growth."*, *"In order to preserve our natural livelihoods, we must all be prepared to limit our standard of living."*. Variable is the mean of agreement with these four statements, where "fully agree" is coded as 5, "rather agree" is coded as 4, "neither agree nor disagree" is coded as 3, "rather disagree" is coded as 2, and "fully disagree is coded as 1. The items are taken from Diekmann and Preisendörfer (2003).

Table D.5
Comparison of the sample with the German population.

	Sample	Germany (2019)
Female	0.418	0.505
At least technical college	0.327	0.281
Employed	0.516	0.519
Age:		
< 25 years	0.021	0.240
25–35 years	0.093	0.127
35–45 years	0.130	0.126
45–55 years	0.182	0.149
55–65 years	0.226	0.150
≥ 65 years	0.348	0.209
Household size:		
1 person	0.269	0.212
2 persons	0.473	0.333
3 persons	0.136	0.179
4 persons	0.090	0.183
≥ 5 persons	0.031	0.093
Net household income:		
Income < 1700 euros	0.182	0.305
Income 1700–3200 euros	0.375	0.361
Income ≥ 3200 euros	0.443	0.334

Data for the German population is drawn from Destatis (2020).

Table D.6
Means of a variety of attitudes towards the *Fridays for Future* movement for respondents in estimation sample with covariates (models (3) and (4) in Table 3).

	Whole sample		In Est. sample with Cov.		Not in Est. sample with Cov.		*t*-statistic
	# Obs.	Mean	# Obs.	Mean	# Obs.	Mean	
Train voucher	5948	0.772	4513	0.778	1435	0.754	−1.886
Attitude towards Fridays for Future:	*5948*		*4513*		*1435*		
Negative attitude		0.309		0.300		0.337	2.694
Neutral attitude		0.233		0.228		0.250	1.747
Positive attitude		0.458		0.473		0.413	−3.984
Should protest only in free time:	*5914*		*4500*		*1414*		
disagree		0.274		0.287		0.231	−4.130
neutral		0.083		0.084		0.080	−0.486
agree		0.643		0.629		0.689	4.124
OK to skip classes:	*5913*		*4501*		*1412*		
disagree		0.490		0.477		0.532	3.587
neutral		0.097		0.096		0.100	0.380
agree		0.412		0.426		0.368	−3.872
Question of intergenerational justice:	*5912*		*4498*		*1414*		
disagree		0.144		0.143		0.144	0.082
neutral		0.111		0.108		0.120	1.272
agree		0.745		0.749		0.736	−0.983
Students should rather change own behavior:	*5896*		*4489*		*1407*		
disagree		0.286		0.301		0.241	−4.320
neutral		0.146		0.144		0.153	0.783
agree		0.567		0.555		0.606	3.380

Note: t statistics for testing the equality of means between respondents included in the estimation sample with covariates and those not included are reported in last column.

Table D.7
Means of socio-demographic characteristics for respondents in estimation sample with covariates (models (3) and (4) in Table 3).

	Whole sample		In Est. sample with Cov.		Not in Est. sample with Cov.		*t*-statistic
	# Obs.	Mean	# Obs.	Mean	# Obs.	Mean	
Female	5607	0.418	4513	0.395	1094	0.510	6.947
Age	5607	56.316	4513	56.328	1094	56.268	−0.114
At least technical college	5444	0.327	4513	0.334	931	0.295	−2.283
Employed	5571	0.516	4513	0.521	1058	0.495	−1.517
Children < 14 years in household	5882	0.151	4513	0.150	1369	0.154	0.352
Distance to nearest airport	5939	34.23	4513	34.17	1426	34.40	0.331
Flyers	5948	0.696	4513	0.695	1435	0.696	0.060
Environmentalist attitude	5349	3.647	4513	3.660	836	3.579	−2.441
Inclination towards Green party	5380	0.192	4408	0.202	972	0.149	−3.764
Area of residence:	*5897*		*4513*		*1384*		
Urban area		0.359		0.361		0.354	−0.454
Peri-urban area		0.432		0.426		0.451	1.642
Rural area		0.209		0.213		0.195	−1.464

(*continued on next page*)

Table D.7 (*continued*).

	Whole sample		In Est. sample with Cov.		Not in Est. sample with Cov.		*t*-statistic
	# Obs.	Mean	# Obs.	Mean	# Obs.	Mean	
Size of nearest airport:	*5939*		*4513*		*1426*		
Large airport		0.710		0.710		0.711	0.098
Medium airport		0.290		0.290		0.289	−0.098
Household size:	*5929*		*4513*		*1416*		
1 person		0.269		0.281		0.232	−3.639
2 persons		0.473		0.472		0.475	0.203
3 persons		0.136		0.130		0.156	2.489
4 persons		0.090		0.086		0.105	2.230
≥ 5 persons		0.031		0.031		0.032	0.101
Net household income:	*4939*		*4513*		426		
Income < 1200 Euro		0.076		0.074		0.094	1.447
Income 1200–2700 Euro		0.361		0.356		0.415	2.460
Income 2700–4200 Euro		0.337		0.341		0.298	−1.772
Income ≥ 4200		0.226		0.229		0.192	−1.738

Note: t statistics for testing the equality of means between respondents included in the estimation sample with covariates and those not included are reported in the last column. Environmentalist attitude is an index variable of items a, b, c, and d of Question KU3.

Table D.8
χ^2-test of relationship between treatment status and voucher choice.

	# Obs.	%
Control group		
Flight voucher	730	24.729
Train voucher	2222	75.271
Total	2952	100
Treatment group		
Flight voucher	625	20.861
Train voucher	2371	79.139
Total	2996	100
χ^2	12.645	
p-value	0.000	

Table D.9
Results of a Linear Probability Model (LPM) on the likelihood to choose the train voucher.

	(1)		(2)		(3)		(4)	
Treatment	0.0387**	(0.0109)	0.0388**	(0.0108)	0.0434**	(0.0109)	0.0483**	(0.0123)
Positive attitude	–	–	0.0760**	(0.0137)	0.0171	(0.0147)	0.0744**	(0.0156)
Negative attitude	–	–	−0.0485**	(0.0157)	−0.0269	(0.0166)	−0.0519**	(0.0182)
Constant	0.7527**	(0.0079)	0.7328**	(0.0129)	0.6163**	(0.0495)	0.7341**	(0.0149)
Female	–	–	–	–	0.0154	(0.0114)	–	–
Age	–	–	–	–	0.0019**	(0.0005)	–	–
College degree	–	–	–	–	0.0169	(0.0123)	–	–
Employed	–	–	–	–	−0.0165	(0.0145)	–	–
Child younger 14	–	–	–	–	−0.0451	(0.0239)	–	–
Peri-urban area	–	–	–	–	−0.0351**	(0.0130)	–	–
Rural area	–	–	–	–	−0.0441**	(0.0168)	–	–
Distance to airport	–	–	–	–	0.0000	(0.0000)	–	–
Large airport	–	–	–	–	−0.0509**	(0.0119)	–	–
Environ. attitude	–	–	–	–	0.0462**	(0.0078)	–	–
Net household income:								
Medium income	–	–	–	–	0.0178	(0.0199)	–	–
High income	–	–	–	–	−0.0095	(0.0227)	–	–
Very high income	–	–	–	–	−0.0021	(0.0257)	–	–
Household size:								
2 persons	–	–	–	–	0.0083	(0.0150)	–	–
3 persons	–	–	–	–	0.0157	(0.0231)	–	–
4 persons	–	–	–	–	0.0418	(0.0302)	–	–
5+ persons	–	–	–	–	0.1163**	(0.0365)	–	–
Frequency of air travel:								
Flights: < 1 per year	–	–	–	–	−0.1418**	(0.0118)	–	–
Flights: 1–2 per year	–	–	–	–	−0.3820**	(0.0160)	–	–
Flights: 3–5 per year	–	–	–	–	−0.4919**	(0.0321)	–	–
Flights: > 5 per year	–	–	–	–	−0.5432**	(0.0600)	–	–
Frequency of long-distance trips by train:								
Train: < 1 per year	–	–	–	–	0.1034**	(0.0138)	–	–
Train: 1–2 per year	–	–	–	–	0.1824**	(0.0150)	–	–
Train: 3–5 per year	–	–	–	–	0.2039**	(0.0235)	–	–
Train: > 5 per year	–	–	–	–	0.2852**	(0.0429)	–	–
Observations	5948		5948		4513		4513	
Adjusted R^2	0.002		0.019		0.221		0.020	

Note: * and ** indicate statistical significance at the 5% and 1% level, respectively. The number of observations decreases from column (2) to column (3) because of missing values in the covariates. Column (4) uses the same sample as column (3), but without controlling for covariates.

Table D.10
Average marginal effects from a logit estimation on the likelihood to choose the train voucher.

	(1)		(2)		(3)		(4)	
	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.
Treatment	0.0387**	(0.0109)	0.0388**	(0.0108)	0.0412**	(0.0108)	0.0483**	(0.0122)
Positive attitude	–	–	0.0760**	(0.0137)	0.0207	(0.0142)	0.0744**	(0.0156)
Negative attitude	–	–	−0.0484**	(0.0157)	−0.0232	(0.0155)	−0.0518**	(0.0182)
Female	–	–	–	–	0.0170	(0.0115)	–	–
Age	–	–	–	–	0.0020**	(0.0005)	–	–
College degree	–	–	–	–	0.0119	(0.0119)	–	–
Employed	–	–	–	–	−0.0163	(0.0145)	–	–
Child younger 14	–	–	–	–	−0.0381	(0.0218)	–	–
Peri-urban area	–	–	–	–	−0.0381**	(0.0126)	–	–
Rural area	–	–	–	–	−0.0489**	(0.0170)	–	–
Distance to airport	–	–	–	–	0.0000	(0.0000)	–	–
Large airport	–	–	–	–	−0.0494**	(0.0119)	–	–
Environ. attitude	–	–	–	–	0.0439**	(0.0071)	–	–
Net household income:								
Medium income	–	–	–	–	0.0209	(0.0258)	–	–
High income	–	–	–	–	−0.0031	(0.0272)	–	–
Very high income	–	–	–	–	0.0102	(0.0292)	–	–
Household size:								
2 persons	–	–	–	–	0.0048	(0.0155)	–	–
3 persons	–	–	–	–	0.0123	(0.0227)	–	–
4 persons	–	–	–	–	0.0301	(0.0286)	–	–
5+ persons	–	–	–	–	0.1005**	(0.0306)	–	–
Frequency of air travel:								
Flights: < 1 per year	–	–	–	–	−0.1280**	(0.0107)	–	–
Flights: 1–2 per year	–	–	–	–	−0.3754**	(0.0154)	–	–
Flights: 3–5 per year	–	–	–	–	−0.4824**	(0.0315)	–	–
Flights: > 5 per year	–	–	–	–	−0.5410**	(0.0607)	–	–
Frequency of long-distance trips by train:								
Train: < 1 per year	–	–	–	–	0.1071**	(0.0137)	–	–
Train: 1–2 per year	–	–	–	–	0.1770**	(0.0140)	–	–
Train: 3–5 per year	–	–	–	–	0.1935**	(0.0209)	–	–
Train: > 5 per year	–	–	–	–	0.2436**	(0.0254)	–	–
Observations	5948		5948		4513		4513	

Note: * and ** indicate statistical significance at the 5% and 1% level, respectively. The number of observations decreases from column (2) to column (3) because of missing values in the covariates. Column (4) uses the same sample as column (3), but without controlling for covariates.

Table D.11
Results of a Linear Probability Model (LPM) on the likelihood to choose the train voucher — Reduced samples.

	(1)		(2)		(3)	
	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.
Treatment	0.0492**	(0.0116)	0.0518**	(0.0117)	0.0439**	(0.0110)
Positive attitude	0.0727**	(0.0149)	0.0765**	(0.0150)	0.0757**	(0.0140)
Negative attitude	−0.0516**	(0.0172)	−0.0479**	(0.0173)	−0.0488**	(0.0162)
Constant	0.8040**	(0.0228)	0.7304**	(0.0143)	0.7331**	(0.0133)
Medium income	−0.0260	(0.0202)	–	–	–	–
High income	−0.0855**	(0.0209)	–	–	–	–
Very high income	−0.1377**	(0.0224)	–	–	–	–
Observations	4939		4939		5607	
Adjusted R^2	0.033		0.021		0.019	

Note: * and ** indicate statistical significance at the 5% and 1% level, respectively. Column (2) contains the same observations as column (1), but without controlling for income. Column (3) contains respondents who completed the entire questionnaire, irrespective of whether they chose the "no answer"-option in any question.

Table D.12
Results of a Linear Probability Model (LPM) on the likelihood to choose the train voucher. Heterogeneous treatment effects by previously stated attitude towards *Fridays for Future*.

	(1)		(2)		(3)	
	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.
Treatment	0.0031	(0.0232)	0.0214	(0.0238)	0.0346	(0.0267)
Positive attitude	0.0620**	(0.0197)	0.0139	(0.0206)	0.0796**	(0.0228)
Negative attitude	−0.0866**	(0.0228)	−0.0592*	(0.0240)	−0.0833**	(0.0268)
Treatment * Positive attitude	0.0271	(0.0273)	0.0057	(0.0280)	−0.0107	(0.0312)
Treatment * Negative attitude	0.0753*	(0.0315)	0.0645*	(0.0320)	0.0624	(0.0364)
Constant	0.7511**	(0.0167)	0.6265**	(0.0514)	0.7410**	(0.0196)
Female	–	–	0.0153	(0.0114)	–	–
Age	–	–	0.0019**	(0.0005)	–	–
College degree	–	–	0.0168	(0.0123)	–	–
Employed	–	–	−0.0164	(0.0145)	–	–
Child younger 14	–	–	−0.0440	(0.0238)	–	–
Peri-urban area	–	–	−0.0357**	(0.0130)	–	–
Rural area	–	–	−0.0436**	(0.0168)	–	–
Distance to airport	–	–	0.0000	(0.0000)	–	–
Large airport	–	–	−0.0517**	(0.0119)	–	–
Environ. attitude	–	–	0.0465**	(0.0078)	–	–
Net household income:						
Medium income	–	–	0.0174	(0.0200)	–	–
High income	–	–	−0.0106	(0.0227)	–	–
Very high income	–	–	−0.0029	(0.0258)	–	–
Household size:						
2 persons	–	–	0.0091	(0.0150)	–	–
3 persons	–	–	0.0161	(0.0231)	–	–
4 persons	–	–	0.0410	(0.0301)	–	–
5+ persons	–	–	0.1169**	(0.0365)	–	–
Frequency of air travel:						
Flights: < 1 per year	–	–	−0.1415**	(0.0118)	–	–
Flights: 1–2 per year	–	–	−0.3814**	(0.0160)	–	–
Flights: 3–5 per year	–	–	−0.4900**	(0.0321)	–	–
Flights: > 5 per year	–	–	−0.5418**	(0.0607)	–	–
Frequency of long-distance trips by train:						
Train: < 1 per year	–	–	0.1031**	(0.0138)	–	–
Train: 1–2 per year	–	–	0.1821**	(0.0150)	–	–
Train: 3–5 per year	–	–	0.2033**	(0.0235)	–	–
Train: > 5 per year	–	–	0.2839**	(0.0427)	–	–
Observations	5948		4513		4513	
Adjusted R^2	0.019		0.222		0.021	

Note: * and ** indicate statistical significance at the 5% and 1% level, respectively. The reference category are respondents with a neutral attitude towards *Fridays for Future*. The number of observations decreases from column (1) to column (2) because of missing values in the covariates. Column (3) uses the same sample as column (2), but without controlling for covariates.

Table D.13
Average marginal effects from a logit estimation on the likelihood to choose the train voucher. Heterogeneous treatment effects by previously stated attitude towards *Fridays for Future*.

	(1)		(2)		(3)	
	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.
Positive attitude	0.0762**	(0.0137)	0.0267	(0.0142)	0.0741**	(0.0156)
Negative attitude	−0.0472**	(0.0158)	−0.0211	(0.0156)	−0.0500**	(0.0182)
Treatment effect:						
At positive attitude	0.0302*	(0.0144)	0.0257	(0.0163)	0.0239	(0.0161)
At neutral attitude	0.0031	(0.0232)	0.0212	(0.0218)	0.0347	(0.0267)
At negative attitude	0.0784**	(0.0212)	0.0771**	(0.0195)	0.0970**	(0.0246)
Female	–	–	0.0171	(0.0114)	–	–
Age	–	–	0.0020**	(0.0005)	–	–
College degree	–	–	0.0119	(0.0119)	–	–
Employed	–	–	−0.0162	(0.0145)	–	–
Child younger 14	–	–	−0.0371	(0.0217)	–	–
Peri-urban area	–	–	−0.0389**	(0.0126)	–	–
Rural area	–	–	−0.0486**	(0.0170)	–	–
Distance to airport	–	–	0.0000	(0.0000)	–	–
Large airport	–	–	−0.0498**	(0.0119)	–	–
Environ. attitude	–	–	0.0441**	(0.0071)	–	–
Net household income:						
Medium income	–	–	0.0212	(0.0258)	–	–
High income	–	–	−0.0037	(0.0273)	–	–
Very high income	–	–	0.0097	(0.0293)	–	–
Household size:						
2 persons	–	–	0.0054	(0.0155)	–	–
3 persons	–	–	0.0131	(0.0227)	–	–
4 persons	–	–	0.0289	(0.0286)	–	–
5+ persons	–	–	0.1015**	(0.0307)	–	–
Frequency of air travel:						
Flights: < 1 per year	–	–	−0.1279**	(0.0107)	–	–
Flights: 1–2 per year	–	–	−0.3751**	(0.0154)	–	–
Flights: 3–5 per year	–	–	−0.4795**	(0.0316)	–	–
Flights: > 5 per year	–	–	−0.5391**	(0.0615)	–	–
Frequency of long-distance trips by train:						
Train: < 1 per year	–	–	0.1067**	(0.0137)	–	–
Train: 1–2 per year	–	–	0.1768**	(0.0140)	–	–
Train: 3–5 per year	–	–	0.1934**	(0.0208)	–	–
Train: > 5 per year	–	–	0.2424**	(0.0256)	–	–
Observations	5948		4513		4513	

Note: * and ** indicate statistical significance at the 5% and 1% level, respectively. The reference category are respondents with a neutral attitude towards *Fridays for Future*. The number of observations decreases from column (1) to column (2) because of missing values in the covariates. Column (3) uses the same sample as column (2), but without controlling for covariates.

Data availability

Data will be made available on request.

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