

## Donations to renewable energy projects: The role of social norms and donor anonymity



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### ABSTRACT

This paper shows that interventions based on social norms and on increasing the visibility of people's decisions to others ("decision observability") present promising pathways of generating public support for renewable energy development. In a laboratory experiment ( $n = 300$ ), we show that social norms and decision observability increase support for renewable energy, even at a financial cost to oneself: When exposed to pro-environmental social norms, participants donated 35% more money to an existing renewable energy initiative than participants in the control condition (Cohen's  $d = 0.35$ ). Participants whose decisions were observable to others donated 23% more compared to control ( $d = 0.23$ ). And participants exposed to both treatments (their decisions being observed by others and learning about norms) donated 69% more compared to control ( $d = 0.67$ ). In addition, our treatments had a positive effect on participants' post-decisional emotions of happiness and pride, which partly alleviates existing concerns about possible adverse side-effect of social influence interventions. Suggestions for policy makers and for future research in this area are presented.

### 1. Introduction

The use of electricity from renewable sources, widespread adoption of low-carbon technologies, as well as garnering citizen support for renewable energy development and for phasing out of fossil fuels represent some of the cornerstones of climate protection policies (Ivanova et al., 2020). To contribute to the understanding of what factors drive support for renewable energy, we focus on the example of citizen financial support for the development of solar energy in their region via voluntary donations to a local renewable energy initiative.

Consumer adoption of residential solar as well as community-led development of small-scale renewable power generation are becoming important topics in the scientific and policy discourse (Wolske et al., 2017, 2018; Bollinger et al., 2020; Hess and Lee, 2020). Our study of voluntary donations in support of the development of renewable energy fits squarely into this context. We examine two potential drivers of people's decisions to support renewable energy via donations: normative influence (Bergquist et al., 2019) and reputational influence associated with other people being able to observe one's choices (Bradley

et al., 2018). We also explore whether the two forces interact, specifically whether normative influences may become more powerful in the presence of reputational concerns due to others observing one's decisions (Vesely and Klöckner, 2018).

As we review in more detail in section 1.1, the role of social norms in motivating pro-environmental behavior has been studied extensively (Bergquist et al., 2019; Buckley, 2020), and in fact, social norm messaging became a key element in many large-scale policy interventions promoting household energy conservation during the past decade (Jachimowicz et al., 2018; Buckley, 2020). Normative messages have been occasionally used also to promote consumer uptake of low-carbon technologies (Bollinger et al., 2020). And also relevant to our study, the literature on charitable giving shows that social norms can often motivate people to donate (e.g., Shang and Croson, 2009; Agerström et al., 2016).

The role of decision observability (whether one's decisions can be observed by others) has been studied extensively in the broader literature on pro-social and altruistic behavior (see Bradley et al., 2018 for a review). However, it so far attracted only relatively limited attention

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from researchers studying environmental behavior (see section 1.2 below for an overview). Decision observability and the associated reputational concerns likely have relevance to both pro-social and pro-environmental behavior, as the initial evidence from the environmental domain seems to suggest (e.g., Griskevicius et al., 2010; Vesely and Klöckner, 2018), although additional research is needed to ascertain this more firmly.

We contribute to these literatures by examining whether norms and decision observability can foster voluntary donations (a form of costly support) to promote local development of renewable energy generation. We also explore whether the two factors interact in influencing decisions, which has only been examined in a handful of studies (e.g., Ernest-Jones et al., 2011; Bateson et al., 2013; Vesely and Klöckner, 2018), despite the intuitive appeal of the notion that people become more norm-compliant when others can observe them and can thus potentially sanction non-compliance.

Finally, we also explore how people feel about their decisions following the exposure to norms or to others' scrutiny. For instance, are people exposed to normative pressure happy about their choices? Does being observed by others make people more or less satisfied with their choices? While such questions appear to have great practical relevance, as policy makers may well be reluctant to implement behavioral interventions that could make people hostile, hopeless or fearful, there is so far only a handful of studies addressing the issue of behavioral interventions' impact on people's emotions (see Allcott and Kessler, 2019; Leoniak and Cwalina, 2019 and section 1.3 below).

We conduct a tightly controlled laboratory experiment testing the effects of social norms and decision observability on financial donations to a renewable energy initiative. The results are encouraging in that both social norms and decision observability (participants' decisions being observable to others) increase donations, and we moreover find that this in turn leads to participants experiencing positive emotions of happiness and pride (even though slight feelings of regret are present as well). The fact that we exogenously manipulated both observability and norms and that we were able to measure actual, consequential behavior with precision enhances the validity of our findings (Kormos and Gifford, 2014; Lange and Dewitte, 2019).

### 1.1. Social norms

Social norms are becoming a popular tool for promoting energy and resource conservation (Schultz et al., 2007, 2016; Allcott, 2011; Delmas et al., 2013; Buckley, 2020). Norms can also increase people's willingness to purchase or generate electricity from renewable sources (Wiser, 2007; Ek and Söderholm, 2008; Graziano and Gillingham, 2014; Korcak et al., 2015; Kalkbrenner and Roosen, 2016; Wolske et al., 2017, 2018; Curtius et al., 2018; Parkins et al., 2018) and they shape many other environmentally relevant behaviors as well (for meta-analyses see Bamberg and Möser, 2007; Klöckner, 2013; Bergquist et al., 2019). However, as outlined below, normative influence is not necessarily uniform in strength across contexts and people: some people may be more responsive to norms and some contexts may make people more norm-compliant.

The impact of social norms on environmentally relevant behavior can depend on the norm target's individual characteristics, including the target's baseline behavior levels (Schultz et al., 2007, 2016; Allcott, 2011), personal norms (Schultz et al., 2016; Wan et al., 2017), attitudes (Huffman et al., 2014; Wan et al., 2017), issue involvement (Göckeritz et al., 2010; Lapinski et al., 2017), self-identity (Lapinski et al., 2017), and identification with the norm source (Masson and Fritzsche, 2014; Fritzsche et al., 2018). People who identify themselves with the norm source, for example, are more likely to follow the norm in question (Terry et al., 1999; Fielding et al., 2008; White et al., 2009; Masson and Fritzsche, 2014; De Dominicis et al., 2019).

Similarly, the power of norms may depend on contextual factors such as behavior costs (Andersson and von Borgstede, 2010; Sudarshan,

2017; Drews et al., 2020), perceived threat to the self (Fritzsche et al., 2010), and decision observability (Ernest-Jones et al., 2011; Bateson et al., 2013; Vesely and Klöckner, 2018; see also Andreoni and Bernheim, 2009; Jones and Linardi, 2014; Schram and Charness, 2015 for related studies with a focus other than environmental behavior). In their quasi-experimental study, Vesely and Klöckner (2018) found that when exposing participants to pro-environmental social norms, participants were more likely to follow the norms when their decisions (whether and how much to donate to an environmental organization) were observable to others, compared to when donation decisions were made privately and anonymously. In contrast, Ernest-Jones et al. (2011) and Bateson et al. (2013) found no evidence for an interaction between norms and observability in the context of littering behavior. Other studies (e.g. Wallis and Klöckner, 2020; Geiger et al., 2019) also suggest an important role of decision observability for compliance with pro-environmental norms; their design, however, does not allow separating the effect of own decision observability from the effect of social norm salience.

While a number of the aforementioned individual-level moderators of normative influence have received considerable attention in environmental psychology and economics, the role of contextual, situational moderators is so far largely unexplored in these disciplines, despite many scholars stressing the importance of situational factors (Black et al., 1985; Guagnano et al., 1995; Goldstein et al., 2008; Steg and Vlek, 2009; Bugden and Stedman, 2019; Gatersleben et al., 2019). Therefore, among the main objectives of the present study we test: i) the influence of social norms on people's monetary contributions to a renewable energy project, and ii) whether norms interact with decision observability (i.e., a key contextual moderator) in affecting participants' contributions (see hypotheses H1 and H3 in section 1.4).

### 1.2. Decision observability

The second main goal of the present investigation is testing whether decision observability can in itself motivate people to actively support renewable energy development. Is it, for example, possible that people would be more likely to purchase electricity generated from renewable sources if this can become a topic of conversation in their social circle (thus making their decision to some extent observable to others)? By decision observability we mean the visibility of people's decisions to others. Whether observability influences people's decisions has been studied in a number of areas, including in economics (for example, the study of conspicuous consumption, see e.g. Heffetz, 2011), in psychology and neighboring disciplines (for example, the study of pro-social behavior, see Bradley et al., 2018), and to a smaller extent also in environmental behavior research.

There is some initial evidence which shows that increasing decision observability, or perceptions thereof, can promote certain pro-environmental behaviors, such as donating money to environmental organizations (Vesely and Klöckner, 2018; Barclay and Barker, 2020), conserving electricity (Delmas and Lessem, 2014; but see Lange et al., 2020), enrolling in electricity demand-response schemes (Yoeli et al., 2013), purchasing sustainable products (Griskevicius et al., 2010; Delgado et al., 2015; Naderi and Strutton, 2015; Aagerup and Nilsson, 2016; Kim et al., 2018; mixed findings reported by Berger, 2019), and avoiding littering (Ernest-Jones et al., 2011; Bateson et al., 2015; but see Schultz et al., 2013; Bateson et al., 2013). On the other hand, Lange et al. (2020) and Brick and Sherman (2021) failed to find significant effects of observability on various pro-environmental behaviors. Brick et al. (2017) reported mixed findings: in some cases perceived observability could be linked to greater and in some cases to lesser performance of pro-environmental behavior. Compared to control, d'Adda (2011) found no effect of decision observability on donations to a reforestation project, possibly due to a small sample size. Hanemann et al. (2015) touch upon the role of decision observability, but its effect on preferences for renewable electricity cannot be isolated in their experiment due to

design issues (namely the presence of a confounding variable).

The broader literature on pro-social behavior, focusing for example on donations to charities, volunteering and on generosity and fairness in economic exchanges, similarly indicates that observability (or perceptions thereof) can motivate people to behave more pro-socially, see for example Hoffman et al. (1996), Andreoni and Petrie (2004), Haley and Fessler (2005), Bateson et al. (2006), Ekström (2012); for meta-analyses see Northover et al. (2017) and Bradley et al. (2018). Observability effects are, however, not always robust (Dufwenberg and Muren, 2006; Fehr and Schneider, 2010; Ekström, 2012; Northover et al., 2017; Kim et al., 2018; see also Griskevicius et al., 2010; Bateson et al., 2013; Brick et al., 2017).

A final stream of research that motivated our investigation of observability suggests that behaving pro-environmentally can in some cases serve as a signal of the actor's desirable qualities, such as social status (Brooks and Wilson, 2015; Puska et al., 2016; see also Griskevicius et al., 2010) and good personality (Skippon and Garwood, 2011; Skippon et al., 2016). The signaling value of pro-environmental behaviors should in turn make people more likely to engage in them as behavior observability increases. Overall, the findings reported in this literature also appear to support our prediction that observability will increase people's willingness to financially contribute to renewable energy development (see hypothesis H2 in section 1.4).

### 1.3. Side effects on emotions

Normative and observability interventions exert pressure on people to behave in a certain way. Normative interventions force people to shift their behavior in the direction of the norm. And increasing decision observability creates an opportunity for subsequent social sanctions (Gächter and Fehr, 1999; Dufwenberg and Muren, 2006). While direct evidence on this issue is limited, it seems plausible that these types of interventions can affect their targets' emotions (consistent with Lindbeck et al., 1999; Bruvoll and Nyborg, 2004; López-Pérez, 2008).

Possible unintended side-effects of environmental policies and interventions on their targets' emotions have been, for the most part, overlooked in the literature. What evidence there is, is mostly indirect or anecdotal (see below). To help close this gap, we have measured participants' post-decisional emotions and tested whether our treatments influenced emotions and whether any such influences were mediated by the decisions participants made.

Aronson and O'Leary (1982-83), Allcott (2011), Ayres et al. (2012) and Sussman and Gifford (2012) report that some people complained or in other ways expressed their displeasure about receiving normative interventions as part of field experiments on energy and water conservation. Delmas and Lessem (2014, p. 366), on the other hand, report receiving an "incredible amount of positive comments" from student participants assigned to the decision observability treatment in their field experiment on energy conservation. Even though emotions were not formally measured in these studies, the evidence suggests that social influence interventions do not leave their targets' emotions unaffected (see also van Diepen et al., 2009; DellaVigna et al., 2012).

Importantly, it should be noted that if people feel good about an intervention (for example because a valued goal, such as environmental protection, becomes activated), they might be less likely to spontaneously let the researchers know about their positive experience, given that positive emotions are generally less likely to prompt concrete action than negative emotions (see e.g. Fredrickson, 2001). For this reason it is necessary to measure interventions' positive and negative effects on emotions in a systematic way. In a hypothetical scenario, Bolderdijk et al. (2013) found that participants anticipated more pleasant feelings were they to comply with a biospheric appeal ("Want to protect the environment? Check your car's tire pressure") than with an economic appeal ("Want to save money? Check your car's tire pressure"). A number of studies, however, suggest that social influence interventions may affect participants' emotions negatively. In particular, Bergquist

and Nilsson (2016) show that normative signs promoting energy conservation can be perceived negatively, while Reyniers and Bhalla (2013) and Wang and Tong (2015) report that donors felt less happy about their donations to charitable organizations when donations were publicly observable. In contrast, Leoniak and Cwalina (2019) report an almost complete absence of negative reactions to normative signs in terms of experiencing irritation and anger, and Allcott and Kessler (2019) report a mixture of negative but mostly positive or neutral reactions to receiving normative messages. Toner et al. (2014) similarly found no effect of providing feedback regarding one's own and one's group's environmental impact on participants' emotions of guilt, embarrassment, shame and remorse, but this was possibly due to a lack of power.

While the above studies provide initial evidence concerning possible emotional after-effects of interventions designed to promote pro-environmental behavior, more research into this issue is clearly needed. Interventions' downstream effects on their targets' emotions ought to be considered not only because people's emotional welfare should be a key objective in itself, but also because emotions can in turn influence subsequent intentions and behaviors (e.g., Ferguson and Branscombe, 2010; Harth et al., 2013; Rees et al., 2015; Bissing-Olson et al., 2016; Russell et al., 2017; Chatelain et al., 2018; Carrus et al., 2021) possibly giving rise to spillover effects (see Truelove et al., 2014; Maki et al., 2019).

### 1.4. Hypotheses

**H1.** Monetary contributions to renewable energy development will be higher when participants are presented with descriptive social norms indicating other people have made large donations.

**H2.** Monetary contributions to renewable energy development will be higher when contribution decisions are publicly observable.

**H3.** The effect of descriptive social norms on contributions will be moderated by the level of observability. The effect of descriptive norms will be strengthened when decisions are publicly observable.

These hypotheses build on the hypotheses proposed by Vesely and Klöckner (2018). Note, however, that our descriptive norm manipulation complements the injunctive norm manipulation employed in Vesely and Klöckner (2018). Following Cialdini et al. (1990), we understand descriptive norms as information on what other people do, whereas injunctive norms refer to information on what other people consider to be socially appropriate behavior. Both of these types of social norms have been previously shown to be able to motivate sustainable energy-related decisions (e.g., Schultz et al., 2007; Korcaj et al., 2015; Wolske et al., 2017).

## 2. Method

### 2.1. Participants

Three hundred participants (155 women; mean age = 21.9 years, SD = 4.6) took part in a computerized experiment programmed in z-Tree (Fischbacher, 2007) across 12 sessions conducted in the LINEEX lab in Valencia in May and June 2019.<sup>1</sup> Participants were compensated for their time. They earned 15.0 EUR on average (SD = 3.3), excluding any donations they made as part of the study (an additional 3.5 EUR on average, SD = 2.8). All participants provided informed consent prior to

<sup>1</sup> z-Tree instructions for this experiment are available from the corresponding author upon request. z-Tree is a widely used tool for programming economics experiments. However, using alternative programming tools or non-computerized (paper-and-pencil) procedures would be unlikely to substantially alter the experiment if care was taken to reproduce the key design features outlined below.

taking part in the study. Preliminary power calculations indicated that a sample of at least 191 participants was sufficient to detect a small to medium effect ( $\text{partial } R^2 = 0.04$ ) in a two-tailed test with alpha at 0.05 and statistical power at 0.80 (Faul et al., 2007). Given our financial constraints and in order to safely meet the study's expected power requirements, we aimed to recruit 300 participants.

## 2.2. Design overview

The study was implemented as a 2 (descriptive social norm: No norm vs. High norm) \* 2 (decision observability: Anonymous vs. Observable) between-subjects experimental design. Sessions were randomly assigned to treatments within each block of four consecutive sessions. Thus, three sessions, with precisely 25 participants per session, were assigned to each of four conditions.<sup>2</sup>

The dependent variable was the amount of money participants decided to donate out of their participation fee to a well-known Spanish renewable energy development initiative Som Energia after being exposed to the experimental manipulation. Participants were told that "Som Energia is an established cooperative that builds facilities for generating energy from renewable sources in Spain. Currently, Som Energia's facilities generate 11.80 GWh of renewable energy per year. Your donation will help further expand the use of renewable energy in Spain." Minimum possible donation was 0 EUR, maximum possible donation was 10 EUR.

We, in addition, recorded participants' post-decisional emotions, collected their basic socio-demographic information (gender, age and income), as well as additional measures not relevant for the present study.

### 2.2.1. Descriptive social norm manipulation

Before making their own donation decision, participants in the High norm treatment received information on "how much money other participants in this experiment (participating in a previous session) donated", i.e. a situationally relevant descriptive social norm (Cialdini et al., 1990). Specifically, we presented to all participants in the High norm treatment the following information based on actual donation data from one session in a small pilot ( $n = 50$ ) conducted about a week before the main experiment in the LINEEX lab: "Most participants donated at least 4 EUR. Over 30 percent of participants donated 7 EUR or more." Participants in the No norm treatment received no information on others' previous donations.

The High norm treatment conveys information that was meant to discourage low donations ("most participants donated at least 4 EUR") and inspire participants to make high donations ("over 30 percent of participants donated 7 EUR or more"). Similar descriptive norm manipulations have been used, for example, in Goldstein et al. (2008) and Krupka and Weber (2009). As the experiment was conducted in a reputable economics laboratory with a strict ban on experimental deception (as is common practice in experimental economics, Hertwig and Ortmann, 2001), we have reason to believe that the norm manipulation was credible to participants. Running replication studies in

<sup>2</sup> To define the terminology we use here, by "session" we mean the occasion when invited participants arrive to the lab and participate in the experiment. In our case, the experiment consisted of 12 such occasions with 25 participants taking part on each occasion. A "condition" (used here synonymously with "treatment") in an experiment is defined by the level or state of the independent variables in that condition: for example, in our case, participants in the control condition are not observed and they do not receive a normative message, while in one of the other conditions, participants are observed and they do receive a normative message. This experimental variation of the levels or states of the independent variables across conditions makes identification of the variables' causal effects possible. A "between-subjects experimental design" means that each participant was assigned to precisely one experimental condition (rather than to several conditions consecutively as in "within-subject" designs).

settings where participants might be more prone to suspect experimental deception might necessitate assuring participants beforehand that no deception will take place in the study, as well as administering manipulation checks to ensure that participants perceive the manipulation to be credible.

### 2.2.2. Observability manipulation

In the Anonymous treatment, participants were informed that their decision will be "completely private and anonymous and it will not be revealed to others". In the Observable treatment, participants were informed that, at the conclusion of the session, their decision will be "revealed to other participants in this session" along with their first name and the place where they sit. This manipulation was adapted from Vesely and Klöckner (2018), for a similar approach see e.g. Andreoni and Petrie (2004).

### 2.2.3. Post-experimental questionnaire

We measured participants' post-decisional emotional evaluations of their donation decisions with five items assessing happiness, pride, guilt, irritation and regret (see Appendix A for an overview of these items). For example: "How do you feel about your donation decision?" with response options "extremely happy" (coded as 5), "very happy", "fairly happy", "a little bit happy", "not happy" (coded as 1), and "I do not know" (treated as missing in the analyses).

## 3. Results

### 3.1. Main findings

Fig. 1 displays mean donations in the four conditions and the associated 95% confidence intervals. Inspecting the figure suggests that both observability and norms increased donations (see Table 1 for formal tests).

Table 1 presents statistical tests of hypotheses H1-H3. In Model 1, we regress the amount donated by the participant on treatments and their interaction by means of an OLS regression. We in addition include socio-demographic controls in Model 2.

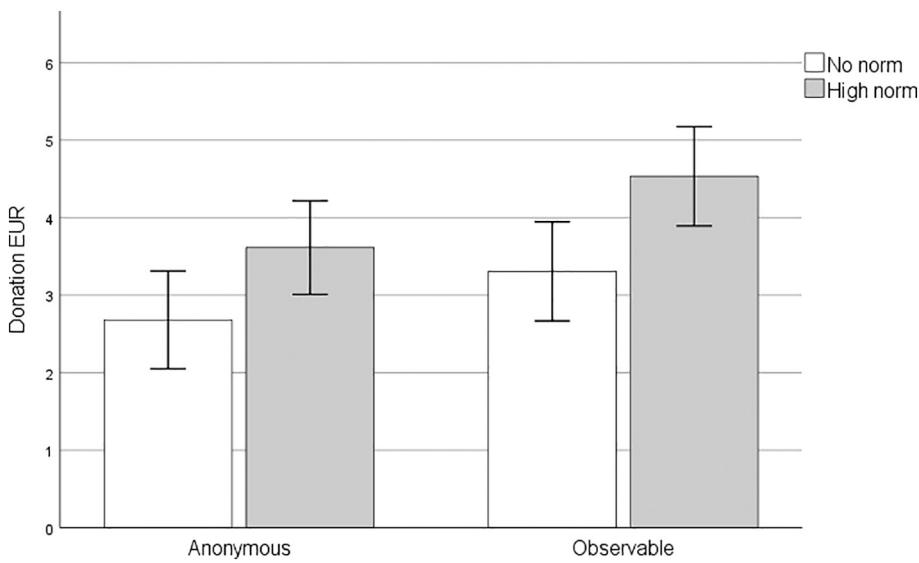
Hypotheses H1 and H2 were supported: participants donated more money when presented with pro-environmental descriptive norms (H1) and when others could observe their decisions (H2). However, contrary to H3, the two treatments did not interact with each other: descriptive norms had an approximately equally strong effect on donations whether or not the donation decision was observable to others. These results are robust to inclusion of socio-demographic controls (see Model 2). Interestingly, on average women donated substantially more money than men.

### 3.2. Supplementary analyses

The focus of the supplementary analyses is on treatment effects on participants' post-decisional emotions. To this end, we first subjected the five items measuring participants' post-decisional emotions (reproduced in Appendix A) to a principal component analysis, using oblimin as the rotation method. By Kaiser's criterion we extracted two factors which together explain 68.6% of variance in the five questionnaire items. Table 2 presents item loadings to the rotated factors (the pattern matrix).

As can be seen in Table 2, items "happy" and "proud" load strongly on the first factor, which we refer to as "good feelings (mixed with regret)". It is important to note that this component does not consist solely of the good feelings of happiness and pride, but rather that it is also tinged with regret (to which we return in the discussion). Items "guilty", "irritated" and "regretful" load strongly on the second factor, called "bad feelings" henceforth. There are some weak cross-loadings and the two factors are weakly negatively correlated ( $r = -0.16$ ).

To explore how the treatments affect post-decisional emotions we

**Fig. 1.** Mean donations (in EUR) in the four conditions with 95% CIs.**Table 1**  
Treatment effects on donations to a renewable energy project.

	Model 1	Model 2
Norm treatment	0.54 (0.16)**	0.49 (0.16)**
Observable treatment	0.39 (0.16)*	0.39 (0.16)*
Norm * Observable	0.07 (0.16)	0.02 (0.16)
Income		-0.05 (0.21)
Age		-0.00 (0.04)
Female		1.25 (0.31)***
Number of observations	300	299
Adj. R <sup>2</sup>	0.048	0.087

Unstandardized regression coefficients and the associated standard errors (in parentheses) are reported. We use effects coding of treatments: “No norm” is coded as -1, “High norm” is coded as 1, “Anonymous” is coded as -1, “Observable” is coded as 1. Income in EUR is divided by 1000 to obtain readable estimates. \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$  (all tests are two-tailed).

**Table 2**  
Two components of post-decisional emotions.

Item	“Good feelings (mixed with regret)” component	“Bad feelings” component
Happy	0.66	-0.05
Proud	0.70	0.06
Guilty	-0.22	0.54
Irritated	-0.03	0.57
Regretful	0.17	0.61

N = 247; “I don’t know” responses were treated as missing data (list-wise deletion).

conduct, separately for each of the two emotion factors from Table 2, moderated mediation analysis in STATA (Preacher et al., 2007; Hayes, 2013). The post-decisional emotion factor serves as the dependent variable, the amount donated to the renewable energy project is the mediator, while our two treatments and their interaction serve as independent variables. Table 3 presents the results for “good feelings (mixed with regret)” as the dependent variable and Table 4 presents the results for “bad feelings”.

Table 3 shows direct effects of variables listed in column 1 on the mediator (see column 2) and on the dependent variable (see column 3). Most importantly, column 4 displays indirect effects of the treatments and their interaction mediated via donations on “good feelings (mixed with regret)”. The indirect main effects of both treatments are

**Table 3**  
Treatment effects on post-decisional “good feelings (mixed with regret)”.

	Direct effects: Prediction of donations	Direct effects: Prediction of “good feelings (mixed with regret)”	Indirect effects: Prediction of “good feelings (mixed with regret)”
Norm treatment	0.49 (0.17)**	0.00 (0.07)	0.13 (0.05)*
Observable treatment	0.39 (0.17)*	-0.07 (0.07)	0.11 (0.05)*
Norm * Observable Donations	0.12 (0.17)	0.02 (0.07)	0.03 (0.05)
		0.28 (0.03)***	

N = 247 (since calculations are based on a subsample of participants for which emotions data was available, the coefficients in column 2 are slightly different from those reported in Model 1 in Table 1). Unstandardized regression coefficients and the associated bootstrapped standard errors (in parentheses, based on 5000 replications) are reported. \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$  (all tests are two-tailed).

**Table 4**  
Treatment effects on post-decisional “bad feelings”.

	Direct effects: Prediction of donations	Direct effects: Prediction of “bad feelings”	Indirect effects: Prediction of “bad feelings”
Norm treatment	0.49 (0.17)**	-0.12 (0.08)	-0.01 (0.02)
Observable treatment	0.39 (0.17)*	-0.08 (0.08)	-0.01 (0.01)
Norm * Observable Donations	0.12 (0.17)	-0.09 (0.08)	-0.00 (0.00)
		-0.02 (0.03)	

N = 247 (since calculations are based on a subsample of participants for which emotions data was available, the coefficients in column 2 are slightly different from those reported in Model 1 in Table 1). Unstandardized regression coefficients and the associated bootstrapped standard errors (in parentheses, based on 5000 replications) are reported. \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$  (all tests are two-tailed).

statistically significant and positive; the interaction between treatments is non-significant. This means that participants exposed to pro-environmental descriptive norms donate more (consistent with the test of H1 above) which in turn leads them to experience more “good feelings (mixed with regret)”, in particular more happiness and pride. Similarly,

when others can observe their decisions, this leads participants to donate more (consistent with the test of H2 above) which again leads them to feel more "good" (and to some extent more regretful). Thus, both treatments have positive side effects on people's post-decisional emotions, but also cause a slight increase in post-decisional regret.

**Table 4** repeats the same moderated mediation analysis for "bad feelings". Once again, columns 2 and 3 report direct effects on the mediator and the dependent variable, respectively. Column 4 reports indirect effects of the treatments and their interaction mediated via donations on "bad feelings", none of which is statistically significantly different from zero.

#### 4. Conclusion and policy implications

Our findings demonstrate that social norms and decision observability motivate people to be more supportive of renewable energy. We show this in the context of monetary donations to a large, well-established renewable energy development initiative in Spain. While participants in the control condition donated on average 2.7 EUR from their earnings to the initiative, participants exposed to pro-environmental norms donated 3.6 EUR on average and participants whose decisions were observable to others donated 3.3 EUR on average. Participants whose decisions were observable and who in addition received information on norms donated 4.5 EUR on average (see also Fig. 1 above).

Using Cohen's (1988) measure of effect size, we see that compared to control the increase in donations was relatively modest in the "observable no norm" condition ( $d = 0.23$ ) and in the "anonymous high norm" condition ( $d = 0.35$ ), but large in the "observable high norm" condition" ( $d = 0.67$ ).<sup>3</sup> An intuitive metric of effect size is also to look at the percentage increase in donations compared to the control condition's baseline: donations increased by 23% in "observable no norm", by 35% in "anonymous high norm" and by 69% in "observable high norm", on average. These are all substantial effects in economic terms (Allcott, 2011).

Norms and observability both had an additive effect on donations, but contrary to hypothesis H3 the two factors did not interact. In other words, the result obtained in Vesely and Klöckner (2018) of participants adhering to norms more strongly when their decisions were visible to others was not replicated here. A plausible explanation is that in the present study we manipulated descriptive norms (i.e., information on what other people do, see Cialdini et al., 1990), rather than injunctive norms (i.e., information on what other people consider to be socially appropriate behavior) as Vesely and Klöckner (2018) did. Descriptive norms are thought to operate primarily through pinpointing feasible and adaptive courses of action and deviating from them is less strongly tied to subsequent social sanctions than disregarding injunctive norms (Deutsch and Gerard, 1955; Cialdini et al., 1990). It might be for this reason that when sanctioning opportunities were introduced by making behavior observable this boosted compliance with injunctive norms in Vesely and Klöckner (2018) but left compliance with descriptive norms unaffected in the present study.

We note that on average women donated substantially more money than men. This seems to be at odds with findings from previous questionnaire studies indicating greater interest in and support for renewable energy among men than among women (Kalkbrenner and Roosen, 2016; Wolske et al., 2017). Ek and Söderholm (2008) and Curtius et al. (2018) report non-significant effects of gender on preferences for green electricity and on intention to install solar panels, respectively. Wiser (2007)

reports mixed findings with respect to gender differences in support for renewable energy development. More research based, like the present study, on actual behavioral data is, therefore, necessary to determine gender effects in this context more conclusively.

Besides treatment effects on donations, we also found that both social norms and increased observability had a positive effect on participants' post-decisional emotions of happiness and pride, but to a smaller extent also increased feelings of post-decisional regret. This finding, while preliminary in nature, seems to partly dispel the worry that social influence interventions similar to those studied here may have unintended adverse side-effects on participants' well-being, as suggested by previous anecdotal evidence (e.g., Aronson and O'Leary, 1982-83; Allcott, 2011; Sussman and Gifford, 2012). The increase in feeling regretful about one's donation decision caused by our treatments was subtle. Perhaps it can be interpreted as participants regretting donating more than they would have in the absence of social pressure caused by the treatments. But we also cannot rule out an alternative interpretation, namely that participants regretted not having donated more money. Future research using more comprehensive measures of emotions is therefore needed to further explore the emotional after-effects of behavioral interventions.

Another important agenda for future research is to identify specific aspects of interventions that trigger positive versus negative emotions. Making feelings of connection to nature salient could be one aspect of an intervention that leads to positive emotions (Capaldi et al., 2014). In contrast, perceptions of coercion may be associated with negative emotions, motivation crowding-out and reactance (cf. Brehm, 1966; Gneezy and Rustichini, 2000; de Groot and Schuitema, 2012; Sussman and Gifford, 2012; Bergquist and Nilsson, 2016; Conway III and Repke, 2019).

#### 4.1. Limitations and some directions for future research

The study has two main limitations that we readily acknowledge. First, the study should be regarded as exploratory, as while it was based on existing theorizing and past research, it has not been pre-registered. While we add to the literature supporting the case for the importance of social norms and decision observability in the context of environmentally relevant decision making, subsequent pre-registered replications are warranted. A precondition for replicating our findings is for the norm manipulation to be sufficiently strong compared to the target population's "home-grown" normative perceptions, as normative interventions have been known to fail or even backfire when this condition appeared to not have been met (Schultz et al., 2007; Shang and Croson, 2009; Allcott, 2011). In addition, moderators listed in section 1.1 can weaken or eliminate social norm effects in certain cases. Intuition suggests that decision observability might matter more when the observed decision maker is psychologically closer to the observer, for example in the sense of the two parties being acquainted or in the sense of them being able to interact in the future (a notion that finds empirical support in Gächter and Fehr, 1999). Thus, the effect of decision observability may become weaker, and hence more difficult to detect statistically, as the psychological distance between the observer and the decision maker increases.

This study took full advantage of the strengths of the lab experimental methodology, notably its ability to draw valid causal conclusions about the influence of experimentally manipulated factors, in our case social norms and decision observability (cf. Falk and Heckman, 2009). While we attempted to bring realistic features to the lab (notably by asking participants to make consequential decisions about their own money, with real impact on renewable energy development in their region), the study still suffers from a limitation in terms of its generalizability or "external validity", an issue that experimental economics and psychology have been grappling with for decades (see e.g. Falk and Heckman, 2009). First of all, our sample was not representative, but rather it was a convenience student sample. Secondly, participants could

<sup>3</sup> The  $d$  values are computed by dividing the difference in mean donations in the compared conditions by the mean of the donations' standard deviations in the compared conditions. An alternative formula only using the standard deviation of the control condition in the denominator leads to virtually identical results in the present case.

have only donated a small portion of their total wealth to the renewable energy initiative (i.e., a portion of their earnings from the experiment). Third, participants were only offered one potential donation recipient, while outside the laboratory there are multiple such opportunities to donate. Fourth, participants were directly offered the option to donate, while outside the laboratory such opportunities often need to be actively sought out. There were other differences between our laboratory setting and a comparable field setting, as is virtually inevitable in an economics lab experiment. However, and crucially, none of these differences between the lab and the field pose a problem for identifying the causal effects of norms and observability, our manipulated variables, which was the primary purpose of the study. Previous research very often, even though certainly not always, suggests substantial correspondence between treatment effects obtained in the lab and results from field studies (Mitchell, 2012). This is to say that it is probably reasonable to expect that the effects we observe would be obtained in comparable settings outside the laboratory as well, but that follow-up field experiments, new lab experiments and empirical analyses of naturally occurring data will provide increasing levels of confidence regarding the effects of social norms and decision observability in the context of citizen voluntary financial support for renewable energy development.

#### 4.2. Concluding remarks

In closing, social norms and decision observability represent promising means of generating public support for renewable energy development. Subsequent studies should focus on testing scalable interventions derived from the present experiment in field settings. Whereas social norm interventions have been repeatedly successfully employed in the field (e.g., Allcott, 2011; Brülsauer et al., 2020), the scope of observability interventions tested in field settings is so far limited (Bateson et al., 2006, 2013, 2015; Ekström, 2012; Delmas and Lessem, 2014). We suggest that in the context of generating support for renewable energy, properly designed and regulated electronic social media may offer a suitable channel for voluntarily sharing information about one's own behavior and for accessing shared information about the behavior of others (see e.g. Glogovac et al., 2016). This is where policy makers may step in. They, as well as environmental organizations and other stakeholders, can make such information sharing easier and more efficient through design and regulation, for example by creating

attractive and safe electronic social media platforms. Naturally, before large-scale roll-out, the most suitable method of information sharing should be pre-tested in subsequent applied field studies (see e.g. Mack et al., 2019 for related research).

There is evidence that people are often willing to broadcast information about their pro-social actions (Andreoni and Petrie, 2004; Wang and Tong, 2015; Schitter et al., 2019), which is routinely utilized by charitable organizations presenting benefactors with opportunities for such pro-social displays (Harbaugh, 1998). And since social interactions appear to be a factor contributing to the success of behavioral interventions in the environmental domain (e.g., Elf et al., 2019; Gillingham and Bollinger, 2021), we believe that policy makers and other stakeholders may want to harness people's propensity to share their pro-social and pro-environmental behaviors with others, through electronic social media platforms and other fora. New research is therefore needed to study in detail people's willingness to share with others on social media their pro-environmental behavior and progress, and the impact this can have on own and others' subsequent behavior change. For those who are not keen on social sharing, other policy tools, such as nudges or monetary incentives, could be more suitable. In line with previous theorizing (e.g., Krupka and Weber, 2009), making people's pro-social and pro-environmental actions more visible can in turn serve to further cultivate pro-social and pro-environmental normative perceptions in the public and thus further strengthen the motivations to act in a socially and environmentally beneficial manner.

#### Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests:

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#### Appendix A. Items measuring post-decisional emotions

Item	Item wording and response options (and their coding, not shown to participants)
Happy	How do you feel about your donation decision? (5 = extremely happy, 4 = very happy, 3 = fairly happy, 2 = a little bit happy, 1 = not happy, -999 = I do not know)
Proud	How do you feel about your donation decision? (5 = extremely proud, 4 = very proud, 3 = fairly proud, 2 = a little bit proud, 1 = not proud, -999 = I do not know)
Guilty	How do you feel about your donation decision? (5 = extremely guilty, 4 = very guilty, 3 = fairly guilty, 2 = a little bit guilty, 1 = not guilty, -999 = I do not know)
Irritated	How do you feel about your donation decision? (5 = extremely irritated, 4 = very irritated, 3 = fairly irritated, 2 = a little bit irritated, 1 = not irritated, -999 = I do not know)
Regretful	How do you feel about your donation decision? (5 = extremely regretful, 4 = very regretful, 3 = fairly regretful, 2 = a little bit regretful, 1 = not regretful, -999 = I do not know)

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