Designing more effective norm interventions:

The role of valence

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Abstract

Social norm interventions represent a low-cost and effective policy tool that have been shown to generate behaviour change in a number of contexts. We investigate whether valence framing impacts the effectiveness of a social norm intervention on prosocial behaviour. We use Amazon Mechanical Turk in conjunction with oTree to conduct an experiment in which we manipulate descriptive beliefs and original endowments in the context of a dictator game. We find that the impact of a social norm intervention appears to be significantly greater in a frame of negative valence vs. a frame of positive valence. Loss aversion and positional preferences could play a role in these findings. Regression results furthermore indicate a differences in the determinants of allocation decisions across frames, suggesting that normative beliefs matter more in a positive frame, whereas descriptive beliefs matter more in a negative frame. This work contributes to a better understanding of framing effects as well as the conditions under which normative considerations are most salient. On a practical level, it points to an opportunity for policymakers to substantially improve upon the design of social norm interventions.

Keywords: social norms; framing; behavioral intervention; social information

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1 Introduction

Social norms have been shown to impact behaviour in a wide variety of contexts (Bicchieri, 2006; Young, 2015; Gintis, 2009) and can constitute an important informal enforcement mechanism for achieving beneficial collective outcomes (Nyborg et al., 2016). The dynamics of norm proliferation within populations has therefore become of increasing interest to researchers in diverse fields pertaining to taxation, health, and environmental behaviors. Social norm interventions, or the disclosure of information regarding the behaviour or attitudes of others, have also attracted attention from policymakers as a promising low-cost strategy to encourage the adoption of welfare-improving behaviour and facilitate the spread of corresponding norms (Allcott, 2011; Cialdini et al., 2006; Schultz et al. 2008). Farrow et al. (2017) survey experimental work on social norm interventions in the context of environmental behaviors and find that a large body of field evidence demonstrates their effectiveness in this context, as well. Normative considerations are particularly important in the context of social dilemmas in which purely self-interested individuals have, according to traditional neoclassical economic theory, no intrinsic incentive to cooperate.

While most social dilemmas are typically thought of as either problems of provision or appropriation, it is possible to characterize the same dilemma within the context of either frame (Cox et al., 2013). The atmosphere, for example, is typically conceived of as a shared resource that must be preserved through refraining from engaging in carbon-intensive activities. However, the resource can equally be conceived of as one that must be created and maintained by preferentially engaging in carbon-neutral and carbon-enhancing activities. While in both frames of this dilemma, prosocial behaviour may amount to the same action (e.g. traveling by bike or taking

public transit), the prescriptive emphasis of the prosocial norm evoked in each frame manifests differently according to whether the dilemma is characterized as a problem of appropriation or provision. In the first instance, the prosocial norm prescribes that one refrain from extracting wealth from the resource (e.g. by refraining from driving a car), whereas the prosocial norm in the second instance consists of an injunction that one contribute to the shared wealth of the resource (e.g. by choosing to bike or take public transit). When the issue of clean air is conceived of as a problem of appropriation, prosocial behavior amounts to refraining from contributing to a public bad, whereas when clean air is conceived of as a provision problem, normative behavior amounts to contributing to the public good. It follows that messages encouraging certain pro-environmental behaviors (e.g. driving less), could be accomplished either by an appeal to contribute to maintaining the shared resource of clean air, placing an emphasis on one's responsibility to behave prosocially, or to refrain from degrading the resource, placing emphasis rather on one's responsibility to not behave antisocially. We contend that the social ramifications of deviating in these two scenarios are, accordingly, quite different – so much so as to make a behavioral intervention differently effective across these scenarios, as well.

Given that normative messages have been shown to be effective tools to encourage pro-social behaviors, and to the extent that environmental issues can be characterized as either problems of provision or appropriation, it seems pertinent to investigate whether social norm interventions are more or less effective when applied in either type of situation. To investigate this possibility, we implement normative interventions in decision scenarios that differ in valence. In the context of a simple dictator game with no role or payoff uncertainty, we manipulate empirical expectations and original endowments to isolate the impact of valence framing on the effectiveness of

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a social norm intervention that mimics those often used by policymakers and the proponents of environmental campaigns in the real world. By advancing our knowledge of the conditions under which social norm interventions generate the greatest behavioral impacts, we add to the capacity of policymakers to become more effective 'behavioral architects.'

Contrary to the conventional selfishness assumption advanced by standard economic theory, studies in experimental and behavioral economics have demonstrated that people systematically behave in prosocial ways (Engel, 2011; List, 2007) and furthermore, that these prosocial behaviors are sensitive to a range of experimental manipulations. These observations suggest that a variety of low-cost interventions could serve as promising policy tools for encouraging prosocial behaviors (Kinzig et al., 2013; Scarlett et al., 2013; Schultz et al., 2008). In this paper, we examine the confluence of two of these manipulations in order to gain insights on how to optimize the effectiveness of a behavioral intervention to improve environmental outcomes, and find that valence framing has a dramatic effect on the effectiveness of a normative behavioral intervention.

Norms are supported by a variety of enforcement mechanisms (Young, 2015) that can consist of rewards for compliance or punishment for deviation, and be either material or immaterial (i.e. psychological) in nature, and intrinsically or extrinsically enforced. Guilt, for example, can be considered a psychological, intrinsically-enforced punishment for deviating from a social norm, whereas shame could be considered an extrinsically-enforced psychological punishment. In contrast to a personal or moral norm, the behaviors prescribed by social norms are inherently consensus-driven, which emphasizes the particular importance of extrinsic factors (i.e. factors that are social in origin) as enforcement mechanisms (e.g. shame, esteem). As a result, another feature of social norms is that they are incredibly context dependent. The relative acceptability or

prevalence of a behavior such as littering, for example, can differ widely across cultures and social groups. We expand the consideration of social context to include valence framing. Specifically, we explore whether the valence of the decision frame has a systematic impact on the effect of social feedback on behavior.

Camerer and Thaler (1995) were early proponents of the idea that dictator game giving arises from norms. They reason that behavior in these one-shot games reflects the manners that people have become accustomed to following in the real-world, which prescribe similar prosocial behavior even in one-shot interactions (e.g. tipping). An explanation based on manners is also supported by experimental evidence that even those who are fairness-minded behave selfishly in the contexts where this is considered socially acceptable (e.g. markets). More recent evidence indeed suggests that social norms can be responsible for the changes in behavior detected across framing conditions, according to which different frames and choice sets serve to activate different social norms, along with the beliefs and preferences that accompany those norms (Bardsley, 2008; Dufwenberg et al., 2011; Gächter et al., 2015; Krupka and Weber, 2009, 2013). Studying pro-social behavior in the context of a positive valence frame (a dictator game), Bicchieri and Xiao (2009) found that manipulating participants' empirical expectations yielded a higher impact on giving behavior than manipulating normative expectations. In contrast, in the context of a negative valence frame (a resource dilemma), Cialdini et al. (2006) find that an injunctive normative message is more successful than a descriptive normative message at encouraging visitors to a national park to refrain from taking petrified wood. Krupka and Weber (2013) find differences in injunctive social norms across standard vs. bully dictator games (which extends the valence to include negative frame, introducing a taking option). Even when final outcomes are equivalent, they find that taking is relatively less acceptable than giving,

and that the bully dictator game yields higher average cooperation than the giving game. Alevy et al. (2014) find that introducing observability to a dictator game increases prosocial behavior in a giving game, and decreases taking in a bully dictator game. Using Amazon Mechanical Turk, Raihani and McAuliff (2014) find that an injunctive message increases giving, but a descriptive message has not effect. In another series of online experiments using the MTurk platform, Dreber et al. (2013) find no significant difference in amounts transferred to receivers in give and take dictator games.

If, as previous evidence suggests, norms determine the landscape of the material and non-material incentives that agents face, and if the same actions take on a different normative significance across valence frames, then it follows that normative considerations should impact behavior differently across these frames. Interestingly, there appears to be no work that examines the impact of valence framing on the effectiveness of an intervention that brings cognitive attention to the prevailing social norm. We design an experiment with the aim of systematically testing the effect of valence framing on normative considerations. Should a social norm intervention indeed be more effective in one frame versus another, this insight would provide policymakers a strategy by which they could improve the design of social norm interventions aiming to incite behavior change.

2   Research questions and hypotheses

To understand the potential role of valence in the behavioral differences across these two types of situations, we employ a simplified framework using the dictator game. In this way, we eliminate potential strategic differences between the two types of situations (notably rivalry) as potential drivers of the effect of valence on behavior. In this paper,

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we consider the typical dictator game to be one of positive valence. The payoff outcomes in this game are $E_i - x$ for the dictator, and x for the receiver, where E_i is the dictator's original endowment, and x represents their transfer to the receiver. In a dictator game of negative valence, in contrast, the dictator also has sole decision-making capability, but it is the receiver who possesses the initial endowment, E_i. The payoff outcomes in this game are thus x for the dictator, and $E_i - x$ for the receiver, where x represents the amount taken from the receiver by the dictator. Thus, although the strategic considerations and range of possible outcomes for both players remain the same across frames, the nature of the dictator's action changes from one in which he transfers money from himself to the other worker (i.e. giving) to one in which he transfers money from the other worker to himself (i.e. taking).[1]

Although this distinction is of little consequence to traditional economic theory, it is considered quite important by psychologists (Beckenkamp, 2006). In order to investigate the impact of valence on normative interventions, we design a 2 (positive vs. negative valence) by 3 (no, low, and high social norm intervention) between-subjects experiment. The broad experimental design is summarized in Table 1.

Table 1: Experimental design

Social norm intervention	Valence Framing	
	Positive	Negative
Control	T1	T2
Low	T3	T4
High	T5	T6

While some studies find no significant difference in baseline levels of prosocial behaviour across frames that differ in valence (Apesteguia and Maier-Rigaud, 2006; Dreber et al., 2013), others indicate that social dilemmas of positive valence, in which group members must contribute to the creation of a resource, tend to generate higher

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[1]Note that the Nash equilibria are $x*=0$ in the positive frame, and $x*= E_i$ in the negative frame.

levels of cooperation than dilemmas of negative valence, in which group members must exercise self-restraint in order to preserve a resource (Andreoni, 1995; Bougherara et al. 2008; Khadjavi and Lange, 2015; Willinger and Ziegelmeyer, 1999; Sonnemans et al., 1998). Evidence demonstrating that valence framing appears to affect the normative significance of the actions in question suggests that normative considerations may have a different impact on behavior across frames. The results found by Krupka and Weber (2009, 2013) and Bicchieri and Xiao (2009) lead us to expect that a social norm intervention will have a positive effect on transfer amounts in the traditional dictator game of positive valence, forming our first hypothesis:

> **Hypothesis 1.** *A social norm intervention increases prosocial behavior in the dictator game of positive valence relative to baseline conditions (T3, T5 > T1), and a high social norm intervention increases prosocial behavior to a greater degree than a low social norm intervention (T5 > T3).*

Theories regarding the mechanisms that support conformity to social norms emphasize that motivation to conform can arise not only from the pursuit of the positive psychological benefits that may accompany conforming, but also the avoidance of anticipated negative consequences that may result from deviating (Young, 2015; Bicchieri, 2006). Sugden (2000)'s resentment hypothesis proposes that people rely on behavioral strategies that focus on reducing the distance between their own behavior and others' expectations in order to avoid the negative fallout that disappointing others may entail. Taken together, these works indicate that the avoidance of negative consequences serves as an important motivation for conformity, which is supported by results indicating that a decision scenario involving taking elicits more cooperative norms relative to a scenario that involves only giving (Krupka and Weber, 2013). Unlike

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Krupka and Weber (2013), who elicit normative beliefs and use these normative beliefs to predict behavior of separate players, we seek to manipulate descriptive beliefs to evaluate the impact of information provision on behavior. Since deviating in a frame of negative valence (i.e. taking too much) is arguably a more severe infraction than deviating in a frame of positive valence (i.e. giving too little), we expect prosocial behavior to be more sensitive to the social norm intervention in the taking game. Our second hypothesis regarding the relative efficacy of descriptive norms compared across these two games is therefore the following:

> **Hypothesis 2.** *Both levels of social norm interventions will have a greater impact on prosocial behavior when implemented in a dictator game of negative valence compared to a frame of positive valence ($T4 - T2 > T3 - T1$, $T6 - T2 > T5 - T1$).*

To facilitate an investigation of not only whether, but how valence framing may lead to different reactions to social norm interventions, we elicit participants' beliefs (i.e. their normative and empirical expectations) as well as their social preferences. To elicit beliefs, we follow incentivized methods in the experimental economics and social psychology literature (Bicchieri and Xiao, 2009; Krupka and Weber, 2013), and to elicit preferences we use the incentivized Social Value Orientation measure developed by Murphy and Ackermann (2014). Thus, in addition to the main research question, our experimental design will allow us to shed light on the potential impact of valence framing and social norm interventions on preferences and beliefs, as well as the impact of framing on the relationship between beliefs and preferences and behaviour.

Further avenues of exploration made possible by this dataset include effects related to gender, age, education, income, geography, and political affiliation, as well as

the possible impacts of descriptive and injunctive beliefs on social preferences, of role (dictator vs. receiver) on expectations and preferences, and of empirical expectations on normative expectations. We may expect those indicating more liberal political ideology to express the belief in the appropriateness of greater allocation amounts than those with more conservative ideologies. Additionally, we might also expect that a participant's role in the game may influence their normative beliefs – specifically that being in the position of dictator may lead participants to consider lower allocation amounts as more socially appropriate, which would suggest that people tend to form self-serving perceptions about social norms according to their social position. Though we have no specific expectations regarding the impact of most of the demographic variables on susceptibility to normative interventions, some previous evidence suggests that we might expect women to be more affected by a normative intervention than men (Rand et al., 2016; Jones and Linardi, 2015; Ellingsen et al., 2013). Since descriptive and injunctive beliefs are theorized to be important determinants of norm-related behaviour, we would expect that these (and especially descriptive beliefs) will be a significant determinant of allocation decisions in the multivariate analysis we carry out.

3   Methods

Our experiment consists of two variations of the dictator game, one of positive valence and the other negative, that are structurally equivalent in the range of payoff outcomes and their respective theoretical predictions. In the game of positive valence, a worker is endowed with $1.00 and given the opportunity to allocate this amount between himself and another worker with whom he is randomly paired. In the negative valence frame, a worker is randomly paired with another worker who is endowed with $1.00, and

the first worker is given the opportunity to make the same allocation decision. In each

of these games, the task of the dictator is to distribute this amount between himself and

the worker with whom he is paired.[2]

In each frame, we introduce a social norm intervention in which dictators are

informed that most of the dictators in a previous session of the experiment transferred an

average of either $0.30 (low condition) or $0.50 (high condition) to the participant with

whom they were paired. Unlike previous studies, we vary the intensity of the intervention,

as we introduce treatments designed to elicit both high and low empirical expectations in

each decision frame. Both intervention levels are based on past behavior of actual workers

in a baseline condition. The low condition ($0.30) reflects actual average behavior across

the baseline sample, and as such constitutes a relatively accessible target behavior. The

allocation level chosen for the high intervention condition is also based on data from the

baseline sample, but presents this information in such a way so as to foster the perception

of a different descriptive norm. Following a strategy developed in Bicchieri and Xiao

(2009), we accomplish this experimentally without the use of explicit deception.[3]

For the high intervention, we chose an allocation of $0.50, which represents the

most that any dictator allocated under baseline conditions in the negative frame. This

leads us to believe that $0.50 is indeed relatively much to ask of most dictators and thus

represents a rather challenging and costly behavior to conform to. For the low [high]

conditions, the intervention consists of the following: "In a scenario exactly like this one

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[2]Because we use identical neutral vocabulary in both frames (i.e. 'allocate' rather than 'give' and 'take'), any evidence of a main effect associated with valence framing suggests that the use of stronger frame would conceivably generate an even greater impact.

[3]While explicit deception is not accepted in experimental economics, our strategy in this intervention is considered implicit deception, the use of which has precedent in the economic literature (see Hersch (2015) for a number of examples regarding conditional matching, role assignment, and surprise restart procedures). As Ariely and Norton (2007) recognize, deceptive procedures are often necessary in order to create experimental conditions that will yield meaningful results. We also note that our decision to include this ?high? social norm intervention level is born purely out of a research interest in the role that the costliness of conformity would play in the effectiveness of the SNI. As we will show, such an intervention only offers marginal improvement over the ?low? SNI level, and as such is not of great interest from a policy perspective anyways.

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in a previous study, most Individual A workers allocated an average of $0.70 [$0.50] to themselves and $0.30 [$0.50] to the worker with whom they were paired." Whereas the low condition describes the average allocation among all workers who took part in the baseline experiment (which by definition encompasses most workers), the high condition describes the average allocation of a deliberately chosen selection of at least 50% of the workers in the sample. These workers were selected such that the average allocation amount within the sample was $0.50. Using this formulation, we are able to promote the perception of modal behavior without strictly deceiving participants. To evaluate whether these interventions did indeed have an impact on descriptive beliefs, we elicit these beliefs in all conditions. The experimental design is displayed in Table 2.[4]

Table 2: Dictator game procedures

Positive Valence			Negative Valence		
Instructions and comprehension check					
Baseline	Low SNI	High SNI	Baseline	Low SNI	High SNI
Elicit descriptive expectations					
Elicit normative expectations					
Elicit social preferences					
Collect demographic information					

The experiment was carried out on a targeted sample of 1364 participants using Amazon Mechanical Turk in conjunction with oTree. Amazon Mechanical Turk was used to recruit participants who are then directed to the oTree experimental platform in order to participate in the experiment. Amazon Mechanical Turk is now used by many social scientists to perform incentivized experiments (Baumester et al.

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[4]In four additional treatments, we use the strategy method in order to investigate the extent to which the effectiveness of the social norm intervention is sensitive to the hypothetical nature of the information provided. The four additional strategy method treatments ask participants to imagine the hypothetical behavior of other workers in a past session, altering the order of the hypothetical average amount in each frame ($0.30/$0.50 and $0.50/$0.30). We find no significant difference in average allocation amounts between participants who were exposed to a low (high) social norm intervention and those who first considered a first a high (low) descriptive norm, followed by a low (high) descriptive norm.

2011, RAND) and has been favorably evaluated as a tool for research in social science (Berinksy et al., 2012; Crump et al., 2013). Recruitment through Amazon Mechanical Turk offers a number of advantages: sample populations exhibit more variation in age, socioeconomic status, education, and geographic localization than typical laboratory experiments, a secure anonymous payment platform through which to transfer compensation from experimenters to participants, and rapid turnaround time. As a result of the growth in the use of this platform, its internal and external validity have been the subject of a number of recent inquiries. Amir et al. (2012) find that one dollar stakes in an Amazon Mechanical Turk experiment yield similar results as higher stakes in the same laboratory experiment, lending credibility to the use of the medium and the stakes commonly employed. The downsides that have been identified, such as non-random attrition, less control over concurrent activities, and lack of attention, can be mitigated through careful experimental design (e.g. comprehension checks) and inspection of the resulting data (e.g. consistency, response times) (Mason and Suri, 2012).

We note that this decision setting can be considered to produce conservative results for two reasons. First, we strove to create the most minimal differentiating conditions possible across treatments. Instead of using the words 'give' and 'take' to describe the transfer decisions made by dictators in the positive and negative valences, respectively, we elected to use neutral terminology, i.e. 'allocate,' to describe dictator decisions in both frames. We also described the initial conditions as neutrally as possible across treatments, explaining in the positive frame that Individual A had been allocated $1.00, while in the negative frame that Individual B had been allocated $1.00, rather than describing these endowments more ambiguously (e.g. Individual A/B has $1.00), which could lead dictators to assume that the individual may have earned that money

or had some other type of inherent right to it. Describing this money as having been recently allocated to the individual at once creates a minimal claim to the money and, in being more descriptive, allows for a greater degree of experimental control. Finally, the anonymous online decision setting arguably maximizes the social distance between dictators and receivers as well as all but eliminates the extent to which dictators would expect to be subject to social punishment for deviating from social norms.

4   Results

After accounting for attrition[5] (99 players) and omitting those who repeated the game at least once more in subsequent experimental sessions (241), as well as those who provided incorrect answers to at least one of the three comprehension checks (308), we obtain a total of 716 valid observations across the ten experimental conditions (including the four strategy method treatments), and 492 observations among the six treatments of interest. Of these, 284 contain dictator choices. Overall, this sample was comprised of 58% men and reported an average age of 35.3 years. Most respondents in our sample are located in the US and India (52% and 33%, respectively), with 15% reporting residency in other areas.[6] These descriptive statistics indicate that our U.S. sample is generally representative with respect to gender (44% of the U.S. sample is male vs. 51% of the U.S. population[7]), but that Indian males are overrepresented (72% of the Indian sample is male vs. 52% of the Indian population[8]). Our U.S. sample also appears to be relatively representative with respect to age (sample median of 34 vs. population median of 35) and

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[5]Participants whose partners left the game before it was over were remunerated in the same way as everyone else, i.e. according to a random drawing of one of the incentivized tasks in the game, except that in their case the dictator game task did not figure among the tasks eligible to be selected.

[6]Rand (2012) indicates that self-reports are highly reliable using Amazon Mechanical Turk.

[7]U.S. Census Bureau (2015), https://www.census.gov/quickfacts/table/PST045216/00

[8]Indian Office of the Registrar General & Census Commissioner (2001), http://censusindia.gov.in/ Census_And_You/gender_composition.aspx

education (approximately 39% the sample and 30% of the population hold a bachelor's degree or higher).

Regarding social preferences, 38% of the sample is individualist (maximizes own payoffs), 61% of the sample are prosocials (maximizes joint payoffs or minimizes the difference between payoffs), and less than 1% (2 people) exhibited competitive preferences (maximizes the positive difference between the payoff for oneself and the payoff for the other). We observe that beliefs about injunctive norms exhibit very little variation across valence frame, role (dictator vs. receiver), region, gender, age, educational level, political ideology, and income. We also note that average descriptive beliefs tend to be greater than average behavior in all conditions (though this difference is only significant in one condition), indicating that people expect a greater degree of prosociality from others relative to their own behavior in the game.[9] We also find evidence indicative of a self-serving bias in descriptive beliefs.[10] Figure 1 shows the distribution of allocation decisions by treatment across valence frames. Across all conditions, we observe a majority of dictators allocated $0.50 to the receiver, and we see that the high norm intervention in the negative frame greatly increases this tendency.

Our main findings are reported in Table 3. Regarding average treatment effects, our results show a similar qualitative pattern as those of Krupka and Weber (2013) under baseline conditions, namely that the amount shared with the receiver is higher in the frame that involves taking, although this difference is insignificant, as in Dreber et al. (2013).

Qualitatively, our results indicate that the interventions appear to have an effect

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[9]This may be an artifact of a desire not to view oneself as a sucker, which has been demonstrated as an important motivation in strategic social dilemmas (Bougherara et al., 2009).

[10]In the negative frame, dictators believe that most dictators in a previous session gave $0.43 to Individual B, while receivers believe that most dictators in a previous session gave $0.48 to Individual B ($p = 0.05$).

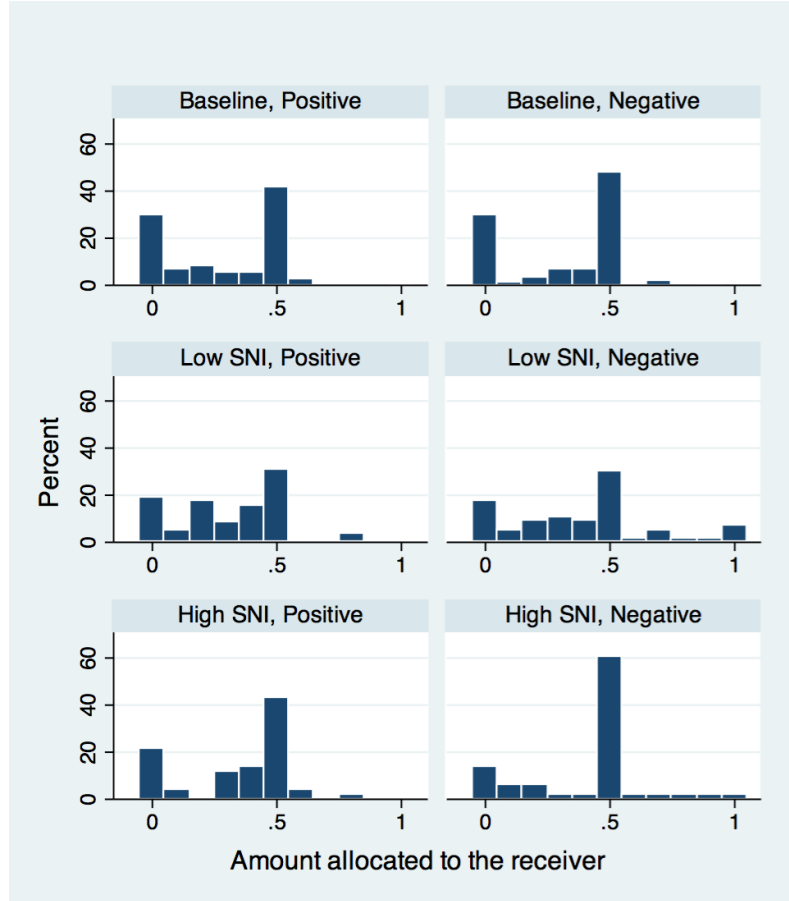Figure 1: Distribution of allocation decisions by treatment and frame

Table 3: Generosity across conditions

Condition	Valence	
	Positive	Negative
Baseline	0.290 (0.231)	0.320 (0.232)
	$n = 132$	$n = 144$
Low social norm intervention	0.310 (0.210)	0.393* (0.285)
	$n = 58$	$n = 56$
High social norm intervention	0.349 (0.216)	.414** (0.233)
	$n = 51$	$n = 51$

* and ** indicate p-values of less than 0.05 and 0.01 when from a t-test
with respect to the baseline condition in the same frame.
Standard deviations are in parentheses.

on allocations with respect to baseline levels, with the low and high interventions raising average allocation amounts by $0.020 and $0.059 in the positive frame and by $0.073 and $0.094 in the negative frame. We do not, however, find strong support for our Hypothesis 1 in the positive frame, as mean allocation amount does not appear to differ significantly across intervention levels. In the negative frame, in contrast, we do find that average allocation levels in the social norm intervention treatments is greater than in the baseline treatment. An analysis of variance in the positive frame indicates a slightly insignificant overall treatment effect of social norm interventions (F = 2.90, p = 0.089), while an analysis of variance in the negative frame indicates a significant intervention effect (F = 8.08, p = 0.005). These findings provide support for Hypothesis 2, indicating that a social norm intervention generates higher average allocation amounts when implemented in a frame of negative valence compared to a frame of positive valence. Although a 3x2 analysis of variance on the entirety of the experimental design, indicates a main effect of both social norm interventions (F = 4.32, p = 0.013) and negative valence (F = 6.94, p = 0.009), it does not indicate a significant interaction effect between the two (F = 0.43, p = 0.65). We explore these results in further detail through multivariate analysis.

To investigate the relative importance of the various determinants of allocation decisions, we perform a tobit regression on observations from the pooled sample, as well as on the samples from each valence frame separately.[11] Descriptive statistics are presented in Table 4 and regression results are presented in Table 5. The variables 'low social norm intervention' and 'high social norm intervention' are dummy variables equal to one if the participant was in the treatment condition of interest and zero otherwise. The remainder

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[11]Left-censored at zero and right-censored at 1. Other multivariate models were explored, including a hurdle model and an ordinal regression model. The hurdle model failed to converge no matter the specification. This may be due to the fact that participants exhibited strong model behavior (many observations are either $0 or $0.50). A Brant test of an ordered logit regression reveals that the data violate the parallel lines assumption, and although a partial proportional odds model outperformed the ordered logit, it generated a non-trivial number of negative predicted outcome probabilities.

of the independent variables used in the analysis are described in Table 4.

Table 4: Sample descriptive statistics

Variable	Coding	Average	Min	Max
Generosity	Dollars	0.33	0	1
Normative belief	Allocation rated as the most socially appropriate (weighted by appropriateness score)	0.526	0.322	0.655
Descriptive belief	Allocation amount the participant believes most other participants chose	0.43	0.1	1
Gender	0 = male 1 = female	0.413	0	1
Age	Age in years	35.3	19	72
Education	1 = some high school 2 = high school graduate 3 = some college (no degree) 4 = associate's degree 5 = bachelor's degree 6 = graduate degree, (master's) 7 = graduate degree, (doctorate)	4.7	1	7
Income	1 = less than $10,000 2 = $10,000 - $14,499 3 = $15,000 - $24,999 4 = $25,000 - $39,999 5 = $40,000 - $59,999 6 = $60,000 - $74,499 7 = $75,000 - $99,999 8 = $100,000 or more 9 = prefer not to answer	4.06	1	9
Political ideology	1 = extremely liberal 2 = liberal 3 = slightly liberal 4 = neutral 5 = slightly conservative 6 = conservative 7 = extremely conservative 8 = prefer not to answer	3.5	1	7
Degree of financial ease	1 = very at ease 2 = somewhat at ease 3 = somewhat uneasy 4 = very uneasy	2.43	0	4
Prosocial type	0 = individualist 1 = prosocial	0.605	0	1
India	0 = not a resident of India 1 = resident of India	0.355	0	1
EU	0 = not a resident of the EU 1 = resident of the EU	0.06	0	1
Other[12]	0 = not a resident of one of these countries 1 = resident of one of these countries	0.081	0	1

Table 5: Tobit regression results for generosity

Independent variables	Parameter estimates (s.e.)		
	Entire sample	Positive valence	Negative valence
Normative belief	0.384	0.557	0.086
	(0.216)	(0.294)	(0.306)
Descriptive belief	0.342***	0.172	0.580***
	(0.087)	(0.114)	(0.130)
Low SNI	-0.047	-0.063	0.030
	(0.056)	(0.052)	(0.057)
High SNI	0.007	0.025	0.004
	(0.056)	0.053)	(0.054)
Negative valence	-0.007	-	-
	(0.051)		
Negative valence * Low SNI	0.089	-	-
	(0.079)		
Negative valence * High SNI	0.003	-	-
	(0.079)		
Prosocial type	0.132**	0.133**	0.326***
	(0.034)	(0.046)	(0.050)
Gender	-0.031	-0.007	-0.065
	(0.035)	(0.048)	(0.045)
Age	0.002*	0.002	0.003
	(0.001)	(0.001)	(0.002)
Income	-0.006	-0.021	0.007
	(0.008)	(0.013)	(0.012)
Educational attainment	0.003	0.012	-0.008
	(0.014)	(0.012)	(0.019)
Political ideology	0.008	0.014	0.008
	(0.009)	(0.014)	(0.011)
Financial ease	0.007	0.011	-0.011
	(0.020)	(0.028)	(0.029)
India	0.075	0.006	0.130*
	(0.046)	(0.068)	(0.061)
EU	0.166**	0.093	0.164
	(0.071)	(0.113)	(0.087)
Other regions	-0.113	-0.265*	-0.015
	(0.071)	(0.116)	(0.092)
_cons	(-0.279)	-0.228	-0.303
	(0.175)	(0.236)	(0.240)
N =	217	105	112
Left-censored observations	45	20	25
Uncensored observations	170	85	85
Right-censored observations	2	0	2
Pseudo R^2	0.536	0.677	0.659

*, **, and *** refer to associated p-values of less than 0.05, 0.01, and 0.001, respectively.

From Table 5 we observe that several differences exist in the determinants of allocation amounts across frames. Interestingly, the dummy variables for the interventions themselves are not significant in any of the regressions. This may be due

to the relatively greater importance of negative valence, descriptive beliefs, and prosociality on behavior. We note that beliefs about others' behavior is not a significant predictor of generosity in the positive frame, but it is strongly significant, and large in magnitude, in the negative frame. Furthermore, normative beliefs are weakly insignificant as a determinant of behavior in the positive frame ($p = 0.06$), whereas they are not at all significant in the negative frame ($p = 0.77$). We also observe that having a prosocial social value orientation is a significant predictor of generosity in all regressions. The magnitude of the parameter estimate associated with prosocial social preferences suggests that a negative frame appears to induce prosocial people to be more generous than a positive frame. The age parameter is significant, but is not economically meaningful due to its low magnitude. A couple of regional effects also emerge. Those reporting residency in EU countries appear to be more generous than those in the U.S. (our reference group). Those residing in India appear to be more generous overall in the negative frame than those in the U.S., implying a greater sensitivity to the change in frame. In the positive frame, those reporting residency in countries other than the U.S., India, and the EU, allocate significantly less of their endowment to the receiver.

5   Discussion

In contrast to some previous literature, we do not find strong support for our Hypothesis 1 in the positive frame. However, we do find a significant average treatment effect of framing with respect to the social norm interventions in the negative frame. Specifically, the intervention yields an average allocation amount of $0.310 when implemented in the positive frame vs. $0.393 when implemented in the negative frame, amounting to an increase of approximately 27%. Analyses of variance within each frame

also indicate a significant treatment effect of interventions in the negative frame, but not in the positive frame. Regression analysis furthermore suggests that there may be important differences in how decisions are made across frames. Whereas normative beliefs appear to be a relatively important decision factor in the positive frame, descriptive beliefs emerge as extremely important in the negative frame. Interventions that seek to influence descriptive beliefs in negative frames may therefore be more effective than those that seek to influence injunctive beliefs.

This novel result offers an important refinement of our understanding of how social norm interventions impact behavior that can be useful to policymakers seeking to design normative interventions that are maximally effective. Specifically, our results suggest that a simple reframing of the decision context from positive to negative may increase its behavioral impact. This result resonates with Bohm and Theelen (2016), who study the impact of pure frame change in the context of a public good game and find that cooperation levels are significantly higher in negatively-framed game than a positively-framed game. We note that the large magnitude of the impact of a social norm intervention in the negative frame in Table 3 is striking given the minimal conditions in which it arose – that is, in the context of neutral terminology and an anonymous online decision environment that minimizes the extent to which participants could expect to receive punishment for deviating from the social norm.[13] This suggests that the social norms identified here may be to some extent internalized by the participants in our sample, or that an experimenter demand effect may still exist despite the considerable social distance between participants and the experimenters. The issue of robustness and external validity is an important one, and should be explored in extensions to this work through replications and field studies.

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[13]We strove to make it clear to participants that there were no right or wrong answers to the questions we pose in the tasks.

One possible reason why we observe such a dramatic difference in the effectiveness of the normative intervention across valence frames relates not to a difference in the social significance of compliance across these settings, but to a difference in the significance of deviation. In the positive frame, in which prosocial behavior could be succinctly described as 'giving', deviating from prosocial behavior would be implicitly described as 'not giving,' or failing to behave prosocially enough (a fairly innocuous crime). In the negative frame, however, in which prosocial behavior amounts to 'not taking,' antisocial behavior could be implicitly described as 'taking too much.' Deviants in this frame therefore face the option of behaving *too* antisocially, arguably a more serious infraction than failing to behave prosocially *enough* (the implication of deviation in the positive frame). Here, one could consider a form of loss aversion to emerge: the threat of losing social esteem, i.e. falling from grace, associated with deviating in the negative frame may be more motivating than the threat of not gaining additional social esteem, i.e. distinguishing oneself, in the positive frame. One of the most notable findings of the analysis suggests that descriptive beliefs play a much more important role in determining behavior in a context where people are more sensitive to the costs of deviating from socially-appropriate behavior than they are to the gains that stand to be obtained by conforming. The fact that normative beliefs appear to be a more important factor in decision-making in the positive frame, in contrast, suggests that intervention strategies could differ by frame.

Finally, we note we find no evidence of a boomerang effect similar to that which has been found with the use of social comparison interventions in other contexts. Indeed, it appears that receiving information about actual average behavior (i.e., an average allocation of about $0.30) induces participants to not give not simply as much, but indeed more than, this amount. Thus, another possible explanation, which is not mutually-

exclusive with the loss aversion hypothesis, is that social information activates positional preferences with respect to moral capital (a desire to be more prosocial than others), and that this effect is greater in the negative frame.

6 Conclusion

Tversky and Kahneman (1981) observe that 'when framing influences the experience of consequences, the adoption of a decision frame is an ethically significant act.' Indeed, we echo others in emphasizing that a consideration of the ethicality of social norm interventions should necessarily precede considerations surrounding the design and implementation of these interventions.[14] Allcott and Kessler (2015), furthermore, show that ignoring the costs that consumers bear in engaging in energy-saving behavior leads to inflated welfare estimates of behavioral intervention designed to encourage energy conservation, and therefore stress the need to conduct comprehensive welfare analyses of these types of interventions in order to fully account for their benefits as well as their costs.

We note several additional avenues for interesting future work. Coffman et al. (2015) have developed a model of information nudges in which the aggregate impact of information about others' behavior depends in part on the extent to which the intervention changes marginal agents' beliefs, and Frey and Meier (2004) have demonstrated that people who are indifferent to behaving prosocially react most strongly to information about others' behavior. In this regard, useful future work could examine social norm interventions in a within-subjects design in order to evaluate the impact of social interventions as a function of the degree to which they differ from apriori beliefs, and to determine the factors that contribute to whether or not beliefs are

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[14]See, for example, Schubert (2017) for an approach to determining the ethical quality of green nudges.

updated in a significant way, as well as those influencing whether or not an agent acts on these changed beliefs. Another interesting extension to the present work, inspired by Harris et al. (2014) is exploring whether, in situations where people are confronted with a variety of social norms, they are more likely to follow the norm that is most self-serving. Another unexplored question is whether these findings extend to higher stakes (e.g. are people similarly willing to conform to a social norm when it becomes more costly to do so?) We also note that a change in valence frame that we study is be closely related to research on proscriptive vs. prescriptive messages (e.g. Winter et al., 2000) and research demonstrating that the word 'no' elicits a unique cognitive response in the brain (Alia-Klein et al., 2007). Relatedly, the significance of framing the norm in terms of what is given/left to the receiver vs. what is taken/kept by the dictator constitutes a different type of frame change that may well have impacts on behavior and conformity to social norms.

We contend that the scale of the impact we find as a result of this simple frame change represents a significant advance in our knowledge of the conditions under which normative considerations are most salient and exposes potential sources of differences in the decision-making process across frames. Because these findings can conceivably have applications in a variety of domains, the extent to which they extend to other contexts should also be a priority for future research.

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Supplementary materials: Experimental protocol

[Both Conditions][15]

Instructions

This is a study on decision-making. You will receive some additional money based on the choices that you and other workers make during the study. In this study, we ask you to participate in 19 tasks.[16] **At the end of the study, one of these tasks will be selected at random, and you will be compensated according to the choice that you and other workers made in this task.** Please answer as honestly as possible. There are no right or wrong answers.

– SCREEN 2 –
Positive Valence [Negative Valence]

Comprehension check

Please consider the following scenario: Individual A is randomly paired with another person, Individual B. Individual A is allocated $1.00 and has the opportunity to allocate this money between him or herself and Individual B. Individual A will make a choice, and then both individuals will be paid money based on the choice made by Individual A. The pairing is anonymous, meaning that neither individual will ever know the identity of the other individual with whom he or she is paired. [Please consider the following scenario: Individual B is allocated $1.00 and Individual A has the opportunity to allocate this money between him or herself and Individual B. Individual A will make a choice, and then both individuals will be paid money based on the choice made by Individual A. The pairing is anonymous, meaning that neither individual will ever know the identity of the other individual with whom he or she is paired.]

Before beginning the compensated tasks, we would like to make sure that you understand this scenario. Below are several possible amounts that Individual A could choose to allocate to him or herself. For each of these amounts, please indicate how much money would be allocated to Individual B as a result. You must answer these questions correctly in order for your work to be approved.

Allocation	
Individual A	Individual B
$0.20	
$1.00	
$0.70	

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[15]Instructions for Player B are not presented here as they are not the interest of this analysis.

[16]Player B's participated in 18 tasks.

Positive Valence [Negative Valence]

Part 1

Now, we will begin the 19 tasks.

Please consider the same scenario described before: Individual A is allocated $1.00 and has the opportunity to allocate this money between him or herself and Individual B. Individual A will make a choice, and then both individuals will be paid money based on the choice made by Individual A. [Please consider the same scenario described before: Individual B is allocated $1.00 and Individual A has the opportunity to allocate this money between him or herself and Individual B. Individual A will make a choice, and then both individuals will be paid money based on the choice made by Individual A.]

In this task, you are Individual A and you have been randomly paired with another worker, Individual B. Please indicate the amount you would like to allocate to yourself and to the worker with whom you are paired. **If this task is selected at the end of the study, both you and the worker with whom you are paired will be compensated according to the allocation you choose in this task.** Your worker ID and the ID of the worker with whom you are paired will remain anonymous

In a scenario exactly like this one in a previous study, most Individual A workers allocated an average of $0.70 [$0.50] to themselves and $0.30 [$0.50][17] to the worker with whom they were paired.[18] Please indicate the amount you would like to allocate to yourself and to the worker with whom you are paired.

Allocation		
Individual A (you)	Individual B (worker with whom you are paired)	
$0	$1.00	
$0.10	$0.90	
$0.20	$0.80	
$0.30	$0.70	
$0.40	$0.60	
$0.50	$0.50	
$0.60	$0.40	
$0.70	$0.30	
$0.80	$0.20	
$0.90	$0.10	
$1.00	$0	

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[17]For the 'low' and 'high' conditions, respectively.

[18]This sentence was not included in the baseline treatment.

Positive Valence [Negative Valence]

Part 2

Please consider the same scenario described before: You are Individual A and have been allocated $1.00. You have the opportunity to allocate this money between yourself and Individual B. You will make a choice, and then both you and Individual B will be paid money based on the choice you make. [Please consider the same scenario described before: Individual B is allocated $1.00 and Individual A has the opportunity to allocate this money between him or herself and Individual B. You are Individual A. You will make a choice, and then both you and Individual B will be paid money based on the choice you make.]

In this task, we are interested in how you think most Individual A workers allocated money in a scenario exactly like this one in a previous study. In the table below, please indicate the allocation that you think most Individual A workers in this scenario actually chose in a previous study. **If this task is selected at the end of the study, you will receive a bonus of $1.00 if you choose the same allocation that was most frequently chosen by Individual A workers in the previous study.**

Allocation		
Individual A (you)	Individual B (worker with whom you are paired)	
$0	$1.00	
$0.10	$0.90	
$0.20	$0.80	
$0.30	$0.70	
$0.40	$0.60	
$0.50	$0.50	
$0.60	$0.40	
$0.70	$0.30	
$0.80	$0.20	
$0.90	$0.10	
$1.00	$0	

Positive Valence [Negative Valence]

Part 2

Please consider the same scenario described before: You are Individual A and have been allocated $1.00. You have the opportunity to allocate this money between yourself and Individual B. You will make a choice, and then both you and Individual B will be paid money based on the choice you make. [Please consider the same scenario described before: Individual B is allocated $1.00 and Individual A has the opportunity to allocate this money between him or herself and Individual B. You are Individual A. You will make a choice, and then both you and Individual B will be paid money based on the choice you make.]

In the tasks below, please evaluate the different possible allocation choices available to Individual A and decide, for each possible allocation, whether you believe choosing that option is very socially inappropriate, somewhat socially inappropriate, somewhat socially appropriate, or very socially appropriate. By socially appropriate, we mean behavior that most people agree is the "correct" or "ethical" thing to do. **If one of the tasks below is randomly selected at the end of the study, you will receive a bonus of $1.00 if your response matches the most common response given by the other Individual A workers who are also participating in this study.**

For example, if you decide that choosing to allocate $0 to Individual A and $1.00 to Individual B is "very socially appropriate," you should mark "very socially appropriate" next to this possible allocation. If this allocation is the task that is selected at the end of the study, and if most other Individual A workers also marked this allocation as "very socially appropriate," then you will receive a bonus of $1.00.

Possible allocations		Appropriateness			
Individual A	Individual B	Very socially inappropriate	Somewhat socially inappropriate	Somewhat socially appropriate	Very socially appropriate
$0	$1.00				
$0.10	$0.90				
$0.20	$0.80				
$0.30	$0.70				
$0.40	$0.60				
$0.50	$0.50				
$0.60	$0.40				
$0.70	$0.30				
$0.80	$0.20				
$0.90	$0.10				
$1.00	$0				

Part 3

In the following six tasks, you will be making decisions about allocating resources between yourself and another worker. **If one of these tasks is selected at the end of the study, you will be randomly paired with a different worker and both you and the worker with whom you are paired will be compensated according to the allocation you chose in the selected task.** Your worker ID and the ID of the worker with whom you are paired will remain anonymous. All of your choices are completely confidential.

On each of the following sliders, please indicate the allocation you prefer most by marking the respective position along the midline. As you can see, your choices could influence both the amount of money that you receive as well as the amount of money that the other receives. There are no right or wrong answers. This is all about personal preferences.

[Slider displayed to participants]

(Other) 85 cents		15 cents (Other)
(You) 85 cents	Other receives : 85 cents You receive : 85 cents	85 cents (You)

[All Players]

Part 3

Please indicate the allocation you prefer most by marking the respective position along the midline.[19] There are no right or wrong answers. This is all about personal preferences. **If this task is selected at the end of the study, then both you and the worker with whom you have been paired for this part of the study will be compensated according to your choice in this task.**

[Slider displayed to participants]

(Other) 15 cents		50 cents (Other)
(You) 85 cents	Other receives : 85 cents You receive : 85 cents	100 cents (You)

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[19]Following Murphy et al. (2011), the bounds of the sliders that follow are [100 cents, 85 cents], [100 cents, 15 cents], [50 cents, 100 cents], and [50 cents, 85 cents] for the Other and [50 cents, 85 cents], [50 cents, 85 cents], [100 cents, 50 cents], and [100 cents, 85 cents] for You.