Social norm interventions as an underappreciated lever for behavior change in energy conservation

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Abstract: Although promising advances have been made in the use of non-pecuniary interventions as low-cost policy instruments to encourage climate-related behavior change, a significant amount remains to be understood. Experimental evidence has shown that behavioral interventions that leverage social norms can be a reliable tool for behavior change with respect to energy conservation. We review several policy lessons based on this literature, such as how to implement social norm interventions so as to avoid counterproductive outcomes, and emphasize that more research is needed in order to further improve the effectiveness of this type of intervention. We identify a variety of topics for future research, such as complementarity with other behavioral interventions, conflict between norms pertaining to various reference groups, the dynamics of descriptive and normative information, and identity considerations.

Key words: energy conservation, behavioral economics, social norms, behavior change, sustainability, nudge, social information, boomerang effect, conformity, bias

JEL classification numbers: J16; Q59; Z13

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1. Introduction

The recent ratification of the Paris Agreement as well as other international agreements to limit the use of hydrofluorocarbons and aviation emissions represent important diplomatic milestones in a concerted global response to climate change. Despite this progress, new evidence indicates that the pace of emissions reductions must be dramatically accelerated in order to limit global warming to the 1.5 degree threshold targeted by the Paris Agreement.[1] This mitigation can be accomplished through technological innovations such as transitions to renewable energy sources, as well as through behavioral changes, notably the adoption of less consumptive energy habits. Given indications that behavioral habits are the main driver of variations in household energy use,[2] targeting consumption habits and the latent 'behavioral capital' that lies therein[3] should be an important element of mitigation strategies.

In a context of limited government budgets and an increasingly pressing need to reach energy conservation goals to attenuate climate change, there arises a strong demand for policy interventions that are at once effective, inexpensive, as well as relatively immediate in their impacts. As an alternative policy tool, non-pecuniary, behavioral interventions have the potential to meet these requirements and can often be more economical than traditional command-and-control or incentive-based tools in encouraging pro-environmental and prosocial behaviors.[4, 5,6,7,8] Those that leverage the power of social norms constitute one type of intervention that has shown significant promise in the domain of energy-related behaviors. Social norm interventions provide information about either most other people's behavior (i.e. descriptive norms) and/or what most people consider to be appropriate behavior (i.e. injunctive norms). In what follows we examine the empirical evidence for the effectiveness of social norm interventions with respect to energy-related behaviors and discuss the need for a more comprehensive understanding of how best to implement this type of intervention in order to further build upon their demonstrated successes. Although we are not the first to concentrate on the potential benefits of leveraging social norms to

achieve energy conservation objectives,[9,10] this work adds to the existing literature on the subject in two ways. First, we synthesize several important lessons from existing research, such as how to successfully leverage beneficial minority (i.e. non-prevailing) norms and avoid potential counterproductive effects. Second, we raise a host of under-addressed issues regarding the most effective use of normative information and suggest several promising topics for future research.

The remainder of the paper is organized as follows. Section 2 draws some important lessons from the existing research regarding the use of social norm interventions as policy tools in order to reach energy conservation objectives. Section 3 raises a number of research questions, the exploration of which would contribute to improving the design of these interventions to enhance their effectiveness. Section 4 concludes.

2. Social norms and energy conservation: lessons from the existing literature

Recent reviews show that social norm interventions, in the form of communicating descriptive or injunctive information, can have significant effects on behavior in a variety of domains, including energy-related behaviors.[11,12,13] Table 1 provides an overview of several studies devoted to the use of social norm interventions in the realm of energy conservation.[14] We selected studies in economics and social psychology that met the following criteria. First, we selected studies that either experimentally manipulated perceived social norms or elicited perceived norms and examined the extent to which these norms predicted energy use intentions or behavior. Second, we selected studies that implemented a social norm intervention using a message communicating either descriptive or injunctive information (as opposed to studies that make norms salient in other ways, such as manipulating the physical environment). The research questions addressed by many of these studies are more complex than what is presented in this summary, examining, for example, the impact of different levels of norms, or various situational or individual factors that moderate the norm-behavior relationship.

Table 1. Studies examining the impact of social norm interventions on energy conservation

Study	Context • Location, date[a] • Behavior or intention studied • Sample characteristics	Methods • Data collection • Analysis	Results [b]
Allcott (2011)[10]	• USA, 2009-2010 • Household electricity use • 588,446 households	• Field experiment • Regression	DN + IN [c] : 2% average reduction in monthly energy use
Allcott (2015)[15]	• USA, 2009-2013 • Household electricity use • 8.57 million households	• Field experiment • Regression	DN + IN [c] : 1.31% average reduction in monthly energy use
Allcott and Rogers (2012)[16]	• USA, 2008-2012 • Household electricity use • 78,887 households	• Field experiment • Regression	DN + IN [c] : 2-3% average reduction in monthly energy use for discontinued vs continuous intervention, respectively
Ayres et al. (2013)[17]	• USA, 2008-2009 • Household electricity use • 75,000 households	• Field experiment • Regression	DN+ IN [c] : 1.2-2.1% average reduction in monthly energy use
Byrne et al. (2014)[18]	• Australia, 2012-2013 • Household electricity use • 8,578 households	• Field experiment, survey • Regression	DN + IN [c] : 4.6% average reduction in monthly energy use
Costa and Kahn (2013)[19]	• USA, 2007-2009 • Energy use • 81,722 households	• Field experiment • Regression •	DN + IN [c] : 2% average reduction in daily energy use
Nolan et al. (2008)[20] Study 1	• USA, 2003-2004 • Intention to conserve energy • 810 California residents	• Phone interviews • Regression	DN: Significant
Handgraaf, de Jeude, and Appelt (2013)[21]	• Netherlands • Electricity conservation in the workplace • 83 environmental consulting employees	• Field experiment • Univariate tests	IN: Significant
Oceja and Berenguer (2009)[22] Study 1	• Spain • Turning lights off in a public restroom • 125 university students	• Field experiment • Univariate tests	DN: Significant
Oceja and Berenguer (2009)[22] Study 2	• Spain • Turning lights off in a public restroom • 200 university students	• Field experiment • Univariate tests	DN: Significant IN: Not significant

Nolan et al. (2008)[20] Study 2	• USA • Household energy use • 371 California residents	• Personal interviews, field experiment • Univariate tests	DN: Significant
Schultz et al. (2007)[9]	• USA • Household energy use • 287 households, San Marcos, CA	• Field experiment • Univariate tests	DN: Significant DN + IN: Significant
Smith et al. (2012)[23] Study 1	• UK • Intention to conserve energy • 162 university students	• Survey • Univariate tests	DN: Not significant IN: Not significant
Smith et al. (2012)[23] Study 2	• UK, China • Intention to conserve energy • 152 university students (80 in China, 72 in UK)	• Survey • Univariate tests	DN: Significant IN: Not significant
Yeomans and Herberich (2014)[24]	• USA, 2010 • Decision to inflate tires to improve fuel efficiency • 700 gas station customers	• Field experiment • Univariate tests	DN: Not significant

[a] When provided.

[b] Results are reported in terms of the main, direct effects of social norms found in each study. A significant impact indicates that the intervention resulted in behavior or intentions more closely matching the norm than in the control treatment, or in the case of regression analysis, that the social norm parameter significantly increases the propensity to indicate pro-environmental intentions or engage in pro-environmental behavior. Reported results are significant at the 10 percent level. DN indicates descriptive norm, IN indicates injunctive norm. Significance is reported at the 10% level.

[c] The treatments used in these studies consisted of home energy reports that involved various combinations of descriptive and injunctive social feedback on current period energy use, descriptive social feedback on twelve-month historical energy use, personalized feedback on twelve-month historical energy use, and targeted energy efficiency advice.

The evidence shows that descriptive norm interventions appear to be consistently effective at inciting significant changes in energy-related behaviors, and that descriptive norm interventions seem to achieve particularly reliable results. Of the 14 studies examining descriptive norm interventions, 12 report significant results, while injunctive norm interventions significantly impact behavior in 8 of 12 studies.[25] We also note that all of the large-scale field studies showed significant effects. Although the magnitudes of these behavior changes tend to be modest (e.g. 2% average reduction in energy use), aggregate outcomes resulting from such changes can be significant. One study reports that the small individual decreases in energy consumption that occurred after the large-scale application of

a social norm intervention is equivalent to that generated by a 11-20 percent short-run price increase or a 5 percent long-run price increase.[10]

Additional insights that are not reported in Table 1 suggest that a more nuanced understanding of how to apply social norm interventions would be useful, not only to maximize their impact, but also to avoid the type of counterproductive (i.e. boomerang) effects that have now been documented in a number of instances. Another study, for example, finds that the impact of an intervention varies by ideology (conservative vs. liberal), environmental preferences, and community characteristics.[19] Another study finds that simply providing descriptive social norm information relative to a baseline condition had no significant effect on propensity to engage in an energy-saving measure, but that the same intervention had differing effects when combined with different types of incentives: a descriptive norm reduced conservation behavior when offered in conjunction with a pecuniary incentive (a fee waiver for carrying out the measure), but the same descriptive norm increased conservation behavior when offered with another type of non-pecuniary incentive (personal assistance in carrying out the measure).[24] This result is interesting, as it suggests that social norm interventions may not simply be additive in behavioral impacts when applied along with other policy tools. These findings demonstrate a clear need for further research examining what constitutes an appropriate combination of instruments, as well as what kinds of combinations should be avoided. In reviewing the studies in Table 1, we also note a relative lack of research that takes place in the context of developing countries. Below we highlight several key findings from the existing literature that could serve as a preliminary checklist for practitioners seeking to use social norm interventions in order to encourage energy conservation.

- Lesson 1. Descriptive social norm interventions can have unintended negative effects on behavioral objectives. The use of descriptive norms has been shown to have a boomerang effect for some individuals when they learn that they outperform the norm.[9,10] Several strategies can be employed in order to overcome this boomerang effect. One method is to provide additional injunctive information supportive of the desired

behavior.[10] Other evidence suggests that the boomerang effect can be prevented by framing one's performance relative to others as a competition.[26] Yet another strategy that may enable policymakers to avoid the boomerang effect could be to target specific subgroups, such as underperformers, when communicating information about a descriptive norm.

- Lesson 2. Although social norm interventions appear to have significant impacts on energy-related behaviors, these impacts often operate unconsciously.[27,28] As such, they cannot be reliably estimated through the direct elicitation of stated preferences. Instead, researchers and practitioners should gauge their effectiveness through experimental studies that elicit revealed motivations. Moreover, some evidence suggests that interventions that leverage intuitive decision-making may be more effective than those that attempt to change behavior through more deliberative cognitive processes.[19]

- Lesson 3. Even if majority behavior is in conflict with beneficial behavior, descriptive norm messages can nonetheless be tailored, without the use of deception, so as to support the beneficial behavior. In political circles, maintaining public trust in institutions is considered to be of utmost importance in assuring the continued political feasibility of behavioral interventions, since without this trust, such interventions are likely to fail.[4,29] (Thaler and Sunstein, 2008; OECD, 2015). In cases of undesirable prevalent behavior, the way in which a social norm is framed and worded becomes of crucial importance in the development of the intervention. In the context of a financially incentivized online shopping environment, one study varies the polarity of quantifier vocabulary in framing minority norms in order to increase the frequency of the desired behavior.[30] They find that non-prevalent norms can be effective if communicated using verbal quantifiers of positive (vs. negative) polarity, since doing so draws cognitive attention to the prevalence (vs. the rarity) of the desired

behavior. Another strategy in the face of a minority norm of beneficial behavior could also be to communicate the norm in absolute terms rather than in relative or proportional terms. When even absolute terms are unhelpful, the results from the former study suggest that emphasizing a positive trend in a minority behavior could be a more favorable alternative in inducing minority behavior.[22] The authors also note that a variety of other linguistic elements of framing should also be examined in greater detail with respect to their ability to communicate descriptive information in a truthful yet productive manner.

3. Further issues regarding the use of social norms to reach energy conservation objectives

After reiterating the insights above, we wish to raise a number of extensions regarding the application of social norm interventions that could enable practitioners to maximize the effectiveness of these interventions as well as avoid potential undesirable effects. An empirical paper, for example, shows that the degree to which behavioral habits influence electricity consumption varies by appliance, and that households with the highest consumption levels use a disproportionate amount of energy compared to households that use less than average.[2] These findings imply that behavioral interventions seeking to maximize energy reduction by changing consumption habits should target habits related to specific appliances, namely those with large behavioral components (e.g. air conditioners as opposed to refrigerators), and that these interventions could, furthermore, target the highest use consumers in order to generate the greatest reductions in energy use.

As we saw in the previous section, experimental evidence has demonstrated that social norm interventions have the capacity to backfire, sometimes leading to unexpected consequences such as boomerang effects.[9,10] Another study refers to interventions that disseminate a single descriptive norm message as 'social norm marketing', and characterize this strategy as 'scatter-shot' in that it casts a wide net, but is not necessarily effective for all people.[31] They contrast this strategy with a more targeted intervention such as applying personalized descriptive feedback (information on one's own performance relative to others') along with

injunctive feedback (indications of approval or disapproval) depending on one's personal performance relative to others.[10] This type of targeted intervention eliminated the undesirable boomerang effect that occurred under the more basic implementation method. This example demonstrates that, although the concept of social norm interventions may seem rather intuitive and several implementation principles have already been established, much remains to be understood regarding the heterogeneous ways in which normative interventions can impact behavior across individual characteristics and broader decision contexts. We contend that this complexity is at present inadequately understood, and moreover, that improving upon this knowledge could contribute substantially to our ability to maximize the effectiveness of social norm interventions. We also observe that the evidence we have with respect to the effectiveness of social norm interventions pertains to behaviors that can be generally measured in a quantitative way (e.g. monthly energy usage). Interesting and relevant behaviors that do not neatly conform to measurement, such as the extent to which people are supportive of others who engage in energy conservation, remain experimentally unaddressed. Without purporting to be exhaustive, we present several specific areas that deserve attention.

Social norms and temporal issues

One area concerns several questions regarding temporality and social norm interventions. For example, what contributes to the durability of the beliefs and behavior change that result from social norm interventions? More research into this question would enable policymakers to design interventions whose impacts are as persistent as possible. Additionally, are there strategic moments or ages when social norms should be implemented? Perhaps introducing normative interventions in primary school would help to instill beneficial beliefs regarding energy conservation behavior throughout one's life. Finally, is it possible that consumers could be influenced by the anticipated social norms of future generations? Several of these questions are closely linked with research on the internalization of purely 'social' norms into 'personal' norms of behavior,[32,33] and the extent to which personal identity plays a role in this process. The generational implications of internalization, for example the propensity for

internalized social norms to pass from parents to children, would also be a natural component of work in this area.

Complementarity with other behavioral interventions

Given that social norm interventions may be implemented in diverse contexts, it seems necessary to examine how these interventions interact with other types of interventions, both pecuniary and non-pecuniary in nature. One study, for example, found that a social norm intervention alone had no effect on conservation behavior, but that the same intervention decreased proenvironmental behavior when combined with a pecuniary incentive and increased proenvironmental behavior when combined with another type of non-pecuniary incentive.[17] Additionally, non-pecuniary interventions can bear on several different psychological biases, such as loss aversion, reactive devaluation, optimism bias, default bias, etc. The complementarity or incompatibility of social norm interventions with these other types of behavioral interventions, however, has not yet been studied.

Divergence between descriptive and injunctive norms

Another area of research interest concerns the convergence or conflict between descriptive and injunctive social norms. For example, is one type of intervention generally more powerful than the other? How should policymakers manage potential conflicts between these two types of norms? One study suggests that care should be taken when using injunctive norm interventions, as the way in which such injunctions are received on an individual level could generate undesirable psychological or behavioral consequences, such as resentment or rebellious behavior.[34] Figure 1 shows an example of a decision tool informed by social norm research that could be of use to policymakers when choosing how to best implement descriptive and normative information.

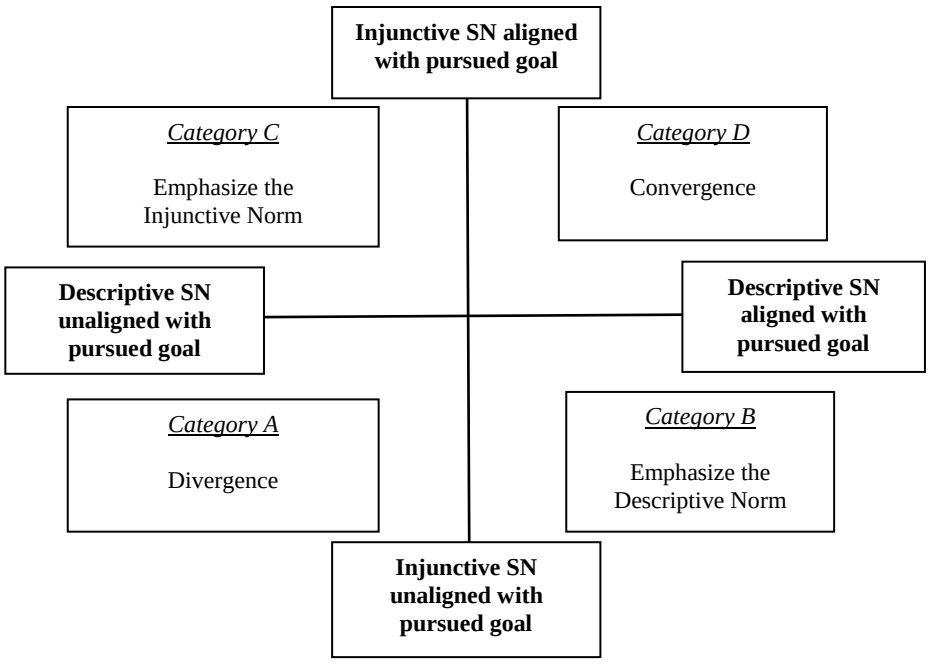

Figure 1. Decision tree regarding the use of descriptive and normative information

Social norms and identity

Another avenue for future research on social norm interventions concerns the fact that individuals frequently belong to various social groups (e.g. family, firm, city, or religion, to cite a few), each of which contribute to some extend to their identity, and each of these identities may correspond to different norms. Previous research has shown that social norm interventions exert varying influences on an individual's behavior depending on their relation to normative reference group.[35,36] When these groups hold conflicting norms (e.g. a norm among one's peer group to litter vs. a broader societal norm not to litter), for example, how does an individual choose which norm to adhere to? In some cases, it may be that a tradeoff is made between identity concerns and self-serving concerns (for example, between adhering to a costly social norm that aligns with an individual's desired identity and a costless norm that already aligns an individual's current behavior). To the extent that groups can be characterized

according to dimensions such as their size and degree of proximity to an individual, experimental studies could examine the importance of these dimensions in scenarios in which individuals face conflicting norms between groups.

This research could respond to practical questions, such as whether it is better to call attention to a more distant group (e.g. people in a given region) that exhibits a more favorable norm (e.g. engaging in high levels of energy-saving behavior) versus a more proximate group (e.g. people in a given city of the region) that have less favorable norm (e.g. engaging in lower levels of conservation behavior). Another interesting extension is the relative effectiveness of motivating conservation behavior by emphasizing the admirable behavior of an in-group vs. the objectionable behavior of an out-group. The first type of intervention leverages identity considerations insofar as one pursues alignment with a certain group and is the subject of much of the extant literature. The second type of intervention, in contrast, leverages one's desire to differentiate oneself from a perceived out-group by outperforming them, and this form of descriptive norm intervention has not received much attention to date.

Last but not least, a natural dimension concerning the interaction between identity and social norm interventions is gender. Given that the behavioral impact of social information is greater the decision-maker's identification with the reference group,[28] it can be expected that gender identity could be leveraged to enhance the effectiveness of normative information. Several questions could be posed as extensions to this line of research. For example, do women and men react similarly when faced with an identical social norm intervention? How do men and women react when confronted with social norms drawn from the same (different) gender group? The findings of such work could have practical implications for public policy interventions. For example, given evidence that men tend to behave in more resource intensive ways than women,[37] it may be possible to improve environmental outcomes through a targeted social norm intervention that alters common perceptions regarding the masculinity (or lack thereof) of energy conservation.[38]

4. Conclusion

Overall, experimental evidence suggests that social norm interventions, in the form of providing information about what other people do and/or consider appropriate, have reliable impacts on energy-related behaviors. This explains their growing appeal as an inexpensive but effective tool available to policymakers seeking to reach energy conservation objectives and mitigate climate change. We have highlighted several lessons offered by the existing research regarding how best to apply social norm interventions in order avoid counterproductive boomerang effects as well as how to mitigate conflicting descriptive and injunctive norms. Next we raised a variety of issues that remain unaddressed, the study of which could improve the way in which social norm interventions are currently implemented. One study finds that ignoring the costs that consumers bear in engaging in energy saving behavior leads to welfare estimates that are inflated by a factor of six, and therefore stress the need to conduct comprehensive welfare analyses of behavioral interventions in order to fully account for the costs, as well as the benefits, of these interventions.[39] They also observe that the retail price of natural gas at the utility they study is above the social marginal cost, noting that in these cases, behavioral interventions should be justified in order to correct market failures or increase consumer welfare and that the welfare gains of nudges should be driven by private gains to consumers rather than un-internalized social benefits. In addition to better understanding the costs of normative interventions, we also believe that the effectiveness of social norm interventions themselves could be better understood. The evidence and insights we have collected here demonstrate that, while social norm interventions have been established as an effective policy tool to encourage energy conservation, a great deal more is yet to be understood regarding the advantages and disadvantages of specific implementation techniques. Pursuing a better understanding of how social norm interventions impact behavior would improve our proficiency in making the most of this measure and represents an area of research regarding behavioral solutions to climate change that continues to hold great promise.

Biographical Notes

Katherine Farrow is a post-doctoral researcher at the University of Paris Nanterre. She completed her PhD at the University of Montpellier and previously held positions at the U.S. National Oceanic and Atmospheric Administration and at Maine Sea Grant. Her work focuses on the relevance of behavioral insights in the design of interventions to encourage environmentally-friendly behavior.

Selected publications:

- Farrow, K., Grolleau, G., Mzoughi, N. 2018. What in the word! The scope for the effect of word choice on economic behavior. ***Kyklos***, forthcoming.
- Farrow K., Grolleau G., and Ibanez L., 2017, 'Social norms and pro-environmental behavior: A review of the evidence', ***Ecological Economics***, 140: 1–13.
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Selected publications:

- Farrow, K., Grolleau, G., Mzoughi, N. 2018. What in the word! The scope for the effect of word choice on economic behavior. ***Kyklos***, forthcoming.
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[38] As a preliminary investigation into such an issue, we implemented a survey administered by a group of students as part of their course in economics with one of the authors. We solicited responses from a convenience sample regarding support for behavioral changes that mitigate climate change. Using a between-subjects design, we created two identical, self-administered pen and paper questionnaires that differed only in the provision of a descriptive social norm in one of the two versions. In Treatment No Social Norm [Social Norm], we asked respondents to indicate their support (I do not support at all, I rather do not support, I rather support, and I highly support) for behavior changes that mitigate environmental damage. The statement reads as follows: *"Completely modifying one's way of life, for example by reducing one's energy consumption and generating less trash, is necessary in order to mitigate the consequences of climate change. [According to a recent study, nine out of ten French people are in favor of these changes.] Are you in favor of these changes?"* We obtained 334 observations (135 men and 198 women). We found that the norm intervention is not significant overall, but that this result masks an interesting gender effect. Women appear to be positively influenced by information about the descriptive norm, with a greater percentage indicating that they highly support environmentally friendly behavior change in the norm treatment (56%) than in the control treatment (34%). In contrast, men appear to be negatively influenced by the intervention, with 22% indicating a high level of support for behavior change in the norm treatment versus 39% who indicated high support for behavior change in the control treatment. This novel result highlights the fact that there is much still to be understood regarding the impacts of social norm interventions on behavior. (The referenced study can be found at http://www.lepoint.fr/societe/climat-pres-de-9-francais-sur-10-s-attendent-a-devoir-changer-de-mode-de-vie-07-10-2015-1971521_23.php).