Energy and Buildings 133 (2016) 32–36

Contents lists available at ScienceDirect

Energy and Buildings

journal homepage: www.elsevier.com/locate/enbuild

Using social norm to promote energy conservation in a public building

Yaqin Liu*, Diogo Veríssimo, Faraz Farhidi

Department of Economics, Andrew Young School of Policy Studies, Georgia State University, Atlanta, GA, United States

ARTICLE INFO

Article history:
Received 20 April 2016
Received in revised form 4 August 2016
Accepted 20 September 2016
Available online 21 September 2016

Keywords:
Social norms
Energy conservation
Petition
Public building

ABSTRACT

In the last decade, there have been an increasing number of interventions that rely on social norms to leverage support for changes in behavior. Many of these interventions target environmentally relevant behaviors such as water and energy consumption, most commonly at the household level. In this paper, we present a field experiment that examines the impact of social norms on petition signing addressing energy consumption in a University campus building. Our results indicate that social norms have an impact on student's support for the initiative, with 5% more students signing a petition to adjust the building's thermostat by 2 °F when informed that 90% of students initially agreed to sign the petition. Our research highlights that social norms can be used to influence individual behavior in a petition signing context, which is more likely to lead to permanent change, than those contexts where individuals need to repeatedly sustain these changes individually over time.

1. Introduction

As climate change becomes increasingly recognized as the key environmental issue of our times [1], there is overwhelming scientific consensus that only a large reduction in greenhouse gas emissions can reduce the risks and impacts associated with climate change [2]. Yet, to achieve meaningful reductions, we will need to change our energy use patterns. One of the more immediate and cost-effective paths to accomplish this is to increase energy conservation and improve use efficiency [3].

Historically, this challenge has been tackled through technological innovation, such as the development of more energy efficient electrical and mechanical equipment [4]. However, using energy more efficiently is not just a technological issue, human behavior plays a crucial role in it. In fact, there is a rapidly growing body of evidence supporting the idea that "energy use is not determined just by the equipment we purchase, but how we use it" [4]. Behavioral adjustments and prospects have a great impact on thermal adaptation [5]. Yet the challenge remains, how can we incentivize individuals to change their behavior in a lasting way?

Previous research on human behavior and the environment has shown that while people stated they engaged in energy conservation behaviors because of economic or environmental concerns, these factors were weak predictors of actual behavior. The strongest predictor of energy conservation intentions was in fact, social norms, group-based standards or rules regarding appropriate attitudes and behaviors [6].

Social norms play an essential role in shaping how individuals interpret and act [7–9]. There are two types of norms: injunctive norms and descriptive norms [10]. Injunctive norms reflect perceptions of what others approve or disapprove of, and motivate action because of the social rewards and punishments associated with engaging, or not engaging, in the behavior. Descriptive norms reflect perceptions of whether other people actually engage in the normative behavior themselves, and motivate action by informing people about what is likely to be effective or adaptive behavior in a particular context. Considering the differences between the two types of norms [11,12], our research focuses on the latter, as they tend to motivate behavior in the immediate context in which others' behavior occurs or can be observed. The effectiveness of descriptive social norms has been observed in pro-environmental behaviors, including energy and water conservation [6,13,14]. However, published studies have so far mostly focused on private behaviors that affect individual outcomes such as household's energy or water consumption. Despite a few previous studies addressing group norms [15–17], we know relatively little about how social norms influence private behaviors that affect collective outcomes, a situation considered in this paper that is particularly common when considering pro-environmental behaviors.

In this paper, we consider an initiative to save energy in a public building by adjusting the general thermostat. Our target is a teaching building on Georgia State University campus. The thermostat of the whole building is preset and controlled by building main-

* Corresponding author at: 556R, 14th Marietta Street, Atlanta, GA 30303, United States.

E-mail address: yliu64@student.gsu.edu (Y. Liu).

http://dx.doi.org/10.1016/j.enbuild.2016.09.041
0378-7788/

tenance. The users (students and teachers) of the building do not have access to the thermostat. Contrary to energy and water conservation in households, adjusting the thermostat of the building needs consent from a large majority of the users. In the experiment, we ask users to sign a petition to adjust the thermostat up in summer and turn it down in winter. An important difference from household conservation choice is that once the change is implemented, the new temperature settings will be permanent. Unlike in a household where individuals need to make choices repeatedly and treatment effect decays, we target a long-lasting conservation that only requires a single decision from users.

Within this context, we examine the effect of descriptive social norms on petition signing. Descriptive social norms have been shown to influence voter turnout [18–20]. Coleman [21] also shows that social conformity shifts individual's choices on which party to vote for. This connection has been examined only in a few studies such as Margetts [22] who investigated the idea of how social norms impact petition signing but did not look into environmental issues. Our research tries to leverage the predicted impact of social norms on petition signing behavior to achieve a permanent change in public building energy consumption.

2. Energy efficiency in public buildings

An evaluation by the U.S. Department of Energy uncovered that buildings account for 40% of all energy use in the United States, more than either industry or transportation. US Buildings also account for about 9% of worldwide carbon dioxide emissions, more than Japan, France and the United Kingdom combined [23]. Energy use has grown in both residential and commercial buildings across the US, and while residential energy consumption exceeds commercial, the latter has been increasing more rapidly, from 14% of total U.S. energy consumption in 1980 to 18% by 2005 [23]. This substantial overall energy consumption means that even proportionally small energy savings can produce meaningful environmental benefits allied to reductions in economic costs. Nevertheless, most of the literature on social norms and energy conservation focuses on energy consumption at the household level [14,24,25].

This is an important gap on our knowledge as there are major differences between the way energy is managed in the residential and commercial sectors. In residential buildings, occupants are directly in charge of controlling energy use and also response for the energy costs. There is therefore a motivation to keep the balance between comfort and energy consumption. However, in commercial buildings, the majority of buildings are managed centrally, with the owner being responsible for the energy cost. In this case, users typically do not have a direct financial interest to conserve energy at work as they do at home [26]. Even among those who are motivated to conserve energy for non-financial reasons, the presence of a general control set by the building manager or owner, may impact the perceived ability of an individual to influence change and make it more difficult to access information on how much energy is being used.

The target building in this paper is the Aderhold Learning Center building situated in Atlanta, Georgia, which is one the biggest classroom buildings on the Georgia State University (GSU) campus, with an area of about 200,000 square feet. It is also one of the most used, with 20,000 students using it every semester. The total energy use of the Aderhold Learning Center building in 2013 was about 2.9 million of KWh, which is equivalent to 260 U.S. household's yearly consumptions. According to the U.S. Energy Information Administration, the average annual electricity consumption for a U.S. residential utility customer was 10,908 KWH in 2013.

The largest energy expense in US buildings, more than a quarter total energy consumption, is around cooling and heating [23]. In the Aderhold Learning Center building the temperature range has been centrally set between 64 and 72 °F. If the thermostat of Aderhold Learning Center building is adjusted by 2°, the degree days of cooling and heating will be reduced by 21% and reduce overall energy consumption of Aderhold Learning Center building by about 5% (Appendix A). This motivated us to investigate how social norms could be used to influence the support of the users of this publicly owned building for a voluntary permanent thermostat adjustment to save energy and reduce costs to GSU.

3. Experimental methods

3.1. Overview

The experiment took place in the Aderhold Learning Center Building of Georgia State University (GSU) from Nov to Dec 2014. As we mentioned above, Aderhold Learning Center building is one of the largest and most used buildings and it is open to students of all years and majors. The experiment was implemented both in the morning and afternoon of Monday through Friday to cover all possible majors. The entire sample covers over 50 different majors in the five main categories: arts and humanities, science, business, engineer and education.

The temperature of the building is controlled by a central control and it has been set at the range 64–72 °F for the past decades. The windows cannot be opened or closed by students in the building. Also, using personal air conditioner or heater is strictly prohibited on such buildings in the university. Since 2011, there have been 77 complaints regarding rooms being too hot or too cold at Aderhold Learning Center building. Considering that around 20,000 students use Aderhold Learning Center building each semester, the perceived actual comfort level in general is satisfactory. More technical information on the HVAC system of Aderhold Learning Center building is provided in Appendix A.

Over the course of the months of November and December in Atlanta, the temperature is characterized by rapidly falling daily high temperatures, with daily highs decreasing from 68 °F to 58 °F and from 58 °F to 52 °F respectively [27]. The thermostat was set at 65 °F during the period that the experiment was carried out.

The data collection was carried out in collaboration with the Sustainable Energy Tribe (SET), an active student association at GSU. SET frequently runs petitions for promoting energy and water conservation across the GSU campus. We had six interviewers, half male and half female, who are undergraduate and graduate students from GSU. The age ranges from 20 to 31. We had both white and black interviewers and one Asian interviewer. The nationalities are Portuguese, American, Chinese and Iranian.

It was stated in script that the petition will be submitted to the President of GSU. The Georgia State University has specific rules for University-level policy waiver or variance petitions. If the petition is approved by the university committee, the thermostat in the Aderhold Learning Center building will be reset. If the petition is rejected, no adjustment will be made. Subjects were aware that they only signed a petition that may or may not lead to an actual change.

3.2. Field experiment procedure and data collecting

We conducted a randomized field experiment. The petition was modified to include two phases. In phase one, in the first three days of the experiment, a random sample of students in the Aderhold Learning Center building were asked by SET members about the petition and the percentage of people who signed was recorded.

Table 1
Percentage of respondents who signed the petition per treatment (Tr) per day.

Column #1 Day	2 Tr 1	3 Tr 2	4 #Tr1	5 #Tr2	6 Total # Listen size	7 % Listen Rate
1	86.8%	97%	38	33	71	66.4
2	100%	95.2%	64	63	127	62.3
3	84.8%	100%	33	32	65	54.6
4	77.92%	83.10%	77	71	148	83.1
5	79.41%	%83.33%	34	42	76	74.5
6	85.42%	89.80%	48	49	97	74.6
7	85.92%	91.78%	71	73	144	77.4
8	90.77%	91.89%	65	37	102	56.4
9	80.70%	87.5%	57	48	105	69.1
10	84.31%	95.56%	51	45	96	74.4
AVE	85.9%	90.9%	538	493	1031	69.3

These data from phase one were then used to predict the overall percentage of students expected to sign the petition therefore determining the social norm information to be used in the next phase of the experiment. This data was not included in the analysis. In phase two, we modified the original petition by adding a social norm treatment in which subjects were given information in the original petition plus the percentage of people who signed in the first three days (phase one). Subjects are randomly exposed to one of the two treatments. Treatment 1 is the original petition, containing information on the temperature changes being petitioned and frames the benefits in terms of both economic and environmental terms. Treatment 2 resembles the first in every aspect except for an additional sentence on the proportion of people who have in the recent past signed the petition. In the first three days prior to experiment, 169 students were sampled, 90% of them signed the petition. Appendix B presents the two petitions.

The two treatments were assigned randomly using the enumerator member-day-hour as the unit. On a given day and a particular one-hour block assignment, a SET member will implement a randomly assigned version of the script followed by the other version in the following hour. We piloted the script (n = 35) for clarity and found no need for substantial changes to the script except minor wording. SET members were debriefed extensively on the purpose and nature of the experiment and received training to ensure full adherence to the script. The petition was implemented by SET members at the two main entrances points to the GSU Aderhold Learning Center building. To carry out the experiment, each enumerator approaches the potential respondent individually, introducing him or herself, introducing the SET and explaining the objectives of the petition. This included an explanation of the procedures that the petition would follow after the signatures were collected, in this delivery to GSU President Mark Becker.

There is the possibility in this experiment that the same person might be approached more than once (on the same day or across several days). However, due to the nature of the petition, we believe that respondents had no incentive to sign the petition again and would simply communicate this fact to the enumerator, as in fact was the case several times.

4. Data analysis and results

Results are presented in Table 1. We calculated the listen rate as the percentage of respondents who listen to the full petition script to the total subjects approached on that day. Column 4 and 5 present the number of subjects who agreed to listen to the petition in Treatment 1 and Treatment 2 specifically, including both those who signed and rejected the petition. Column 6 presents the total number of subjects who agreed to listen in the two treatments. Column 7 shows the percentage of subjects who agreed to listen to the total subjects approached on that day. We calculate the percentage of subjects who signed the petition in the two treatments as number of signatures to the total number of those who listened to the petition. Column 2 and column 3 present the results of the percentage of subjects who signed the petition in treatment1 and treatment 2. We observed 5% difference in the percentage of subjects who signed the petition between the two treatments (Table 1). The difference is statistically significant. Standard two-sample test of proportions yields p-value equals 0.0126. Binomial test of two sides shows p-value is 0.0012.

Table 2
Percentage of respondents who signed the petition by interviewer type.

	Female	Male	Native	Non-native	Interviewer 4
Total # Tr1	255	221	153	323	62
Signed Tr1	216	185	138	263	61
percentage	85%	84%	90%	81%	98%
Total # Tr2	252	192	150	294	49
Signed Tr2	227	177	142	262	44
percentage	90%	92%	95%	89%	90%

In Table 2, we present the results by categories of interviewers. Excluding interviewer 4, which we will discuss separately, in the column for Female, total subjects interviewed by female interviewers in treatment 1 were 255 and 216 out of it signed the petition. In treatment 2, there were 252 subjects interviewed by female interviewers and 227 signed. The difference between the percentage signed within female interviewer in the two treatments were statistically significant (Chi-Square test, p-value = 0.068). For male, native, nonnative categories, we observe similar results. The treatment effect is consistent across all categories of interviewers and the results are not driven by interviewer effect.

However, interviewer 4 is an outlier in our data as the percentage signed in treatment 2 is larger than the percentage signed in treatment 1. The underlying reasons for this different result is unclear. Although interviewer 4 is female and a native speaker, we cannot claim that those two factors are the causes because we did observe consistent results for all other female and native interviewers. It is possible that some personal behavior of interviewer 4 drove the difference in the results. Nevertheless, the treatment effect is still significant after including the data of interviewer 4, as we presented in Table 1. In future research, we may consider monitoring interviewer during experiment to better control and understand interviewer effects.

5. Discussion

The research in this paper advances our current understanding of the use of social norms. Published studies that leveraging social norms to change energy or water use behavior so far mostly focused on private behaviors that affect individual outcomes. To our best knowledge, this paper presents the first research examining the impact of social norms on collective energy conservation through the channel of petition. This paper contributes to our knowledge about how social norms influence private behaviors that affect collective outcomes. It extends the research of social norms' effect on voter turnout and legislative voting choices to decisions on energy conservation.

It should be noted here that although, the consequence of each individual signing the petition is not a change itself, participants were aware of the administrative channels the petition would follow as to ensure this action would be seen as truly linked to change. This is particularly plausible in the GSU context, as previous student petitions have had important consequences, some even resulting in legal action against the university [28]. Moreover, the notion that those signing petitions are indeed making a decision linked to actual changed is supported by the work of Margetts [22] who found that about two-thirds of those that sign a petition would donate to that cause when given a chance. Also, in our research, it is the collective choice or group decision that decides the outcome and it is not likely to be quickly undone unless the social norm changes.

In addition, our finding contributes to the energy conservation literature by showing a plausible novel way of improving energy conservation in Universities and commercial buildings. First, the achievement of long-lasting change provides huge advantage over the behavior changes that are likely to dissipate over time [29]. Second, the mechanism of energy conservation in our study – voluntary thermostat adjustment – can be easily duplicated to millions of office and school buildings. It is worth pointing out that most buildings' temperature is set according to the Office of Safety and Health Administration (OSHA)'s recommendation without deliberate consideration of the occupants' preference. People often experience over-conditioned shopping malls, offices or hospitals in the U. S. It is also common to see people packing sweaters and space heaters in hotels and working place. Given the heterogeneity of people's preference toward indoor temperature, voluntary thermostat adjustment is a useful approach to figure out the comfortable range of temperature of a specific working place and to increase productivity.

While we observed a high (85.9%) percentage of respondents willing to sign the petition under the control condition, which makes the treatment effect (5%) is less strategically important, it is also true that this indication of widespread support opens the door to explore the possibility of a more pronounced temperature adjustment. In that context, future research could also focus on investigating the different peer groups, by looking at the effects of using comparisons with more prestigious Universities, specific groups within the student body (e.g., seniors) or from other buildings within GSU. In the face of challenges such as climate change where influencing human behavior is the key but there is staunch resistance by many sectors of society in adopting measures to use energy more efficiently, the use of social norms to promote lasting change can be a key tool.

Acknowledgments

The authors thank Dr. Paul Ferraro for his gracious help in supervising the experiment design. Thanks also to the Georgia State University Sustainable Energy tribe for assistance in data collection.

Appendix A.

Characterization of the Aderhold Learning Center building

The Aderhold Learning Center Building has four air handling units (AHU) serving the southeast, southwest, northeast, and northwest areas of the building. The AHUs utilize chilled water coils for cooling and electric heating. Each AHU is equipped with a variable frequency drive (VFD) that modulates the speed of the fans in response to heating/cooling demand from terminal units. Chilled water is provided by two 350-ton centrifugal water cooled chillers with an NPLV of 0.63 according to ARI 550/590-1998. Chilled water is distributed via a primary chilled water loop utilizing pumps with VFDs. Heat generated by the chiller is rejected to via a cooling tower with variable speed fans. Water source heat pumps with an 11 EER serve the data closets and telecom rooms. The terminal units in the building are either parallel fan powered boxes or variable air volume boxes with electric reheat.

Cost analysis

By adjusting the temperature by 2 °F, we estimate that about $20,000 per year can be saved on the electricity used in the Aderhold Learning Center Building. A degree day is a measure of how much and for how long outside air temperature is higher or lower than a particular base temperature. Using Bizee tool online (http://www.degreedays.net/), which is a degree day calculator incorporated weather data for energy professionals, we calculate the different degree days using the base temperature before and after adjustment for the Aderhold Learning Center building. Then, based on the monthly electric bill in the past four years, cost per degree day for each month is calibrated. The total cost saved is estimated by multiplying the degree days reduced after temperature adjustment with the cost per degree day.

Appendix B.

Control and Treatment Scripts (additions unique to treatment script bolded)

Hi, I am with the GSU Sustainable Energy Tribe. We are running a petition to adjust the temperature of the Aderhold Learning Center building, do you have a minute?

If NO, record as rejection to listen.

If YES, provide the following information:

We are going to submit this petition to the President of GSU. **In our first three days, 90% of Georgia State students who were asked, signed this petition**. We want the university to lower the temperature in winter and increase it in summer by 2 °F. Thus, in summer it will be warmer and in winter it will be colder.

This change will save around $20,000 per year, and we are asking GSU to use half of the money for student activities. Adjusting the temperature will also reduce 186 Tons of CO_2 emissions per year. It is equal to the amount removed by a forest three times larger than the GSU campus.

Will you sign the petition?

IF YES, they sign.

If NO, record as reject to sign.

References

[1] Diogo Veríssimo, Douglas C. MacMillan, Robert J. Smith, Jennifer Crees, Zoe G. Davies, Has climate change taken prominence over biodiversity conservation? Bioscience 64 (7) (2014) 625–629.
[2] Martin L. Parry (Ed.), Climate Change 2007: Impacts, Adaptation and Vulnerability: Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, vol. 4, Cambridge University Press, 2007.
[3] Mullainathan Sendhil, H. Allcott, Behavior and energy policy, Science 327 (5970) (2010) 1204–1205.
[4] Zhun Yu, Benjamin C.M. Fung, Fariborz Haghighat, Hiroshi Yoshino, Edward Morofsky, A systematic procedure to study the influence of occupant behavior on building energy consumption, Energy Build. 43 (6) (2011) 1409–1417.
[5] G.S. Brager, R.J. de Dear, Thermal adaptation in the built environment: a literature review, Energy Build. 27 (1) (1998) 83–96.

[6] P. Wesley Schultz, Jessica M. Nolan, Robert B. Cialdini, Noah J. Goldstein, Vladas Griskevicius, The constructive, destructive, and reconstructive power of social norms, Psychol. Sci. 18 (5) (2007) 429–434.
[7] Henk Aarts, Ap Dijksterhuis, The silence of the library: environment, situational norm, and social behavior, J. Personal. Soc. Psychol. 84 (1) (2003) 18.
[8] Robert B. Cialdini, Crafting normative messages to protect the environment, Curr. Dir. Psychol. Sci. 12 (4) (2003) 105–109.
[9] Noah J. Goldstein, Robert B. Cialdini, Vladas Griskevicius, A room with a viewpoint: using social norms to motivate environmental conservation in hotels, J. Consum. Res. 35 (3) (2008) 472–482.
[10] Robert B. Cialdini, Carl A. Kallgren, Raymond R. Reno, A focus theory of normative conduct: a theoretical refinement and reevaluation of the role of norms in human behavior, Adv. Exp. Soc. Psychol. 24 (20) (1991) 1–243.
[11] Carl A. Kallgren, Raymond R. Reno, Robert B. Cialdini, A focus theory of normative conduct: when norms do and do not affect behavior, Personal. Soc. Psychol. Bull. 26 (8) (2000) 1002.
[12] Joanne R. Smith, Winnifred R. Louis, Deborah J. Terry, Katharine H. Greenaway, Miranda R. Clarke, Xiaoliang Cheng, Congruent or conflicted? The impact of injunctive and descriptive norms on environmental intentions, J. Environ. Psychol. 32 (4) (2012) 353–361.
[13] P. Wesley Schultz, Alyssa Messina, Giuseppe Tronu, Eleuterio F. Limas, Rupanwita Gupta, Mica Estrada, Personalized normative feedback and the moderating role of personal norms a field experiment to reduce residential water consumption, Environ. Behav. (2014), 0013916514553835.
[14] Paul J. Ferraro, Michael K. Price, Using nonpecuniary strategies to influence behavior: evidence from a large-scale field experiment, Rev. Econ. Stat. 95 (1) (2013) 64–73.
[15] Brendan J. McAuliffe, Jolanda Jetten, Matthew J. Hornsey, Michael A. Hogg, Individualist and collectivist norms: when it's ok to go your own way, Eur. L. Soc. Psychol. 33 (1) (2003) 57–70.
[16] Matthew J. Hornsey, Tim Grice, Jolanda Jetten, Neil Paulsen, Victor Callan, Group-directed criticisms and recommendations for change: why newcomers arouse more resistance than old-timers, Personal. Soc. Psychol. Bull. (2007).
[17] Joanne R. Smith, Winnifred R. Louis, Do as we say and as we do: the interplay of descriptive and injunctive group norms in the attitude–behaviour relationship, Br. J. Soc. Psychol. 47 (4) (2008) 647–666.
[18] Alan S. Gerber, Todd Rogers, Descriptive social norms and motivation to vote: everybody's voting and so should you, J. Politics 71 (01) (2009) 178–191.
[19] Alan S. Gerber, Donald P. Green, Christopher W. Larimer, Social pressure and voter turnout: evidence from a large-scale field experiment, Am. Political Sci. Rev. 102 (01) (2008) 33–48.
[20] Costas Panagopoulos, Affect, social pressure and prosocial motivation: field experimental evidence of the mobilizing effects of pride, shame and publicizing voting behavior, Political Behav. 32 (3) (2010) 369–386.
[21] Stephen Coleman, The effect of social conformity on collective voting behavior, Political Anal. 12 (1) (2004) 76–96.
[22] Helen Margetts, Peter John, Tobias Escher, Stéphane Reissfelder, How many people does it take to change a petition? Experiments to investigate the impact of on-line social information on collective action, in: 5th ECPR General Conference: European Consortium for Political Research, Potsdam, Germany, 2009, pp. 10–12.
[23] U.S. Department of Energy, Energy Efficiency and Renewable Energy, 2008 http://apps1.eere.energy.gov/buildings/publications/pdfs/corporate/bt_stateindustry.pdf.
[24] Allcott Hunt, Social norms and energy conservation, J. Public Econ. 95 (9) (2011) 1082–1095.
[25] Katrina Jessoe, David Rapson, Knowledge is (less) power: experimental evidence from residential energy use, Natl. Bur. Econ. Res. (w18344) (2012).
[26] Amanda R. Carrico, Manuel Riemer, Motivating energy conservation in the workplace: an evaluation of the use of group-level feedback and peer education, J. Environ. Psychol. 31 (1) (2011) 1–13.
[27] U.S. climate data, Climate Data for Atlanta, GA, 2015 http://www.usclimatedata.com/climate/atlanta/georgia/united-states/usga0028.
[28] C. Frisbie, Students of WRAS 88.5 FM file appeal against GSU-GPB partnership, Signal (2015), Available at: http://georgiastatesignal.com/students-of-wras-88-5-fm-file-appeal-against-gsu-gpb-partnership/#sthash.LksCRedY.dpuf.
[29] Kelly S. Fielding, Anneliese Spinks, Sally Russell, Rod McCrea, Rodney Stewart, John Gardner, An experimental test of voluntary strategies to promote urban water demand management, J. Environ. Manag. 114 (2013) 343–351.