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## 2 Using Pro-Environmental Information to Modify 3 Conservation Behavior: Paper Recycling and Reuse

4

5 **Abstract:** In cases where market policy instruments (e.g. taxes and quotas) are impractical tools to  
6 induce conservation behavior, information campaigns may be a valuable option. We use a  
7 difference-in-differences strategy to estimate the effectiveness a signage campaign for inducing  
8 paper recycling and reuse behavior in computer labs. We find that the implementation of signage  
9 with pro-environment appeals increases the probability of conservation behavior (i.e. recycling or  
10 reuse) by approximately 13%, despite the fact that pre-treatment levels of paper recycling and reuse  
11 were already at approximately 85%. Our results suggest that pro-environment campaigns can be an  
12 effective conservation tool and may be an important policy instrument for policy makers to  
13 consider.

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15 **Keywords:** paper recycling; paper reuse; social norms; pro-environment appeals; computer labs.

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### 17 1. Introduction

18 Taxes, subsidies, and quotas are policy instruments sometimes used by policymakers to encourage  
19 socially desired behavior. But there are some economic environments where the implementation of  
20 such market-based instruments is challenging. Taxes and quotas are not always politically feasible  
21 or practical, and subsidies may add significant burdens to limited government budgets (Allcott,  
22 2011). Moreover, there may be instances, such as with recycling and reuse, where costs of  
23 monitoring behavior would be prohibitive. In such cases, policymakers are increasingly interested in  
24 mechanisms to influence individual decision-making that are not based on typical manipulations of  
25 market prices and quantities.

26 Policy instruments to address problems in waste management may face particular challenges  
27 compared to, for example, conservation programs that discourage consumption. While consumption  
28 may be taxed or subsidized at places of sales, it can be impractical to monitor individual behavior  
29 toward some types of recycling and waste disposal. For example, in some situations (e.g. schools,  
30 universities, and corporate offices) it could be difficult to tax paper disposal that could be recycled,  
31 or conversely subsidize paper that is reused or recycled. Accordingly, while energy and water  
32 conservation programs may focus on consumption reduction associated with monetary incentives  
33 through lower utility bills, recycling and reuse programs may need to rely on pro-environmental  
34 appeals.

35 Such an approach may be based on the “supply of environmentalism” related to psychological and  
36 economic concepts (Glaeser 2014). The provision of information may alter behaviour by providing  
37 “psychic taxes” (with negative information) or “psychic subsidies” (with positive information). The

38 information provided to influence behaviour may appeal to social norms.<sup>1</sup> Following the theoretical  
39 model of Ferraro and Price (2013), we assume that moral values are a function of social norms and  
40 may affect the conservation decisions of rational economic agents. The provision of information in  
41 these contexts may appeal to social norms that change the benefits and costs to individuals, and  
42 thereby influence behaviour.

43 There have been numerous information-based initiatives that have attempted to change behaviors  
44 that can generate negative social spillovers, such as excessive alcohol consumption, drug use,  
45 gambling, and littering (Schultz et al., 2007). Other studies have shown that information campaigns  
46 can be effective in promoting environmental conservation behavior, such as reduced water use  
47 (Kurz et al., 2005; Ferraro et al., 2011; Ferraro and Price, 2013; Richetin et al., 2016), reduced bottled  
48 water consumption (van der Linden, 2015), increase re-use of hotel towels (Goldstein et al. 2008),  
49 reduced electric energy consumption (Allcott, 2011; Nolan et al., 2008), and increased sustainable  
50 transportation behavior (Kormos et al., 2015).

51 There is also a research that suggests that information about recycling can increase recycling  
52 behavior (Margai, 1997; Martinez & Scicchitano, 1998; Vining & Ebreo, 1992). The success of such  
53 information campaigns could arise because the information provided appeals to, and/or reinforces,  
54 accepted social norms and/or attitudes (e.g. Schwab et al. 2014). For example, Abbott et al. (2013)  
55 find evidence that social norms influence recycling in England. Thomas and Sharp (2013) observe  
56 that a number of studies have found that over time, an increasing number of individuals are  
57 recycling regularly to the point where it can be deemed a common behavior. They conclude that  
58 recycling is becoming socially normalized in the United Kingdom.<sup>2</sup>

59 Hornik et al. (1995) offer a literature review of the determinants of recycling behavior, highlighting  
60 the role of incentives and facilitators. They discuss the limitations of economic incentives in  
61 promoting long-term sustainable changes in recycling behavior. They also argue that awareness of  
62 the importance of recycling and knowledge about recycling programs is an important facilitator of  
63 recycling behavior. Hornik et al. conclude that strategies that increase recycling education and  
64 improve social image may induce more consumers to begin recycling.

65 Another challenge in the literature around information induced behaviour arises because  
66 information is only one of many types of determinants that can influence behavior, cross-sectionally,  
67 and over time. To address this identification issue, it can be useful to have observations before and  
68 after a treatment, and controls that do not receive the current information treatments, thereby  
69 allowing a difference-in-differences approach. Very few studies have evaluated the impact of  
70 information on environmental behavior in such an experimental framework (e.g. Ferraro and Price,  
71 2013) and even fewer with respect to recycling behavior (e.g. Iyer and Kashyap, 2007). Moreover, to  
72 our knowledge, this is the first study to investigate the effectiveness of an information campaign  
73 when recycling levels are already high.

74 The objective of this study is to evaluate the impact of a signage campaign. Our case study concerns  
75 the use of paper in university computer labs. We use survey data to obtain difference-in-differences  
76 estimates of the effectiveness of the norm-based strategies in promoting paper conservation  
77 behavior. By examining university computer labs, we explore the use of pro-environmental appeals  
78 in a setting where implementation of typical policy instruments (e.g. taxes, subsidies and quotas) is  
79 impractical; a situation common in working environments and offices that regularly consume large

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<sup>1</sup> According to Scott and Marshall (2005), social norms are a set of rules that determine appropriate and inappropriate values, beliefs, attitudes and behaviors. Failure to follow the rules can result in punishments, including social exclusion.

<sup>2</sup> Refer to Nolan (2015) for a discussion about the normativeness of recycling.

80 amounts of paper.<sup>3</sup> Moreover, at our sites' recycling and reuse baseline levels were approximately  
81 84%. Our paper explores whether the implementation of signage with pro-environment appeals  
82 increases the probability of conservation behavior despite already high levels of recycling and reuse,  
83 thereby indicating whether such campaigns can significantly influence conservation behavior over  
84 the "last mile".

## 85 2. Methods

### 86 2.1. The Recycling and Reuse Program

87 We designed a program to encourage paper recycling and reuse. The program consisted of  
88 improved access to recycling bins and reuse trays. In addition, the program introduced signage  
89 regarding paper recycling and reuse. In order to isolate the impacts of the signage, these features  
90 were implemented differentially across labs. While we improved access to paper recycling and reuse  
91 in both labs, we implemented signage with pro-environmental appeals solely in the treatment lab.  
92 Therefore, our treatment effect refers to the impact of signage (in *addition* to improved  
93 infrastructure). Details are provided below.

94 *Improved Access:* Findings in the literature suggest that there are four key components that contribute  
95 to effectively inducing changes in recycling habits: specialized bins for paper recycling, lids on the  
96 bins to prevent disposal of unwanted material, bins being in close proximity to directional signs, and  
97 the placement of receptacles in all areas of consumption (Binder, 2012; Austin et al., 1993). These  
98 requirements were satisfied in both labs. Moreover, the number and size of recycling bins and reuse  
99 trays reflected the capacity of the computer labs.

100 *Signage:* Signage was introduced in only one of the labs (i.e. the treatment lab). Our signage program  
101 consisted of three groups of posters mounted on three different walls next to printers. Each group of  
102 posters contained three components (see Figure 1). Component (a) was designed to prompt  
103 computer lab users to increase their usage of trays facilitating paper reuse. Component (b) was a  
104 "print green" poster that contained one of three pro-social appeals regarding consumption and  
105 resource use:

106

107 *"Canadians are among the world's largest consumers of paper products, using 6 million tonnes of paper and*  
108 *paperboard annually"*

109 *"24 trees are cut down for every tonne of paper and paperboard produced"*

110 *"Approximately 324 litres of water are needed to produce one kilogram of paper"*

111 To improve paper reuse success, we designed a third poster, component (c), which provided  
112 instructions on how to reuse paper.

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<sup>3</sup> Section 4.1 presents a discussion.

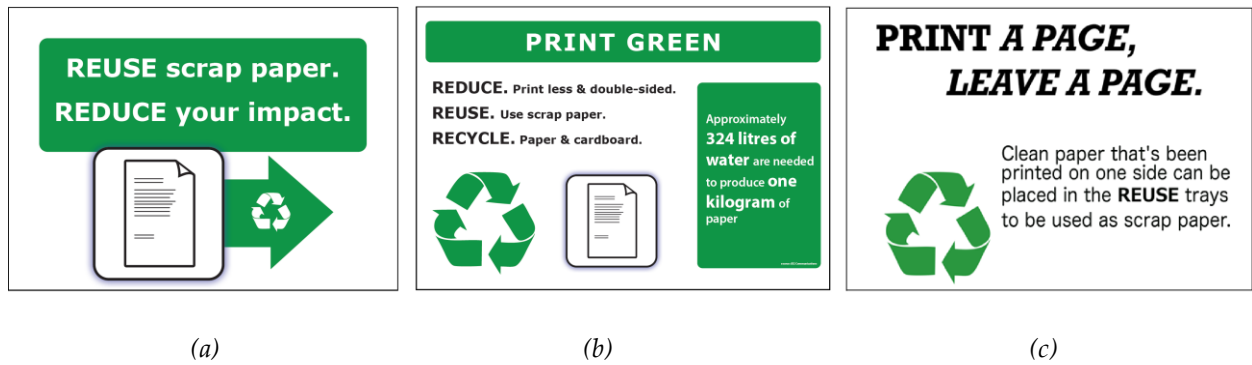


Figure 1: Signage implemented in the treatment lab

2.2. Experimental Design

Our experimental design is motivated by the desire to isolate the effects of the signage treatment from other factors that could influence recycling and/or reuse. There are two categories of factors that could confound this identification: factors that vary cross-sectionally, and factors that vary over time. A difference in difference approach can be used to attempt to control for such factors. Therefore, our experimental design, includes observations before and after the treatment, and controls during the treatment that do not receive the information treatments.

We surveyed users of two computer labs: the control lab and the treatment lab. These are two large labs centrally located on campus with a distance of approximately 500 meters between one another (i.e., a 6 minute walk). Both labs may be used by any student on campus.

A baseline survey was implemented in the Fall of 2012 in both labs. Next, the recycling and reuse program described in the previous section was implemented exclusively in the treatment lab in January 2014. In March 2014 we re-surveyed both labs using the same survey instrument that was implemented in the Fall of 2012.

Interviewers randomly approached users at both computer labs over the course of a week, to fill out a short survey.<sup>4</sup> Interviewers stated that they were collecting information to help the university office of building and grounds services. A key question was: “What do you most often do with used paper in this computer lab?” Respondents were instructed to choose one of four options: a) recycle it; b) use it for scrap paper; c) throw it in the garbage; d) other.

Table 1 summarizes our experimental design by showing the number of responses collected in both labs before and after the treatment.

Table 1: Number of observations per treatment cell

Labs	Fall 2012 (before treatment)	Winter 2014 (after treatment)	Total
Control	86	146	232
Treatment	46	124	170
Total	132	270	402

<sup>4</sup> Users who had already been surveyed were identified and not surveyed again to avoid double counting.

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142 2.3. Program Evaluation

143 The experimental design facilitates the use a difference-in-differences regression model to estimate  
 144 the effect of pro-environment signage on recycling and reuse behavior of computer lab users. This  
 145 approach allows us to compare our treatment group with a control group, thereby accounting for  
 146 non-treatment effects over time. We estimate the following probit model:

$$Prob(Y = 1) = G(\beta_0 + \beta_1 Post + \beta_2 Treatment + \beta_3(Post * Treatment))$$

147 where Y is a binary indicator for the selected behavior (i.e. Y=1 if paper is recycled, Y=0 otherwise), G  
 148 is the c.d.f. of the standard normal distribution, Post is an indicator for the Winter 2014  
 149 (post-treatment) survey, and Treatment is an indicator for the treatment lab.

150 In our case, the treatment effect is equal to the marginal effect of a change in Post\*Treatment from  
 151 zero to one, holding all other variables fixed. As a result, the estimate of the treatment effect on the  
 152 probability of observing the selected behavior is:

$$G(\hat{\beta}_0 + \hat{\beta}_1 Post + \hat{\beta}_2 Treatment + \hat{\beta}_3(Post * Treatment)) - G(\hat{\beta}_0 + \hat{\beta}_1 Post + \hat{\beta}_2 Treatment)$$

153 where  $\hat{\beta}$  denotes probit parameter estimates, with average levels of Post and Treatment used to  
 154 evaluate the above expression.

155 An important identifying assumption of difference-in-differences estimation of treatment effects is  
 156 that behavior of control and treatment groups are identical, except for the effect of the treatment. We  
 157 have no reason to believe that users of the control lab have a systematically different approach  
 158 towards paper recycling or reuse than users of the treatment lab. Nevertheless, we use the Fall 2012  
 159 data (pre-treatment) to test if the proportions of selected behaviors (i.e. recycling, reuse and garbage)  
 160 are statistically different between the two labs. We also note that a given piece of paper can only be  
 161 associated with one behavior, two of which are conservation-oriented (i.e. recycling and reuse).  
 162 Therefore, we also present proportions of the combined behaviors of recycling and reuse. Results are  
 163 presented in Table 2. For all cases, differences between the two labs are not statistically significant.  
 164 This is empirical evidence that behaviors in both labs are similar before treatment, providing  
 165 support for the assumption of random treatment assignment.

166 Table 2: Tests of equality of proportions between the control and treatment labs prior to treatment  
 167 (Fall, 2012)

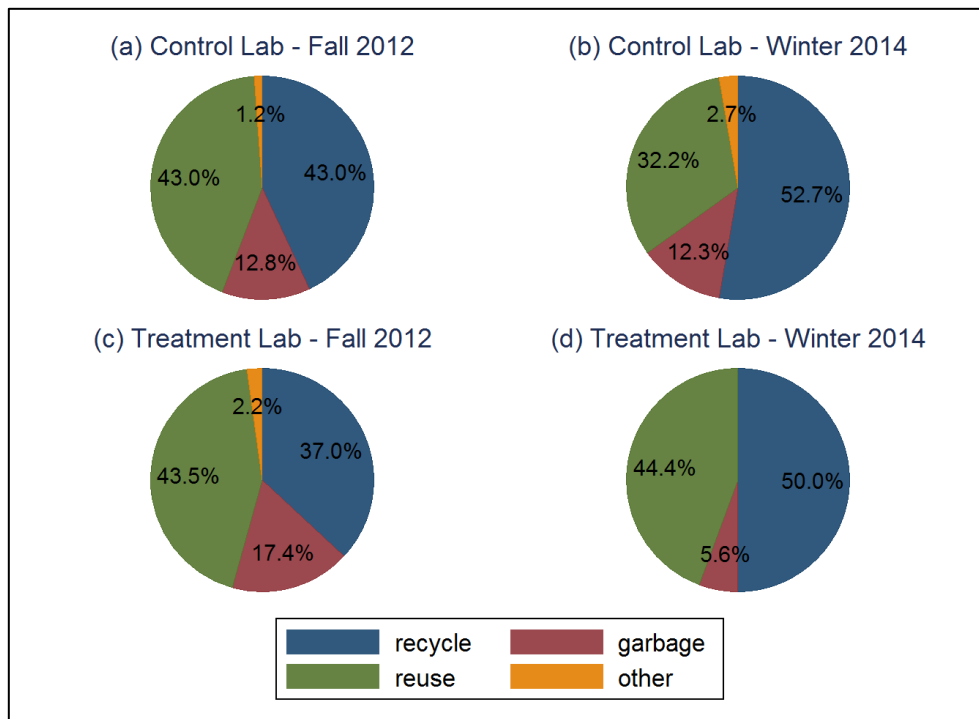
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Labs	Proportion of Recycling	Proportion of Reuse	Proportion of Recycling or Reuse	Proportion of Garbage
Control	0.430 (0.053)	0.430 (0.053)	0.861 (0.037)	0.128 (0.036)
Treatment	0.370 (0.071)	0.435 (0.073)	0.804 (0.058)	0.174 (0.056)
H <sub>0</sub> : Prop(Control) – Prop(Treatment) = 0				
P-value	0.499	0.960	0.401	0.473

169 Note: Standard Errors are in parenthesis.

170 **3. Results**

171 Figure 2 shows the distribution of behaviors by lab, before and after the treatment. In the treatment  
 172 lab, the proportions of respondents recycling and reusing paper increased from Fall 2012 to Winter  
 173 2014, while the proportion of respondents throwing paper in the garbage decreased. But these  
 174 changes may not have been caused by the information provided by our signs, as social norms as  
 175 pro-environmental attitudes and behavior may have been increasing over time. Indeed, we see in the  
 176 control group that recycling also increased over time, while reuse dropped and garbage did not  
 177 change much.



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**Figure 2:** Behavior by lab, before and after treatment

180 The difference-in-differences econometric model is able to provide an estimate of the treatment  
 181 effect of our signage campaign on paper recycling and reuse behavior, while controlling for potential  
 182 non-treatment changes over time. Table 3 shows the marginal effects of our explanatory variables on  
 183 the probability of observing the corresponding behavior. Our interest is on the estimates of the  
 184 treatment effect, i.e. the marginal effect of *Post\*Treatment* on behavior.

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**Table 3:** Difference-in-Differences Probit Regressions

	Recycling	Reuse	Recycling or Reuse	Garbage
<i>Post</i>	0.097 (0.067)	-0.111* (0.068)	-0.009 (0.040)	-0.004 (0.040)
<i>Treatment</i>	-0.063 (0.092)	0.004 (0.089)	-0.045 (0.055)	0.036 (0.052)
<i>Post*Treatment</i>	0.035 (0.111)	0.120 (0.109)	0.128*** (0.048)	-0.097** (0.048)

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Note: The table reports marginal effects. Regressions include a constant. Standard errors are in parenthesis. \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

189 We find that our campaign decreased the probability of throwing paper in the garbage by  
190 approximately 10% (fourth column of Table 3). This treatment effect is statistically significant at the  
191 5% level. But influences of the signage campaign on the individual behaviors of recycling and reuse,  
192 though positive, are not significant. We note, however, that all three behaviors are substitutes for  
193 one another, in that a given piece of paper may only end up in one place. Therefore, an alternative  
194 approach to examining behavior is to aggregate both conservation behaviors (i.e. paper recycling  
195 and reuse) in one model (third column of Table 3). In this model, we find that our signage campaign  
196 increased the probability of conservation behavior (i.e. recycling or reuse) by approximately 13%,  
197 with statistical significance at the 1% level.<sup>5</sup>

## 198 4. Discussion

### 199 4.1. Interpretation of Results and Limitations

200 In cases where market instruments are impractical, information campaigns has been touted as a  
201 means to induce conservation-oriented behavior. Such situations may arise in office environments  
202 where it can be impractical to monitor individual behavior toward recycling and waste disposal.  
203 Moreover, whereas the use of economic instruments frequently requires significant changes in  
204 public policies, which may not be politically appealing, signage campaigns may proceed on an ad  
205 hoc basis, undertaken by individual firms without changes in public policy.

206 Few studies have shown links between such campaigns and changes in behaviors. Moreover, such  
207 investigations rarely have data that allow them to control for the host of intervening factors that  
208 could also contribute towards changed conservation-oriented behavior. In this study, we conduct a  
209 field experiment, with data collected temporally and cross-sectionally. However, there are  
210 limitations. The absence of information about characteristics of respondents prevents us from  
211 controlling for potential impacts of these differences. Nevertheless, given that both labs are available  
212 to all students and are centrally located with small distance from one another, the populations that  
213 these labs serve are likely the same. To the extent that we were able to capture a random sample of  
214 students in both labs, and that potential temporal changes equally influenced both labs, our  
215 difference-in-differences research design allows us to control for changes over time and isolate  
216 impacts of the campaign.

217 Our case study results show that, as a result of an information campaign, throwing paper in the  
218 garbage decreased by approximately 10%, and recycling and reusing increased by approximately  
219 13%. Note that these behavioral changes occurred in an environment where almost 85% of users  
220 were already recycling or reusing, so there was not much room left for improvement. Recent  
221 research indicates that the changed behavior is lower when conservation is already high. For  
222 example, Ferraro and Price (2013) show that the effect of social norms on reducing water  
223 consumption is 94% greater for high water users than that for low water users. In cases where  
224 recycling and reuse programs have not yet been implemented and paper conservation behavior is  
225 low, gains from information campaigns would likely be much higher than our results indicate.

226 Though such changes in two university computing labs may not seem substantial, implementing  
227 such programs on a wide scale could have large impacts on stocks and flows of paper. In 1980, the  
228 Economist suggested businesses should strive towards the “paperless office.” But since then, global  
229 paper consumption has increased by 50%.<sup>6</sup> The average office worker uses approximately two

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<sup>5</sup> As a robustness check, we also estimate a linear probability model and find similar results. Specifically, for the Recycling or Reuse model, the estimated coefficient of *Post\*Treatment* is equal to 0.150 (with  $p < 0.05$ ); for the Garbage model, we estimate this coefficient to be -0.113 (with  $p < 0.1$ ).

<sup>6</sup> Source: <http://www.economist.com/blogs/graphicdetail/2012/04/daily-chart-0>

230 pounds of paper per day, which corresponds to approximately 10,000 sheets of copy paper every  
231 year, or a total of 4 million tons of copy paper a year in the US.<sup>7</sup> Therefore, if information campaigns  
232 were able to reduce paper waste by approximately 13%, the result could increase paper conservation  
233 in American offices by 520,000 tons a year. Moreover, according to the American Forest & Paper  
234 Association, the US supply of printing-writing paper was 20.07 million tons in 2014, while, in the  
235 same year, 11.6 million tons of paper were recovered for recycling (a 58% recovery rate).<sup>8</sup> If  
236 information campaigns were to increase this rate by 13%, printing-writing paper conservation  
237 would increase by 2.7 million tons a year.

238 There are, however, a number of limitations to our study that should be considered in interpreting  
239 our results. One potential issue is cross-contamination, which could occur if the treatment (i.e. the  
240 placement of signs) influences the control group. As both labs are located on the same campus, we  
241 cannot be certain that users interviewed in the control lab were not also users, and influenced by, the  
242 signs posted in the treatment lab. Note, however, that a contamination bias would work against the  
243 identification of a treatment effect. To the extent that contamination occurs, users of the control lab  
244 would increase conservation and the treatment effect found from using our difference-in-differences  
245 approach would be less. Accordingly, our estimates may represent lower bounds of the effect of the  
246 sign campaign on paper recycling and reuse behavior.

247 We also note that the findings of this study are drawn from survey data on stated behaviour. There  
248 is a long standing literature that discusses the advantages and drawbacks of stated preference  
249 methods in comparison to revealed preference approaches<sup>9</sup> (e.g. Adamowicz et al., 1994). For our  
250 study, resources available did not allow us to perform a revealed preference investigation. Future  
251 research could examine possible differences between stated and revealed preferences estimates of  
252 the impact of information campaigns on conservation behavior.

253 Another potential area for further research arises from recent work suggesting that recycling can  
254 lead to increased consumption of waste papers (Caitlin et al., 2013; Cecere et al., 2014). To investigate  
255 this possibility, data on the whole quantity of paper used before and after the introduction of  
256 improved access and pro-environmental signage would be informative.

#### 257 *4.2. Pro-Environmental Information as Policy Instruments*

258 Though pro-environmental information can be effective in promoting conservation behavior, a few  
259 notes of caution are in order. When economic instruments are used to alter behavior, a key part of  
260 the theory and process is the identification and quantification of a negative externality associated  
261 with the behavior in question. For example, paper reuse and recycling could be related to positive  
262 externalities associated with not harvesting trees, thereby maintaining sequestered carbon and/or  
263 providing for wildlife habitat. The values associated with the external costs or benefits are an  
264 integral part of setting the level of taxes or subsidies designed to alter behavior. Unlike economic  
265 approaches, which typically try to tie specific costs and benefits of changed behavior to specified  
266 levels of taxes and subsidies, approaches that provide information have no such basis. For example,  
267 in designing our campaign, we did not consider to what extent the conservation behavior that we  
268 sought to promote was beneficial.

269 So long as more of a desired behavior is better, then considering the level of desired behavior may  
270 not be a concern. (as was the case at the University where our experiment was conducted). But there

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<sup>7</sup> Source: <http://mashable.com/2014/04/22/earth-day-paper-infographic>

<sup>8</sup> Source: <http://www.paperrecycles.org/statistics/recovery-of-printing-writing-papers>

<sup>9</sup> A revealed preference study could use, for instance, data on the weight of recycling bins before and after treatment.



271 may be increased costs and diminishing returns associated with pushing conservation behavior too  
272 far. For example, if a paper campaign attempts to divert the last 1% of paper going to garbage, then  
273 the paper going to reuse paper may have little white space remaining, and/or the paper going to  
274 recycling may be polluted with high levels of impurities (e.g. tapes, glues, and adhesives). Therefore,  
275 such approaches, if taken too far, could be putting paper through costly sorting processes, only to  
276 eventually end up in landfills. The basic problem here is that without accounting for benefits and  
277 costs (internal and external) we don't know what behavior is optimal. Information campaigns could,  
278 therefore, result in behavior that may seem morally correct, but could sacrifice efficiency and use  
279 more resources. Another potential weakness of trying to change behavior with information is that  
280 such approaches can only be effective if they appeal to and reinforce accepted social norms. Existing  
281 social norms are not always based on current knowledge and may be slow to evolve. Therefore,  
282 addressing arising problems where social norms have not yet been formed may have to be  
283 associated with intensive information campaigns if altered behavior is desired.

284 From a public policy perspective, trying to shape public opinion is not without its problems. When  
285 economists seek to design regulatory policies with economic instruments, they generally do so by  
286 accepting public values that exist, and attempt to internalize those public values that are not being  
287 correctly accounted for. The basis for this libertarian approach is that in a democratic society, values  
288 are generally not right or wrong, but the core upon which policy should be based. In contrast,  
289 information campaigns may be based on trying to change and mold public values, a concept that is  
290 typically more associated with authoritarian societies.

291 Nevertheless, information campaigns may provide a useful avenue for policy makers, either by  
292 themselves, or as complements to other conservation policies. For example, the southeast of Brazil  
293 is currently facing its worst drought in nearly a century. As a result, the largest reservoir system  
294 serving Brazil's largest city (Sao Paulo) is currently near depletion.<sup>10</sup> In this situation, conservation  
295 of water is clearly essential, but policy solutions have not been forthcoming, perhaps because of  
296 political procrastination in an election year.<sup>11</sup> With respect to household waste, Waite et al. (2015)  
297 argue that England is unlikely to meet the EU target to reuse, recycle and compost 50% of its  
298 household waste by 2020. They identify the unpopularity of collection charges as one of the  
299 challenges towards meeting the goal. These are two cases where appeals to social norms with  
300 pro-environmental campaigns could potentially help.<sup>12</sup>

## 301 5. Conclusions

302 In this study, we report results of a field experiment designed to evaluate the impact of a signage  
303 campaign on the use of paper in university computer labs. Baseline information on paper  
304 conservation behavior was collected from users of two similar computer labs at the University of  
305 Alberta, Canada. Next, a paper conservation campaign was implemented in one lab through the use  
306 of signage with social appeals. A subsequent survey collected post-campaign information on both  
307 control and treatment labs. These data allow us to obtain difference-in-differences estimates of the  
308 effectiveness of the norm-based strategies in promoting paper conservation behavior. We find that  
309 the implementation of signage with pro-environment appeals increases the probability of

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<sup>10</sup> See

<http://www.nytimes.com/2015/02/17/world/americas/drought-pushes-sao-paulo-brazil-toward-water-crisis.html>

<sup>11</sup> Brazil had a presidential election in 2014. See

<http://www.reuters.com/article/2014/10/31/us-brazil-water-idUSKBN0IK1RL20141031>

<sup>12</sup> Ferraro and Price (2013) found that households that were exposed to social norms consumed approximately 4.8% less water than the average control group household.

310 conservation behavior (i.e. recycling or reuse) by approximately 13%, despite already high levels of  
311 recycling and re-use.

312 Information campaigns may be an effective means of influencing behavior where market  
313 instruments are not viable, or as a complement to other policy alternatives. But unless we have a  
314 clear, and agreed upon, idea of what that behavior should be, such approaches could lead us in  
315 directions that are not socially desirable. Fortunately, information campaigns may be implemented  
316 on small or large scales, by individual firms or as part of large government programs, so that the  
317 approach can be tailored and selectively applied to situations where desired conservation behavior  
318 has been identified and agreed upon.

319 Such was the case with our experiment where signage was added to recycling opportunities. Market  
320 instruments were not viable within the context of computing labs, and recycling and reuse were  
321 identified by the University as desirable outcomes. Within this context, the results of the information  
322 program were impressive in that, despite the fact recycling and re-use were already prevalent,  
323 significant increases were achieved for both recycling and re-use. The pervasive and enduring role  
324 of paper in offices suggests that these results are not only of statistical significance, but also, at large  
325 scales, significant in influencing substantial amounts of recycling and reuse.

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327 **Conflicts of Interest:** The authors declare no conflict of interest.

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