



# Nudging sustainable consumption: The use of descriptive norms to promote a minority behavior in a realistic online shopping environment



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## ABSTRACT

Our research examined effective ways of presenting true descriptive norm information about sustainable consumption in a realistic online shopping environment, even when the current norms for purchasing green products are low. In Experiment 1, participants presented with both “strong” and “weak” formulations of descriptive norms purchased more eco-labeled products and spent more money in comparison with a control condition. Using a different population, Experiment 2 confirmed these results for strong norms, but not for weak ones, and eliminated product salience and differential recall of norms as explanations for these effects. Overall, these findings suggest that even though current levels of green consumption may be relatively low, they can be truthfully described in ways that promote sustainable consumption in a shopping environment with real incentives. These methods can be easily adopted by supermarket chains and department stores.

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## 1. Introduction

Daily consumption habits in developed countries appear to have significant impacts on our environment. Pollution of phreatic tables by chemical fertilizers or massive carbon emissions may be counted as examples of the negative consequences of modern methods of intensive agriculture and conventional industrial processes. In this context, a major challenge for social scientists is to ease the transition towards more sustainable methods of production and consumption (Oskamp, 2000; Schmuck & Vlek, 2003). While purchasing environmentally responsible products often implies immediate costs for the individual in terms of financial losses or the costs of behavioral change, sustainable consumption should produce longer term benefits for the community (e.g., resource conservation, reduction of greenhouse gases). This places the individual in a social and temporal dilemma regarding the management of limited communal resources (Hardin, 1968; Joireman, 2005; Van Lange & Joireman, 2008). How might we get around this obstacle?

Social psychologists have long recognized two major kinds of social influence: informational and normative (Deutsch & Gerard, 1955). A common “informational” strategy to encourage environmentally responsible behavior has been to provide consumers with numerical information about a product's carbon footprint. However, this strategy has met with limited success (Spaargaren, van Koppen, Janssen, Hendriksen, & Kolfshoten, 2013) and it is unclear whether such informational feedback would work successfully in domains such as grocery shopping. Although some stores (e.g., Casino in France) have begun to display carbon information on product packaging, it is still very difficult for consumers to evaluate the impact of their purchases on the environment in an easy and swift way.

However, a simple and recognizable feature that can be exploited in the grocery shopping context is that some products are presented as “green” and are readily perceived by consumers as such. For example, in Casino supermarkets in France there are three kinds of products that fall into the green category: “AB” (*Agriculture Biologique*) and “Bio” (i.e., two organic certifications) food products, as well as chemical products (e.g., washing powders) that have been certified as meeting European Union (EU) standards of environmentally responsible manufacturing. Products belonging to these three categories are presented on the Casino supermarket

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Fig. 1. Ecolabels used in the present study.

website with distinctive green eco-labels (cf. Fig. 1).

In addition to giving product information, these eco-labels may confer a certain social value on products, insofar as pro-environmental behaviors are socially approved (Félonneau & Becker, 2008). As these labels are likely to be recognizable to French consumers, we investigated the power of social norms as “nudges” (Thaler & Sunstein, 2008) to influence the purchasing of such “green” products. To do so, we use an experimental paradigm (*GreenShop*) that presents actual products in a realistic online shopping interface.

The aim of the present studies is to develop and test a methodology for presenting true and effective descriptive norms in a population where the prevalence of the target behavior (sustainable consumption) is initially low. Before detailing the *GreenShop* procedure, below we first review prior work on the use of social norms to influence environmentally responsible behavior.

### 1.1. Using norms to encourage pro-environmental behaviors: focus theory and the salience of descriptive and injunctive norms

Social psychology has shown that social norms constitute an important source of social influence since the origins of the discipline, through the studies of Sherif (1935) on normalization or Asch (1951) on conformity. Cialdini and Trost (1998) make a clear distinction between descriptive norms and injunctive norms. Descriptive norms refer to the perception of the prevalence of a behavior (what most others do, what is done), whereas injunctive norms designate what constitutes commonly approved and disapproved conduct in a certain culture (what ought to be done). For Cialdini, Reno, and Kallgren (1990), descriptive norms constitute decisional shortcuts, whereas injunctive norms introduce the prospect of social rewards and sanctions. These authors analyzed the effects of social norms on behavior in terms of the focus theory of normative conduct, which proposes that norms do not influence behaviors in the same way at all times and in all situations. Indeed, norms will motivate behavior primarily when they are activated, which is more likely if they have been made salient. Thus, persons who are contextually focused on normative considerations are most likely to act in norm-consistent ways. Focus theory predicts that if only one of the two types of norms (descriptive or injunctive) is prominent in an individual's mind, it will exert the stronger influence on behavior.

Although some studies have focused on the influence of subjective norms on shopping behavior for organic products (e.g. Gotschi, Vogel, Lindenthal, & Larcher, 2009), as far as we know there are no studies examining the direct influence of descriptive norms on the purchasing of sustainable grocery products. Descriptive norms have however proved to be effective in inducing pro-environmental behaviors such as energy conservation (e.g., Kantola, Syme, & Campbell, 1984), littering (Cialdini et al., 1990), recycling (Schultz, 1999) and transportation behavior (Kormos, Gifford, & Brown, 2015). For example, an experiment conducted in California on domestic energy saving compared the efficiency of

four messages printed on door hangers in order to encourage 290 households to use fans instead of air conditioning (Nolan, Schultz, Cialdini, Goldstein, & Griskevicius, 2008). The most effective message in reducing energy consumption was the social norm intervention informing participants that 77% of San Marcos residents often use fans instead of air conditioning to keep cool in the summer, (with the following mention: “Your Community's Popular Choice!”).

However, it should be noted that descriptive norms may sometimes have unwelcome effects on environmental behavior. A major problem is that letting people know that an undesired behavior is common (e.g. littering, environmental theft) in a given situation may actually lead them to increase their tendency to produce that behavior (Cialdini, 2003). This is neatly demonstrated by Schultz, Nolan, Cialdini, Goldstein, and Griskevicius (2007) in their study of the effects of social norm feedback on household electricity consumption. When a descriptive norm alone was presented, they observed a classic effect of “normalization” (Sherif, 1935) where consumers moved closer to the norm: High consumers reduced their consumption, but low consumers increased theirs. However, when an injunctive norm message was provided with descriptive norm information, the households consuming less energy continued to consume at low rates.

The above findings raise important questions about how to design such interventions in other domains of environmentally responsible behavior. Although there is often widespread agreement that the environment should be protected (suggesting a high injunctive norm), the number of people who actually engage in sustainable consumption in some domains may be rather low (suggesting a low current consumption norm). For example, according to a survey conducted by the French Institute of Statistics (INSEE, 2013), only 29% of low-income households in France declared that they had bought organic products during the previous month in 2012. This suggests that sustainable consumption in this domain is probably not very widespread in the student population (which we target below), as students generally have a low income. Given that the true base-rate of sustainable consumption in our target group is likely to be low, can we nevertheless design effective norm-based interventions that “nudge” this population to purchase more green products?

There are a number of ways of countering the potentially negative effects of norms describing minority behaviors on the desired behavioral outcome. One is to focus people's attention on injunctive norms that counteract the unwelcome effect of descriptive norms (e.g. Schultz et al., 2007). A second is to present relevant descriptive norm information only to those one wants to influence, such as consumers whose energy use is higher than average (e.g. Kantola et al., 1984). A third is to present descriptive norms that are framed positively in order to create an effective message. For example, Goldstein, Cialdini, and Griskevicius (2008) conveyed a descriptive norm (“Almost 75% of guests who are asked to participate in our new resource savings program do help by using their towels more than once”) that accentuates the actual rate

of towel re-use by previous guests. Results revealed that the descriptive norm condition yielded a significantly higher towel reuse rate than the standard environmental protection condition. However, assertions about social norms that rely on unverifiable assertions or factually incorrect information (e.g., Schultz, Khazian, & Zaleski, 2008) raise ethical concerns (e.g., Croson & Treich, 2014). Such manipulations may be acceptable in the context of an experiment but would seem difficult for a large retailer to utilize, as well-known corporations and retailers rely on public trust in order to obtain and retain business.

In sum, the use of descriptive norms to encourage pro-environmental behavior may backfire for at least three reasons. The first is that giving true information about the extent of pro-environmental behavior may draw attention to the fact that many people do not respect the norm, thus giving them a “licence” to disregard it (cf. Cialdini et al., 2006). The second is that using non-factual norms that misleadingly give the impression that most people indeed follow the pro-environmental norm runs the risk of sapping public confidence in the source, a potentially disastrous outcome for a public company or retailer. Finally, although drawing attention to injunctive norms may sometimes be a solution, companies and retailers may also be reluctant to use these if they are perceived to be too moralizing or patronizing towards (sections of) their clientele.

Below, we seek to identify strategies for presenting true descriptive norm information that circumvent the above problems. In particular, we focus on ways of framing a descriptive norm about a minority pro-environmental behavior in such a way that it will encourage others to perform that behavior.

### 1.2. Framing minority norms to encourage pro-environmental behavior

At the time of writing, many pro-environmental behaviors would be categorized as rare – many people in Western societies still take the plane, drive cars powered by fossil fuel and eat meat and dairy products rather than forego these common behaviors for more environmentally responsible ones (e.g., travelling long distances by train, using public transport or cycling in cities, eating vegetarian products). Given that theories of normative influence postulate that descriptive norms are useful because they provide a standard from which people do not want to deviate, there is a strong incentive to use descriptive norms that suggest a high rate of compliance to a group norm. However, it may be possible to present true descriptive norms about a non-prevalent behavior in such a way that it encourages the behavior in question, through systematically exploiting the linguistic polarity characteristics of verbal and numerical quantifiers. For example, verbal quantifiers with a positive polarity (e.g., *A few, some, many*) of the kind used by Schultz et al. (2008) draw attention towards reasons for performing the behavior in question, whereas those with a negative polarity (e.g., *Few, not many, not all*) draw attention to reasons against. Thus *A few* and *Few* describe the same quantity (Moxey & Sanford, 1993), but the phrase *A few people went to the party because ...* encourages production of reasons that explain why people went to the party (e.g., all their friends were going too), whereas *Few people went to the party because ...* encourages production of reasons that explain why people did not go (e.g., the weather was poor). These polarity phenomena are pervasive in human communication of both verbal and numerical quantities (Geurts & Nouwen, 2007; Hilton, 2010; Hilton, Schmeltzer, & Geurts, 2011; Sanford, Fay, Stewart, & Moxey, 2002).

Although exact comparisons between studies on the effects of social norm information are difficult due to minor differences in procedure, it is noteworthy that the successful message used by

Goldstein et al. (2008) relied on a double-positive quantification strategy that uses positive polarity quantifiers to describe both the number of people performing the target behavior and the number of behaviors performed: e.g., “Almost 75% of guests who are asked to participate in our new resource savings program do help by using their towels *more than once*” (italics added). However, consider the likely response from hotel guests if we described the same behavior from previous guests as “Almost 75% of guests who are asked to participate in our new resource savings program do help by using their towels *at most twice*”. Here, based on previous research, we may expect a substantial number of consumers to think of reasons for *not* performing this behavior (Teigen, Halberg, & Fostervold, 2007). When paired with valued behaviors, positive polarity quantifiers may implicitly suggest reasons for performing the behavior in question thus serving as implicit injunctive norms that encourage people to perform more of a non-prevalent behavior. Consequently, in the research presented below, we constructed descriptive norms which used positive polarity terms to quantify both the number of consumers and the number of products bought, whether the consumers or products were in the majority or minority in their reference group.

## 2. Research overview

We report two experiments in this paper whose main aim was to test the usefulness of true descriptive norms for incentivizing sustainable grocery shopping, even if the behavior in question is not initially widespread. We used an interface that we called “Greenshop”. It was a virtual shop, similar to those which are currently proposed by many supermarket chains for online shopping. It offered a selection of 84 products from the “Casino” grocery chain in France, of which 24 had an “ecological” label (i.e., Bio, AB or EU-certificated eco-label as respecting the environment, see Fig. 1). For each category of products (personal care, sweet and savoury groceries, drinks), there was a choice of at least one standard product and at least one ecological product (cf. Fig. 2). Within each product category, eco-products were more expensive than standard products, but an independent t-test did not show a significant difference between the overall mean price of standard products (2.49 euros,  $SD = 1.23$ ) and ecological products (2.96 euros,  $SD = 1.37$ ,  $p = .14$ , bilateral). Both experiments were conducted with students, a population which may be expected to be familiar with online shopping. We used a suite of 8 laptop computers which we set up in different locations: an experimental room in the University of Toulouse-II (Study 1) and in a public but secluded space in the Toulouse Business School (Study 2).

Participants were informed that they disposed of a 25€ budget. In order to increase the ecological validity of the experimental design and encourage the expression of true preferences, they were also informed that they had 1 chance out of 5 of effectively winning the basket of products they selected (roll of a dice after shopping: 1 “you win”; 6 “roll the dice again”). The “winners” were told that they could pick up their basket in a downtown Casino grocery store.

Although the results from a pilot study of the Greenshop indicated that students bought few green products on average ( $n = 20$ ,  $M = 2.35$ ,  $SD = 1.98$ ), we observed a relatively high proportion who bought at least one product and a majority who bought two. Accordingly, based on our intuitions, we constructed two sets of candidate “strong” and “weak” descriptive norm formulations that truthfully characterized the baseline behavior observed in the pilot study but were expected to suggest respectively a high or a low proportion of people buying ecological products. All four candidate strong norms that we pre-tested included the downwardly bounded quantifier *at least* to accentuate positive polarity, while two of the candidate weak norms included the upwardly bounded

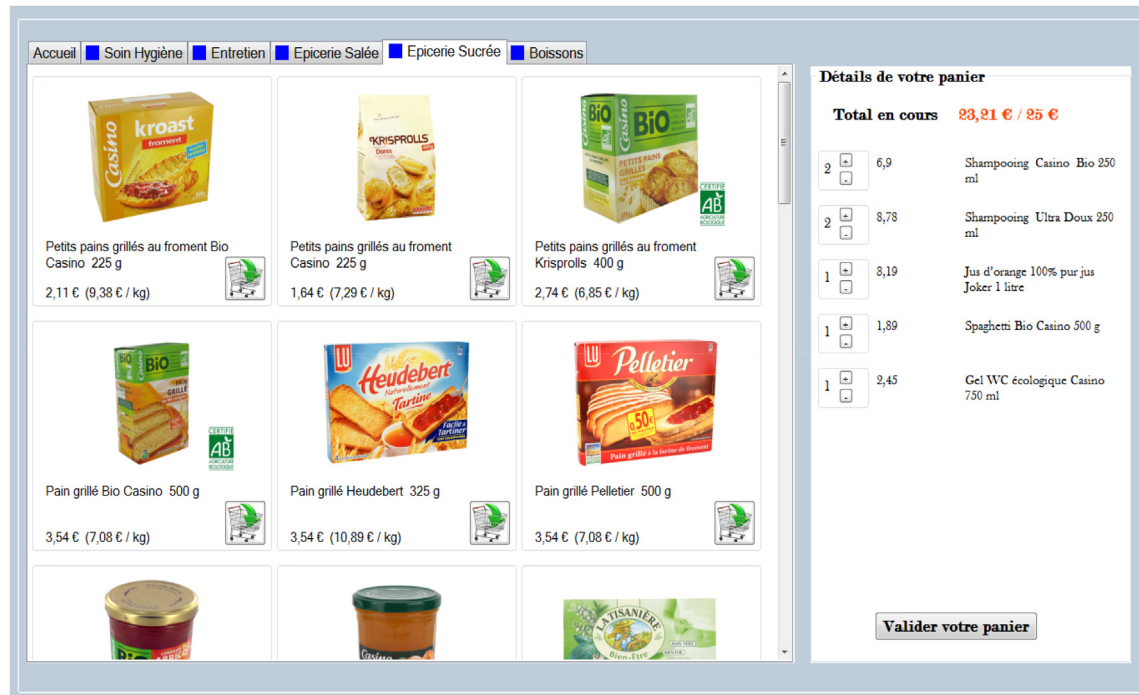


Fig. 2. Screenshot of the Greenshop used in the two experiments.

quantifier *at most* to emphasize negative polarity, or focused on those who did *not* buy ecological products, thus understating the number of ecological products bought.<sup>1</sup>

The pre-test students ( $n = 69$ ) were asked to imagine that various statements had been used to describe the behavior of people who had bought ten products in a shop, and were asked to select the statements that most strongly suggested that a large number of people had bought ecological products (for the four candidate strong norms) or that a small number of people bought ecological products (for the four candidate weak norms). The results revealed that 27 participants considered the statement *70% bought at least one ecological product* and 22 considered the statement *On average, consumers bought at least two ecological products* to suggest the largest proportion among the strong norms, compared to *60% bought at least 2 ecological products* ( $n = 4$ ) and *50% bought at least 3 products* ( $n = 12$ ). Only four found there was no difference between these formulations. For the weak norms, 52 of the 69 participants considered that the statement that *9% purchased an ecological product* suggested the smallest proportion, as compared to *More than 25% did not buy an ecological product* ( $n = 9$ ) or *Practically half bought at least one ecological product* ( $n = 4$ ). Only 3 found no difference between the phrases. On this basis, we selected the first two candidate strong norm statements and the first weak norm statement for our experimental manipulations, as all could be considered as literally true statements about what happened in the pilot experiment.

In Experiment 1, we presented participants with these three descriptive norms (two strong norms and a weak norm) which were consistent with the real shopping data obtained during the pilot study using the Greenshop. In Experiment 2, we added non-factual "extreme" norms in order to clarify understanding of effects observed with the realistic norms in the first experiment.

<sup>1</sup> This formulation was inspired by a Jesuit technique for giving a misleading impression while still telling the truth, strictly speaking (Fauconnier, 1979).

## 2.1. Experiment 1

In our first experiment, we tested whether the descriptive norms would increase sustainable consumption relative to a control condition with no norm information, and whether the descriptive norm information would have different effects on sustainable consumption depending on its formulation (weak vs. strong).

## 2.2. Method

### 2.2.1. Participants

122 humanities undergraduate students from the University of Toulouse-II took part in this experiment. The sample was made up of 78 women and 44 men (Average age = 23.5;  $SD = 4.7$ ), who were approached on campus. They spent on average 24€ ( $SD = 1$ ) in the Greenshop.

### 2.2.2. Materials and procedure

The recruited participants were taken to the lab and placed in front of a computer where the "Greenshop" program had been set up. They were then randomly assigned to one of four conditions:

- The control condition simply informed participants ( $n = 29$ ) of the shop's content: "This shop sells several daily usage products".
- In the "Weak norm" condition, participants ( $n = 31$ ) saw the same information as in the control condition, in addition to a statement which described a low rate of green shopping behavior: "For your information, 9% of previous participants purchased one ecological product".
- In the "Strong norm 1" condition, participants ( $n = 30$ ) saw the control condition information, in addition to a statement which described a high rate of green shopping behavior: "For your information, 70% of previous participants purchased at least one ecological product".



**Table 1**  
Descriptive statistics from Experiment 1.

	Percentage of participants who bought at least one eco-product	Means (SD) of purchased eco-products	Percentage (SD) spent on eco-products
Control condition	58.6	2 (2.45)	24.41 (28.29)
“Weak norm” condition	87.1	2.84 (2.38)	36.40 (26.55)
“Strong norm 1” condition	83.3	2.77 (2.31)	33.47 (25.27)
“Strong norm 2” condition	96.9	3.25 (2.24)	43.83 (28)

- In the “Strong norm 2” condition, participants ( $n = 32$ ) saw the control condition information, in addition to a statement which described a high rate of green shopping behavior but the exact percentage of participants was not mentioned: “For your information, on average, previous participants purchased at least two ecological products”.

### 2.3. Hypotheses

We hypothesized, first, that participants would buy more and spend more money on ecological products in the presence of a strong descriptive norm compared to the control condition. Second, we expected that strong norms would be more effective than weak norms for incentivizing green consumption.

### 2.4. Results

Table 1 presents a descriptive overview of our results. First, in line with our first hypothesis, we observed that, compared to the control condition, participants appeared to add about 1 eco-product as a result of being presented with a norm and spent on average 13% more money on eco-products.<sup>2</sup>

In the following analyses, we focus on the number of green (eco-labeled) products bought and the percentage of budget spent on them. As a Shapiro–Wilk’s test revealed that our data were not from a normally distributed population, both for the number of ecological products purchased ( $S-W = .903$ ,  $df = 122$ ,  $p < .001$ ) and the percentage of revenue spent on ecological products ( $S-W = .938$ ,  $df = 122$ ,  $p < .001$ ), we used a Kruskal–Wallis test, corrected for tied ranks. This revealed a significant effect of norms on the number of ecological products purchased,  $\chi^2(3, N = 122) = 6.900$ ,  $p < .05$  and on the percentage of revenue spent,  $\chi^2(3, N = 122) = 8.990$ ,  $p < .05$ , one-tailed. As shown in Table 2, subsequent Mann–Whitney pairwise comparisons indicated significant differences between the control condition and all three norm conditions (the weak norm and the two strong norms) for our two dependent variables, except for the comparison of the number of products between the control and the strong norm 1 condition, which was marginally significant in the predicted direction ( $p = .10$ ). The other comparisons were not significant. Therefore, contrary to our second hypothesis, strong norms did not significantly encourage participants to buy more or to spend more money on eco-products as compared to weak norms.

### 2.5. Discussion

This experiment is the first to demonstrate the effectiveness of descriptive norms in incentivizing the purchase of real eco-products. This effect is all the more striking as we used real information-based norms about a non-prevalent behavior. However, and against expectations, we did not observe a greater effect

of strong norms compared to weak norms. A number of explanations are possible for this unexpected result. One is that the simple fact of activating a norm (even if it is a weak one) is enough to render the norm salient and guide consumer choices, especially in a student population that we know from other research to be strongly pro-environmental (e.g., Hilton, Charalambides, Demarque, Waroquier, & Raux, 2014). Furthermore, it is possible (despite our pre-testing) that participants had difficulties processing information expressed in percentages and failed to differentiate strong from weak norms in terms of the conveyed prevalence of sustainable consumption. We therefore conducted a second experiment on a different student population in order to clarify these and other issues.

## 3. Experiment 2

The results of the first experiment indicate that descriptive norms can indeed influence shopping for “green” products in a realistic online shopping environment. However, Experiment 1 raised several questions about the nature of this influence. A first question concerned whether it is possible that this effect was due to the simple fact of drawing participants’ attention to the existence of sustainable products in the shop through the norm information, and thus to the possibility of buying sustainable products. Accordingly, we added a new control condition to the next experiment to control for this kind of attentional effect by simply adding a statement that some of the products available in the shop were ecological. A second question concerned whether variations in the quantitative level of norm information was necessary to induce shopping for ecological products, given that there was a significant increase in the number of green products bought both in the strong and weak “norm” conditions. We therefore wished to test whether the different descriptive norms did in fact cause participants to perceive quantitative differences in the number of previous consumers who had bought ecological products, and whether this in turn influenced their own shopping behavior. We therefore decided to replicate the experimental conditions used in Experiment 1, but added a false “extremely low” and a false “extremely high” norm in order to achieve a sharper differentiation in the number of people claimed to buy ecological products in the Greenshop. As manipulation checks, we added questions that assessed whether participants remembered the norm information that they had been given and perceived it to be plausible.

The aims of the second experiment were thus: (1) to ensure that we could replicate the observed effects in Experiment 1, (2) to check that these effects were not merely the result of attentional effects and (3) to assess whether different levels of norm information actually did have an effect on shopping behavior. Finally, we used a different participant population of business school students, which allows us to check the generality of the results obtained in the first experiment across populations.

### 3.1. Method

#### 3.1.1. Participants

273 students from Toulouse Business School took part in the

<sup>2</sup> Chi square tests revealed that the percentage of participants who bought at least one eco-product was significantly higher in every norm condition than in the control.

**Table 2**  
Mann–Whitney U pairwise comparison test for dependent variables in Experiment 1.

	Pairwise comparisons		
	Control vs. Weak norm	Control vs. Strong norm 1	Control vs. Strong norm 2
Number of products purchased	329.000*	329.000	290.000**
Percentage of revenue spent	314.000*	326.000*	271.000**

Note \* $p < .05$ , \*\* $p < .01$ , all tests one-tailed.

research. The sample was made up of 139 women and 134 men (Average age = 21.6;  $SD = 2$ ), who were approached on campus. They spent on average 24.3€ ( $SD = .85$ ).

### 3.1.2. Materials and procedure

As in Experiment 1, the recruited participants were placed in front of a computer which displayed the Greenshop and randomly assigned them to one of 7 conditions:

- The same control condition as in Experiment 1 was used ( $n = 41$ ).
- In a second control condition ( $n = 38$ ), aiming to check that the observed effects were not merely caused by attentional or social desirability effects, the following statement was added to the initial control statement: “For your information, some of the products on sale are ecological”.
- In an “Extremely weak” norm, participants ( $n = 40$ ) saw the same information as in the control condition, plus a statement which described a very low rate of green shopping behavior: “For your information, 1% of previous participants purchased some ecological products”.
- The same “Weak norm” condition as in Experiment 1 ( $n = 39$ ).
- The same “Strong norm 1” condition as in Experiment 1 ( $n = 38$ ).
- The same “Strong norm 2” condition as in Experiment 1 ( $n = 40$ ).
- An “Extremely strong” norm where participants ( $n = 37$ ) saw the same information as in the control condition, plus a statement which described a very high rate of green shopping behavior: “For your information, 90% of previous participants purchased some ecological products”.

At the end of the experiment, we gathered supplementary information about participants' purchasing criteria, habits and environmental attitudes. We also used a manipulation check to ensure that participants correctly identified the norm they were presented with and found it credible.

### 3.2. Results

Globally, all the norms were well recalled by participants (cf. Table 3) and were judged believable ( $M = 2.91$ ,  $SD = 1$ , on 5-point scale). There were no differences between conditions, suggesting

**Table 3**  
Participants' norm recollection in Experiment 2.

“Extremely weak” condition	Correct	38
	Incorrect	2
“Weak norm” condition	Correct	35
	Incorrect	4
“Strong norm 1” condition	Correct	32
	Incorrect	6
“Strong norm 2” condition	Correct	32
	Incorrect	8
“Extremely strong norm” condition	Correct	31
	Incorrect	6

that the majority of participants remembered and accepted the norm information as credible.

Table 4 presents a descriptive overview of our results. First, we observed that participants in the new attentional control condition did not buy significantly more eco-products or spend significantly more money on them than participants in the baseline control condition (number of eco-products purchased:  $p = .49$ ; revenue spent on eco-products:  $p = .45$ ). It therefore seems that the mere fact of drawing attention to the green products is not sufficient to induce new visitors to do the same.<sup>3</sup> We therefore dropped the attentional control condition from subsequent planned comparisons, only reporting statistical contrasts involving the baseline control condition (similar to that used in Experiment 1) below.<sup>4</sup>

We now turn to an analysis of the effects of norms on number of eco-products purchased and percentage of budget spent on these products. A Shapiro–Wilk's test revealed that our data were not from a normally distributed population, both for the number of ecological products purchased ( $S-W = .859$ ,  $df = 273$ ,  $p < .001$ ) and the percentage of the budget spent ( $S-W = .894$ ,  $df = 273$ ,  $p < .001$ ). We therefore used a Kruskal–Wallis analysis of variance, corrected for tied ranks. This revealed an effect of experimental condition on the number of ecological products purchased,  $\chi^2(6, N = 273) = 15.915$ ,  $p < .01$ , and on the percentage of revenue spent,  $\chi^2(6, N = 273) = 14.105$ ,  $p < .05$  (all tests one-tailed). When we turn to specific comparisons, inspection of Table 4 shows that Experiment 2 replicated the finding of Experiment 1 that consumers in both strong norm conditions bought and spent more money on green products than those in the control condition (cf. Table 5). In contrast to Experiment 1 however, the results showed that consumers in the strong norm conditions bought and spent more money on green products than those in the weak norm condition (all  $p$ 's  $< .05$ ). In addition, we observed a marginally significant tendency for extremely strong norms to lead to more green purchases and more money spent on green products than extremely weak norms (both  $p$ 's  $< .08$ , one-tailed).

### 3.3. Discussion

We may first note that the simple fact of mentioning that there were ecological products in the shop (without giving norm information) was not sufficient to induce participants to buy more products compared to the baseline control condition used in Experiment 1. This eliminates the possibility that the results obtained in Experiment 1 were due to attracting participants' attention to a cue (“green”) that they might not otherwise have used in their decision-making. Second, the norm information was correctly

<sup>3</sup> Chi square tests revealed that the percentage of participants who bought at least one eco-product was significantly higher in every norm condition than in the control, except for the weak norm condition. This percentage was significantly higher for the strong norms than for the weak norm.

<sup>4</sup> For the number of eco-products purchased, the attentional control condition was significantly different from all the strong norm conditions but not from the baseline or the weak norm ones. Concerning the percentage spent on eco-products, the attentional condition was different only from the strong norm conditions.

**Table 4**  
Descriptive statistics from Experiment 2.

	Percentage of participants who bought at least one eco-product	Means (SD) of purchased eco-products	Percentage (SD) spent on eco-products
Baseline control condition	56.1	1.56 (2.16)	18.67 (24.55)
Attentional control condition	68.4	1.58 (1.82)	20.24 (20.93)
“Extremely weak” condition	80	1.77 (1.54)	22.10 (20.20)
“Weak norm” condition	61.5	1.67 (1.90)	19.77 (20.96)
“Strong norm 1” condition	86.8	2.29 (1.84)	29.36 (25.23)
“Strong norm 2” condition	92.5	2.22 (1.83)	27.94 (20.22)
“Extremely strong” condition	81.1	2.57 (2.15)	31.83 (26.55)

recalled by most of the participants as well as being judged as quite credible, thus eliminating the possibilities that the effects of norms observed in Experiment 1 are due to differences in recall or in the perceived plausibility of the descriptive norms.

We thus replicated the principal results of Experiment 1, namely that being presented with a norm led participants to buy around one more eco-product per basket and to spend more money than in the control conditions, confirming the potential leveraging effect of descriptive norms. However, post-hoc analyses revealed some systematic differences between our samples. First, comparisons based on amalgamating the results from the four common conditions in Experiments 1 and 2 show that the business students studied in Experiment 2 are overall less “green” than the university students studied in Experiment 1, as they buy significantly fewer green products (Mann–Whitney  $U = 7661$ ,  $p < .01$ ) and spend significantly less money on them (Mann–Whitney  $U = 7440$ ,  $p < .01$ ). Second, focused comparisons show that these group differences were significant in the weak norm and strong norm 2 conditions (respectively  $U = 406$ ,  $p < .01$  and  $U = 381$ ,  $p < .01$  for number of products bought, and  $U = 468$ ,  $p < .05$  and  $U = 428$ ,  $p < .01$ ) for amount of money spent, but were not significant in the baseline and strong norm 1 conditions. This suggested that while both strong norms were effective in influencing green shopping behavior in both experiments, the weak norm and the strong norm 2 were more effective in the university population than in the business population. While underscoring the robustness of the effects of the strong norms across different populations, these results also suggest that there may be significant differences in how different social groups respond to particular descriptive norms. These results yield important clarifications about when particular descriptive norm formulations are most likely to work, and raise important questions for future research and applications.

#### 4. General discussion and conclusions

The aim of the current research was to explore the important

**Table 5**  
Mann–Whitney  $U$  pairwise comparison test for dependent variables in Experiment 2.

	Pairwise comparisons	
	Number of products purchased	Percentage of revenue spent
Baseline control vs. Extremely weak norm	661.500†	680.000
Baseline control vs. Weak norm	744.000	740.000
Baseline control vs. Strong norm 1	521.500**	551.000*
Baseline control vs. Strong norm 2	544.500***	544.000***
Baseline control vs. Extremely strong norm	515.500**	520.000**
Weak norm vs. Strong norm 1	561.000*	567.500*
Weak norm vs. Strong norm 2	592.000*	570.000*
Weak norm vs. Extremely strong norm	534.000*	527.500*
Extremely weak norm vs. Strong norm 1	630.500	649.000
Extremely weak norm vs. Strong norm 2	677.000	648.000†
Extremely weak norm vs. Extremely strong norm	597.000†	597.000†

Note. † $p < .08$ , \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .005$ , all tests one-tailed.

issue of how to promote green consumption. We focused on descriptive norms, as these may constitute powerful behavioral “nudges”. Our goal was to examine the influence of these norms on online purchasing behaviors, and more specifically, to examine the effects of norm formulation and salience. The main results, replicated with two relatively large student samples, highlight the potential of descriptive norms as incentivizing tools for online shopping. With a 25€ budget, participants presented with these norms were willing to add, on average, approximately one eco-product in their basket and to spend 10% more money to do so. Our findings thus confirm earlier research on the effectiveness of descriptive norms in influencing pro-environmental behavior, but extend them to a financially incentivized online shopping environment. Our experiments also demonstrate the utility of the Greenshop protocol, which enables the study of online purchasing behaviors via a realistic interface with real financial implications for experimental participants and uses real norms based on actual shopping behavior by previous visitors to the shop. The methodology is iterative, relying on an initial behavioral sample drawn from the target group of consumers to generate actual norms, which can be truthfully relayed to new generations of consumers drawn from the target sample. Although the initial test of this methodology reported above was performed on student populations, the concept can in principle be applied to all consumer populations that use a particular shop or website. These norm-based nudges are easily implementable and do not need much cognitive analysis by consumers, as they just need to observe or be aware of others’ previous behaviors (Cialdini, 2003). In particular, social norm information may increase the effectiveness of eco-labels which have been found to often (but not always) increase sales of products such as grocery products, detergents, dolphin-safe tuna and seafood, toilet paper, recycled toilet paper, paper towels, household cleaning products, organic cotton in clothes and green electricity (Bjorner, Hansen, & Russell, 2004; Harris, 2007; Vanclay et al., 2011; see also Nimon & Beghin, 1999; Teisl, Roe, & Hicks, 2002)

Our findings constitute novel and practical contributions to the literature, and identify important issues for future research. The first question lies in the inconsistent effects of weak norms which had a comparable effect to strong norms in Experiment 1, but not in Experiment 2. Further work is needed to test whether weak norms are more effective in some populations (e.g., French university students) than others (e.g., French business students). For those who already have strong pro-environmental attitudes, signaling that there exists minority support for an ecological behavior via the display of “weak” norms might be sufficient to induce pro-environmental behavior. On the other hand, if individuals do not share these pro-environmental attitudes from the outset it is likely they will require more convincing and thus, norms will need to convey majority support (i.e. to be “strong” norms) to be successful. Current work in progress by [Lalot, Falomir, and Quiamzade \(2014\)](#) tends to support this assumption. The second question has to do with the generality of our results. We obtained substantial support for our major hypotheses with student populations, who are likely to be familiar with online purchasing. In addition, student populations might be more sensitive to social influences when shopping, due to less ingrained shopping heuristics (e.g., [Hoyer, 1984; Thøgersen, Jørgensen, & Sandager, 2012](#)). Therefore, further studies should focus on comparisons of the effectiveness of such norm-based nudges in different age and social categories and at different levels of computer literacy.

Our finding that it is possible to truthfully use realistic descriptive norm information about a minority behavior in order to encourage that behavior invites further consideration of the role of linguistic factors in the presentation of quantitative information. For example, recent research ([Schmeltzer & Hilton, 2014](#)) has shown that positive polarity framing (e.g., *If there is the least chance that the operation will succeed then ...*) may encourage people to take certain actions (i.e., *take the operation*) more than when the same numerical probability is framed negatively (e.g., *If it is not certain that the operation will succeed*). While social influence researchers have made extensive use of the double-positive quantification strategy (e.g., [Goldstein et al., 2008](#)), other strategies may also be effective. For instance, if the number of consumers buying green products has been increasing from year to year, then communications that draw attention to this trend may be effective (e.g., Every year, more and more consumers buy an increasing number of green products in this shop during each visit), even if this group is still in a minority in absolute terms. Attention to the subtle effects of linguistic factors such as quantifier polarity in constructing reference points may thus allow optimization of the effect of messages aiming to foster sustainable consumption.

In conclusion, our results should have many implications in an increasingly computer-literate world where shopping is done over the internet. While we agree that “the cumulative impact of large numbers of individuals making marginal improvements in their environmental impact will be a marginal collective improvement in environmental impact” ([Thøgersen & Crompton, 2009](#)), the norm-based approach could prove to be very useful in the long term, as a year-on-year leverage effect may progressively lead to a substantial long-term change in consumers’ habits. Thus, if supermarket chains use actual descriptive norms in this way, the norm itself may mechanically evolve over time. In sum, we believe that our research opens up many perspectives. Immediate applications can be envisaged in the growing sector of online shopping, with potential applications for aiding substantial shifts in the consumption of green products in the long term. The potential for the application of these techniques seems considerable, as aids to sustainable consumption may be easily justified by supermarkets and department stores as part of corporate social responsibility actions.

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