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# On Strategic Ignorance of Environmental Harm and Social Norms

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# On strategic ignorance of environmental harm and social norms<sup>\*</sup>

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## Abstract

Are people strategically ignorant of the negative externalities their activities cause the environment? Herein we examine if people avoid costless information on those externalities and use ignorance as an excuse to reduce pro-environmental behavior. We develop a theoretical framework in which people feel guilt from causing harm to the environment (e.g., emitting carbon dioxide) and from deviating from the social norm for pro-environmental behavior (e.g., offsetting carbon emissions). Our model predicts that people may benefit from avoiding information on their harm to the environment, and that they use ignorance as an excuse to engage in less pro-environmental behavior. It also predicts that the cost of ignorance increases if people can learn about the social norm from the information. We test the model predictions empirically with an experiment that involves an imaginary long-distance flight and an option to buy offsets for the flight's carbon footprint. More than half (53 percent) of the subjects choose to ignore information on the carbon footprint alone before deciding their offset purchase, but ignorance significantly decreases (to 29 percent) when the information additionally reveals the social norm, namely the share of air travelers who buy carbon offsets. We find evidence that some people use ignorance as an excuse to reduce pro-environmental behavior—ignorance significantly decreases the probability of buying carbon offsets.

JEL-codes: D03; D81; D83

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## 1. INTRODUCTION

Research implies that people may choose to strategically ignore information—i.e., choose ignorance of the impact of their actions on others to pursue their own self-interest (see for instance Dana et al., 2007; Larson and Capra, 2009; Van der Weele, 2012). People may also ignore information on the harm they cause their future self (strategic self-ignorance) to pursue their short-term interest (Thunström et al., 2013). Strategic ignorance, both of the impact on others and on one’s future self, occurs as a result of an intrapersonal conflict between what one feels one “should do” and what one “wants to do”; ignorance allows people to avoid this conflict and to do what they “want to do.”

In the literature on strategic ignorance of the harm one may cause others, social norms define what one “should do” (Dana et al., 2007; Larson and Capra, 2009; Van der Weele, 2012). We believe that the inner conflict between what one should do and wants to do may also be present in behavior that causes negative externalities on the environment, in which what one “should do” partly depends on social norms. However, we also believe that the social norm surrounding pro-environmental behavior may be unknown—people are unsure what others do to reduce their environmental harm. The aim of this paper is twofold: to explore if strategic ignorance is prevalent with regards to environmentally harmful activities, and to examine how uncertainty of social pressure impacts strategic ignorance.

Our analysis relates to research showing that uncertainty of one’s impact on the environment causes more selfish behavior (e.g., Hine and Gifford, 1996), but differs in that we analyze if people deliberately choose uncertainty. We develop a theoretical framework that shows how guilt-averse people may choose ignorance to avoid guilt from not “doing the right thing,” and that the guilt reduction from ignorance leads to underinvestment in pro-environmental behavior. We assume that “doing the right thing” is based on two components: one’s own sense of right and the social norm.<sup>1</sup> We also assume that not knowing

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<sup>1</sup> Thunström et al. (2013) include guilt aversion in an intrapersonal conflict, where people experience a utility loss from betraying the expectations they have of themselves. Here, we assume that people experience guilt from betraying their own expectations, and experience shame from betraying other people’s expectations, as defined by the social norm.

the social norm creates anxiety, i.e., disutility. Costs of ignorance therefore increase when information entails knowledge of the social norm.

We test our theoretical predictions in an experiment involving an imaginary long-distance return flight, where both the carbon footprint of the flight and the social norm regarding purchases of carbon offsets are unknown. Subjects are asked for their willingness to pay (WTP) for carbon offsets. If strategic ignorance exists, people ignore free information in order to engage in less pro-environmental behavior. Our empirical findings provide support of strategic ignorance of environmental harm—people ignore costless information on their carbon footprint, and ignorance significantly decreases the probability of purchasing carbon offsets. We also find that ignorance is significantly reduced when the information entails knowledge of the social norm.

## 2. ANALYTICAL FRAMEWORK OF STRATEGIC IGNORANCE OF ENVIRONMENTAL HARM

We model the decisions faced by our experimental subjects as driven by three components of utility: (i) the direct opportunity cost of expenditure on carbon offsets, (ii) internal pressure to “do the right thing,” hereafter referred to as “guilt,” and (iii) social pressure to do the right thing, hereafter referred to as “shame.” Since the direct cost  $x$  of carbon offsets is relatively minor, we assume that it enters the utility function linearly. The disutility from guilt and shame are non-linear, however.

Guilt is represented by a function  $g(N^I - x)$ , where  $N^I$  is the norm for offset purchases applied by one’s “internal critic.” For  $x \geq N^I$ , guilt is zero, but for  $x < N^I$ , the function is increasing and convex in the deviation  $N^I - x$ , with  $g'(0) = 0$ .

Shame is represented as a weighted sum of the shame  $s(N^J - x)$  felt with reference to any group  $J$  of perceived “external critics,” where  $N^J$  is that group’s norm and the weight matches the group’s prevalence in the overall population. In the context of our experiment, the only relevant group is that of air travelers who buy offsets. Similar to guilt, shame is increasing and convex in the deviation  $N^J - x$  and zero when  $x = N^J$ . Unlike guilt, however,

shame can go negative—i.e., turn into “pride”—if  $x > N^J$ , implying that one exceeds the social norm.

Let  $e$  denote the “carbon footprint” of a single passenger’s share in a flight’s overall emissions, expressed in the same units as  $x$ . Assume that if a subject is fully informed about  $e$ , she applies internal norm  $N^I = e$ , i.e., feels guilt unless she fully offsets her emissions, and also projects social norm  $N^J = e$  on offset buyers, thereby implicitly assuming that those buyers are informed as well. Letting  $b$  denote the fraction of air travelers who buy offsets, we have that fully informed subjects face optimization problem

$$\min_x c(x) = x + g(e - x) + bs(e - x).$$

A central question addressed by our experiment is how subjects behave when they are *not* fully informed, and moreover face a choice of whether to obtain information before deciding how many offsets to purchase. Subjects are initially uncertain about both the carbon footprint  $e$  and the buyer fraction  $b$ . Our experimental control group C1 is given information on  $e$ , but not  $b$ , while our treatment group T1 is given the *option* of learning  $e$ , but not  $b$ . Similarly, our experimental control group C2 is given information on both  $e$  and  $b$ , while our treatment group T2 is given the option of learning both.

To simplify our analysis of this uncertainty, assume that subjects perceive emissions to be either “high,” equal to  $e^h$ , or “low,” equal to  $e^\ell < e^h$ , whereby  $e^h$  and  $e^\ell$  are identical across all subjects. Subjects may differ, however, in the probability  $p$  that they place on emissions being high. Similarly, assume that all subjects perceive the fraction of buyers to be either  $b^H$  or  $b^L < b^H$ , but differ in terms of the probability  $q$  that they place on the fraction being  $b^H$ .

A key assumption of our model, which drives most of our results, is that uncertainty about  $e$  enters the guilt and shame functions differently. We assume that when a subject is uncertain about  $e$ , the norm  $N^I$  applied by her “internal critic” is her expected value of  $e$ . The norm  $N^J$  that she projects on her “external critics,” however, is the *actual* value of  $e$ , because she continues to assume that those external critics *are* informed.

Defining  $\bar{e} \equiv pe^h + (1-p)e^\ell$  and  $\bar{b} \equiv qb^H + (1-q)b^L$ , the implication is that, for any given level of offset purchases  $x$ , the guilt she feels is  $g(\bar{e} - x)$ , but the shame she feels is  $ps(e^h - x) + (1-p)s(e^\ell - x)$ , weighted by either  $\bar{b}$  or, if she knows it, the true value of  $b$ .

Finally, we make four parametric assumptions that, although not strictly necessary for our results, simplify our exposition. First, we assume that the shame function is quadratic. Second, we assume that the shame function should be consistent with the philosopher Kant's famous "categorical imperative," in the sense that, if all people were identical and fully informed, the social norm should represent the action that everyone would optimally undertake. That is, when everyone faces optimization problem  $\min_x c(x) = x + g(e - x) + s(e - x)$ , the solution given by first-order condition  $1 - g'(e - x) - s'(e - x) = 0$  should equal the norm  $N^J = e$ . But that implies that the shame function must have property  $s'(0) = 1$ . Third, we assume that  $b^L = 0$  and  $b^H = 1$ ; that is, we allow extreme beliefs that either nobody at all or everyone buys travel offsets. Fourth and last, we assume that  $1 - g'(e^h) \geq 0$ . The implication of this final assumption is that a subject who has extreme priors  $\bar{e} = e^h$  on emissions and  $\bar{b} = 0$  on the fraction of offset buyers, and who therefore experiences maximal guilt but minimal shame, optimally buys no offsets. This implies that at least some social pressure is required to induce subjects to buy offsets.

### 2.1. *Decision to become informed or not*

Given the above assumptions, consider the decision faced by subjects in our treatment group T1 whether to obtain costless information about  $e$ . If they remain uninformed, they subsequently face optimization problem

$$\min_x c(x) = x + g(\bar{e} - x) + \bar{b} [ps(e^h - x) + (1-p)s(e^\ell - x)]$$

with solution  $x^n$  given by

$$1 - g'(\bar{e} - x) - \bar{b}[ps'(e^h - x) + (1-p)s'(e^\ell - x)] = 0 \quad (1)$$

if

$$1 - g'(\bar{e}) - \bar{b}[ps'(e^h) + (1-p)s'(e^\ell)] < 0, \quad (2)$$



and  $x^n = 0$  otherwise. Letting  $c^n$  denote their cost at this solution, we have

$$c^n = x^n + g(\bar{e} - x^n) + \bar{b} [ps(e^h - x^n) + (1 - p)s(e^\ell - x^n)].$$

If, however, they choose to learn  $e$ , they subsequently face optimization problem

$$\min_x c = x + g(e - x) + \bar{b}s(e - x),$$

with solution  $x^{1i}(e)$  given by

$$1 - g'(e - x) - \bar{b}s'(e - x) = 0 \quad (3)$$

if

$$1 - g'(e) - \bar{b}s'(e) < 0, \quad (4)$$

and  $x^{1i}(e) = 0$  otherwise. They thereby expect  $e$  to equal  $e^h$  with probability  $p$  and  $e^\ell$  with probability  $1 - p$ . Letting  $E[c^{1i}]$  denote their ex-ante expected cost at the solutions  $x^{1i}(e^h)$  and  $x^{1i}(e^\ell)$ , we have

$$\begin{aligned} E[c^{1i}] &= p [x^{1i}(e^h) + g(e^h - x^{1i}(e^h)) + \bar{b}s(e^h - x^{1i}(e^h))] \\ &\quad + (1 - p) [x^{1i}(e^\ell) + g(e^\ell - x^{1i}(e^\ell)) + \bar{b}s(e^\ell - x^{1i}(e^\ell))]. \end{aligned}$$

The subject should choose to learn  $e$  if and only if  $E[c^{1i}]$  is less than  $c^n$ .

Consider now the special case of a T1 subject with extreme prior  $\bar{b} = 0$ . For this subject, conditions (2) and (4) for interior  $x^n$  and  $x^{1i}(e)$  reduce to  $1 - g'(\bar{e}) < 0$  and  $1 - g'(e) < 0$ . By our assumption that  $1 - g'(e^h) \geq 0$ , both these conditions fail, implying that the subject anticipates buying zero offsets regardless of her information choice. But then  $c^n$  reduces to

$$c^n = g(\bar{e}),$$

while  $E[c^{1i}]$  reduces to

$$E[c^{1i}] = pg(e^h) + (1 - p)g(e^\ell).$$

Since the guilt function is convex, we have by Jensen's inequality that  $E[c^{1i}] > c^n$ , provided only that  $p \in (0, 1)$ . That is, a subject with priors  $\bar{b} = 0$  and  $\bar{e} \in (e^\ell, e^h)$  strictly prefers to stay ignorant about  $e$ , so as to minimize her expected guilt.

Consider next a subject with extreme prior  $\bar{b} = 1$ . For this subject, conditions (2) and (4) reduce to  $1 - g'(\bar{e}) - s'(\bar{e}) < 0$  and  $1 - g'(e) - s'(e) < 0$ , where we have used our assumption that the shame function is quadratic to rewrite  $ps'(e^h) + (1 - p)s'(e^\ell)$  as  $s'(\bar{e})$ . By our other assumptions on the guilt and shame functions, in particular the Kantian assumption that  $s'(0) = 1$ , both these conditions hold. Those same assumptions imply that first-order conditions (1) and (3), which reduce to  $1 - g'(\bar{e} - x) - s'(\bar{e} - x) = 0$  and  $1 - g'(e - x) - s'(e - x) = 0$ , imply solutions  $x^n = \bar{e}$ ,  $x^{1i}(e^h) = e^h$ , and  $x^{1i}(e^\ell) = e^\ell$ . That is, the subject anticipates completely offsetting either her expected emissions if she stays uninformed or her actual emissions if she becomes informed. But then  $c^n$  reduces to

$$c^n = \bar{e} + g(0) + ps(e^h - \bar{e}) + (1 - p)s(e^\ell - \bar{e}),$$

while  $E[c^{1i}]$  reduces to

$$E[c^{1i}] = p[e^h + g(0) + s(0)] + (1 - p)[e^\ell + g(0) + s(0)] = \bar{e} + g(0) + s(0).$$

Since the shame function is convex, we have by Jensen's inequality that  $c^n > E[c^{1i}]$ , provided again that  $p \in (0, 1)$ . That is, a subject with priors  $\bar{b} = 1$  and  $\bar{e} \in (e^\ell, e^h)$  strictly prefers to learn  $e$ , so as to minimize her expected shame.

The gap  $c^n - E[c^{1i}]$  can be shown to monotonically increase in  $\bar{b}$ , implying that for any given prior  $\bar{e}$  on emissions, there is a unique cutoff prior  $\bar{b}^{ni}(\bar{e})$  on the fraction of buyers below which subjects in treatment group T1 prefer to stay ignorant about  $e$ , but above which they prefer to become informed.

Subjects in treatment group T2 face the slightly different decision whether to obtain information about both  $e$  and  $b$ . If they remain uninformed, their cost is  $c^n$ . If they choose to learn  $e$  and  $b$ , they subsequently face optimization problem

$$\min_x c = x + g(e - x) + bs(e - x),$$

with solution  $x^{2i}(e, b)$  given by  $1 - g'(e - x) - bs'(e - x) = 0$  if  $1 - g'(e) - bs'(e) < 0$ , and  $x^{2i}(e, b) = 0$  otherwise. Letting  $E[c^{2i}]$  denote their ex-ante expected cost, we have

$$\begin{aligned} E[c^{2i}] = & pq [x^{2i}(e^h, b^H) + g(e^h - x^{2i}(e^h, b^H)) + b^H s(e^h - x^{2i}(e^h, b^H))] \\ & + p(1 - q) [x^{2i}(e^h, b^L) + g(e^h - x^{2i}(e^h, b^L)) + b^L s(e^h - x^{2i}(e^h, b^L))] \\ & + (1 - p)q [x^{2i}(e^\ell, b^H) + g(e^\ell - x^{2i}(e^\ell, b^H)) + b^H s(e^\ell - x^{2i}(e^\ell, b^H))] \\ & + (1 - p)(1 - q) [x^{2i}(e^\ell, b^L) + g(e^\ell - x^{2i}(e^\ell, b^L)) + b^L s(e^\ell - x^{2i}(e^\ell, b^L))] . \quad (5) \end{aligned}$$

We use a revealed-preference argument to show that  $E[c^{2i}] \leq E[c^{1i}]$ , with strict inequality for all subjects except those with extreme priors  $\bar{b} = 0$  or  $\bar{b} = 1$ . The result follows because, were informed T2 subjects to ignore their information on  $b$  and choose  $x = x^{1i}(e)$ , i.e., buy the same number of offsets as informed T1 subjects, they would incur the same expected costs  $E[c^{1i}]$  as those subjects. But then, by revealed preference and strict convexity of  $c(x)$  at values of  $x \in (0, e)$ , the expected costs of T2 subjects are strictly lower whenever  $x^{2i}(e, b)$  differs from  $x^{1i}(e)$ . This holds for example at  $(e^h, b^H)$ , where both  $x^{2i}$  and  $x^{1i}$  are positive, but  $x^{2i}$  is given by  $1 - g'(e^h - x) - b^H s'(e^h - x) = 0$ , whereas  $x^{1i}$  is given by  $1 - g'(e^h - x) - \bar{b} s'(e^h - x) = 0$ . Aggregating over all possible  $(e, b)$  realizations, we therefore have that  $E[c^{2i}] < E[c^{1i}]$  for all  $\bar{b} \in (0, 1)$ , and  $E[c^{2i}] = E[c^{1i}]$  only at  $\bar{b} = 0$  and  $\bar{b} = 1$ .<sup>2</sup>

But then, since  $E[c^{1i}] > c^n$  at  $\bar{b} = 0$  and  $E[c^{1i}] < c^n$  at  $\bar{b} = 1$ , it follows that T2 subjects, too, should prefer to stay uninformed at priors  $\bar{b}$  below some cutoff. Moreover, the fact that  $E[c^{2i}] < E[c^{1i}]$  for  $\bar{b} \in (0, 1)$  implies that the set of priors  $\bar{b}$  at which T2 subjects prefer to stay uninformed is strictly smaller than that for T1 subjects. That is,

**Proposition 1.** *Subjects offered both carbon-footprint and social information are less likely to avoid that information than subjects offered only carbon-footprint information.*

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<sup>2</sup> Intuitively, subjects with extreme priors  $\bar{b} = 0$  or  $\bar{b} = 1$  do not anticipate learning anything if  $b$  is revealed to them, and therefore must expect to incur the same costs regardless.

## 2.2. Comparison of offset purchases across informed and ignorant subjects

The foregoing analysis might lead one to expect that T1 subjects who choose ignorance buy fewer offsets than those who choose to become informed. After all, it was shown that T1 subjects with given prior  $\bar{e}$  choose ignorance if they have a relatively low prior  $\bar{b}$ , below cutoff  $\bar{b}^{ni}(\bar{e})$ , and therefore feel relatively little social pressure. Intuitively, the less social pressure a subject feels, the fewer offsets she should buy.

Matters are complicated, however, by the fact that offset purchases by informed subjects are determined not by their prior  $\bar{e}$ , but by the actual level of emissions revealed to them, hereafter denoted  $\hat{e}$ . In general, one should expect  $\hat{e}$  to differ from the average prior  $\bar{e}^i$  of all sample subjects who chose, on the basis of their prior, to become informed. Similarly, one should expect it to differ from the average prior  $\bar{e}^n$  of sample subjects who chose to remain ignorant.

The model makes sharp predictions about offset purchases only if  $\bar{e}^i = \bar{e}^n = \hat{e}$ , i.e., under the strong assumptions that (i) all subjects place the same probabilities  $p$  and  $1 - p$  on emissions being  $e^h$  or  $e^\ell$ , and (ii) those probabilities are accurate in the sense that the true level of emissions  $\hat{e}$  equals  $\bar{e} = pe^h + (1 - p)e^\ell$ .

Under these assumptions, all subjects, regardless of their information decision, choose to buy a positive number of offsets if and only if their prior  $\bar{b}$  exceeds a cutoff  $\bar{b}^{0+}(\hat{e})$  given by

$$1 - g'(\hat{e}) - \bar{b}s'(\hat{e}) = 0.$$

There are then two cases to consider. One arises if  $\hat{e}$  is such that  $\bar{b}^{0+} > \bar{b}^{ni}$ . In this case, all subjects who choose ignorance buy zero offsets, whereas only a fraction of subjects who choose to become informed do so, namely those with priors between  $\bar{b}^{ni}$  and  $\bar{b}^{0+}$ . The second case arises if  $\bar{b}^{0+} \leq \bar{b}^{ni}$ . In this case, only a fraction of subjects who choose ignorance buy zero offsets, whereas none of the subjects who choose to be informed do so. Note that in both cases we find that

**Proposition 2.** *Subjects who choose ignorance are more likely to buy zero offsets than subjects who choose information.*

Moreover, when we evaluate first-order conditions (1) and (3) at the same emissions level  $\bar{e} = \hat{e}$ , but at the differing ranges for  $\bar{b}$  described above, we find that

**Proposition 3.** *Among subjects who buy a positive number of offsets, those who choose ignorance buy fewer offsets than those who choose information.*

Since for both propositions the inequalities are strict, it follows by continuity that they should also hold if subjects' priors on emissions are sufficiently "close" to identical and accurate, i.e., if the assumption  $\bar{e}^i = \bar{e}^n = \hat{e}$  holds approximately.

### 3. EXPERIMENTAL DESIGN AND DATA

We design an experiment to examine the prevalence of strategic ignorance of environmental harm, and to examine if ignorance is reduced when information entails knowledge of the social norm regarding pro-environmental behavior. The design required a setting in which people are uncertain both about the environmental harm caused by their consumption and about the social norm. We hypothesized that long-distance flights provide such a setting: people find it hard to estimate the carbon footprint of such flights, and are unaware of the share of air travelers who buy carbon offsets. We base this hypothesis on the lack of readily available data on both carbon footprints and offset purchases. We designed our experiment around an imaginary long-distance flight between Denver and London, for which subjects were offered to buy carbon offsets.

We gave our control group 1 (C1) information on the carbon footprint caused by their trip. We gave control group 2 (C2) information on both the footprint and the social norm, defined as the share of air travelers that buy carbon offsets. The two treatment groups could choose to avoid information on the carbon footprint (T1), or information on both the carbon footprint and the social norm (T2). Our experimental design made it equally costly for subjects in the treatment groups to take or abstain from information: in each

case, they were asked to open a closed envelope.<sup>3</sup> Participants in the experiment were 221 undergraduate students at University of Wyoming.

The experiment was conducted as a four-step procedure:

**Step 1.** Subjects were asked a set of background questions about gender, the extent to which they make adjustments to their daily life due to environmental concerns (every day /often/sometimes/almost never/never), how important the environment is to them (on a scale of 1–7, 1=unimportant, 7=very important) and if they agree with the statement that “Carbon dioxide (CO<sub>2</sub>) emissions by humans contribute to climate change.” (I agree /I disagree/I do not know). Summary statistics for the answers are given in Table 1.<sup>4</sup>

Subjects were thereafter asked to imagine the following:

*Suppose you are taking a round-trip flight to London from Denver. Flying produces carbon dioxide emissions, or CO<sub>2</sub>, which is one of the greenhouse gases that increase the risk of climate change. We can measure your “carbon footprint” from this trip—the CO<sub>2</sub> emissions from the flights divided by the number of passengers—and you can purchase “carbon offsets” that will compensate for your trip by funding projects that reduce CO<sub>2</sub> emissions (e.g., renewable-energy projects that use wind, biomass or solar energy, or projects that improve energy efficiency).*

**Step 2.** The control and treatment groups were provided information that varied over groups. The information provided to each group was as follows:

- (a) C1 (control group 1—carbon-footprint information) was given the following information (“information 1”):

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<sup>3</sup> The information in the envelope that contained information was short, and we assume subjects a priori did not expect the information to be costly, e.g., time-consuming to read or difficult to process.

<sup>4</sup> A  $z$ -test indicates that there is a significant difference between control group C1’s and treatment group T2’s mean value for the variables “climate-change skeptic” ( $z = -2.80$ ,  $p$ -value 0.00) and “climate-change believer” ( $z = -1.94$ ,  $p$ -value 0.05). For control group C2 and treatment group T2, there is a significant difference in the mean value for the variables “climate-change unsure” ( $z = -2.24$ ,  $p$ -value 0.02) and “climate-change skeptic” ( $z = 1.60$ ,  $p$ -value 0.11). Other  $z$ -tests have  $p$ -values above 0.25.

*The carbon footprint from your trip (i.e., per passenger) equals 1.73 metric tons of CO<sub>2</sub>, which amounts to about 10% of an average American’s carbon footprint for a whole year.*

- (b) C2 (control group 2—carbon-footprint and social-pressure information) was given the following information (“information 2”):

*About 3% to 4% of flight travelers buy carbon offsets. The carbon footprint from your trip (i.e., per passenger) equals 1.73 metric tons of CO<sub>2</sub>, which amounts to about 10% of an average American’s carbon footprint for a whole year.*

- (c) T1 (treatment group 1—asked to opt in or opt out from carbon-footprint information) was provided with the following information, and two closed envelopes, one white and one yellow:

*You are offered information that contains the following: (1) your carbon footprint from this trip and (2) how the carbon footprint from your Denver-London trip compares to an average American’s carbon footprint for a whole year.*

*If you want information (1)–(2), please open the white envelope.*

*If you do not want this information, please open the yellow envelope.*

The white envelope contained a sheet of paper with the information provided in “information 1,” and the yellow envelope contained a blank sheet of paper.

- (d) T2 (treatment group 2—asked to opt in or opt out from carbon-footprint and social-pressure information) was provided with the following information and two closed envelopes, one white and one yellow:

*You are offered information that contains the following: (1) what percent of flight travelers normally buy carbon offsets, (2) your carbon footprint from*

*this trip and (3) how the carbon footprint from your Denver-London trip compares to an average American’s carbon footprint for a whole year.*

*If you **want** information (1)–(3), please open the white envelope.*

*If you **do not want** this information, please open the yellow envelope.*

The white envelope contained a sheet of paper with the information provided in “information 2,” and the yellow envelope contained a blank sheet of paper.

**Step 3.** The following information and question was given to all groups:

*Now, suppose the airline offers to sell you carbon offsets when buying your flight ticket. What is the maximum you would be willing to pay for carbon offsets? Please state your amount:*

*\$ \_\_\_\_\_*

**Step 4.** Finally, both treatment groups were asked the following control question:

*Please state below if you opened the white or yellow envelope:*

☐ *Yes, I want info on [...] – I therefore opened the white envelope.*

☐ *No, I do not want info on [...] – I therefore opened the yellow envelope.*

*If you answered “yes” to the above question, please state below if you read the information in the envelope:*

☐ *Yes, I read the information.*

☐ *No, I did not read the information.*

Summary statistics for the information-choice and WTP responses are given in Table 1.<sup>5</sup>

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<sup>5</sup> Of the subjects in treatment groups T1 and T2 who chose information, 98% checked the box that they read the information in the envelope. The remaining 2% did not answer the question.



#### 4. RESULTS I: DOES STRATEGIC IGNORANCE OF ENVIRONMENTAL HARM EXIST?

For strategic ignorance of environmental harm to exist, people must choose to ignore costless information on the environmental impact of their harmful activities and use ignorance to allow themselves to engage in less pro-environmental behavior. When we allowed people to ignore free information on their carbon footprint from the imaginary round trip (T1), 53 percent of subjects chose ignorance. When we allowed people to ignore free information of both their carbon footprint and the social norm regarding the purchase of carbon offsets (T2), the proportion of subjects choosing ignorance was significantly reduced, from 53 to 29 percent ( $p$ -value: 0.025). These results are consistent with the hypothesis that people benefit from ignoring costless information on the environmental harm caused by their activities, but that the costs of ignorance are increased when the information entails knowledge of the social norm.

If ignorance is used strategically, we should observe that allowing subjects to opt in/out of free information significantly reduces their WTP for carbon offsets, and that the observed reduction in WTP is driven by self-selected ignorant subjects. We start off by examining how allowing subjects to ignore carbon-footprint information affected their WTP, by comparing the mean WTP for control group C1 and treatment group T1. Using  $t$ -tests, we cannot reject the hypothesis that the mean WTP for carbon offsets is equal for C1 and T1 ( $p$ -value 0.52). Tables 2 and 3 show the mean WTP for carbon offsets for the control groups and the subgroups in the treatment groups that chose ignorance or to be informed (in Table 3, we dropped extreme values of WTP  $>$ \$250 from the analysis). We add “n” after T1 or T2 to identify subjects in the treatment groups that chose to ignore information, and “i” to identify subjects that chose to inform themselves. Both Table 2 and 3 show that, as expected, the mean WTP of subjects choosing ignorance of carbon offsets (T1n) is significantly lower than that of subjects in the control group ( $p$ -value 0.04), and also than that of subjects who chose to inform themselves (T1i,  $p$ -value 0.05). But, since we cannot confirm a difference in mean WTP for the control group and treatment group T1 as a whole, we are unable to establish if ignorance reduces pro-environmental behavior.

Our result does not change when information entails knowledge of the (low) social norm. Tables 2 and 3 show that we cannot reject the hypothesis of equal mean WTP for subjects in control group C2 and subjects who chose to ignore both carbon-footprint and social-pressure information (T2n), or equal mean WTP for subjects in the control group and subjects who chose to learn both pieces of information (T2i). Note that our results may be impacted by the small number of subjects (8 people) in the T2n group.

Could it be that, even if ignorance does not impact the mean WTP, it impacts the willingness to buy any carbon offsets at all (consistent with Proposition 2 of our theoretical analysis)? To examine this, we compare the share of subjects in control group C1 that stated a zero WTP for carbon offsets (0.212) to the corresponding share of subjects in treatment group T1 (0.362). At the 10-percent level ( $p$ -value 0.07), a  $t$ -test rejects the null hypothesis that the two shares are equal. Figure 1 shows kernel density estimates of the WTP for carbon offsets for control group C1 and the subgroups of treatment group T1 that chose to ignore free carbon-footprint information (T1n) or chose to inform themselves (T1i). The estimates imply that the observed higher share of subjects that stated a zero WTP in treatment group T1 as compared to control group C1 comes from the subgroup who chose ignorance (T1n)—for this subgroup, the estimated density at zero WTP is about twice as high as for the subgroup who chose to be informed (T1i). Ignorance may be used as an excuse to opt out from buying carbon offsets.

How does adding knowledge of the (low) social norm to the information impact these results? Forcing people to take part of this social-pressure information, in addition to the information on their carbon footprint, does not seem to change their willingness to buy carbon offsets: a  $t$ -test cannot reject the hypothesis that the share of people with zero WTP in control group C1 (0.212) is equal to that in control group C2 (0.170) ( $p$ -value 0.59). Further, we find no evidence that when people can opt in/out of the social-pressure and carbon-footprint information, they use ignorance to avoid buying carbon offsets: we cannot reject the hypothesis that the share of subjects in C2 that state a zero WTP for carbon offsets (0.170) is equal to the corresponding share of subjects in T2 (0.143) ( $p$ -value 0.76). Figure 2 reveals a pattern similar to that in Figure 1, however: for the subgroup of T2 who

chose ignorance (T2n), the estimated density at zero WTP is almost twice as high as for the subgroup who chose to be informed (T2i). Maybe the reminder of social pressure alone (even if the social norm is low) increases people’s pro-environmental behavior? We note as a caveat that the treatment group T2 contained only 26 subjects, of which 8 chose to be uninformed.

## 5. RESULTS II: DETERMINANTS OF IGNORANCE

We next use regression analysis to explore the determinants of ignorance of free information about either the carbon footprint alone or both the carbon footprint and the social norm. Our sample consists of the two treatment groups (T1 and T2) in which subjects were given the option to ignore information. The dependent variable in the regression takes value 1 if information was ignored, and 0 otherwise. We include a dummy indicating if the information revealed the social norm (“offered social info” 1 if yes, 0 otherwise), a dummy for “female” (1 if yes, 0 otherwise), an index of the importance people assign to environmental issues, and dummy variables indicating skepticism or uncertainty about human CO<sub>2</sub> emissions’ contribution to climate change (“climate-change skeptic” 1 if yes, 0 otherwise, and “climate-change unsure” 1 if yes, 0 otherwise). The reference case is a man who was offered information that did not reveal the social norm and who believes that humans contribute to climate change.<sup>6</sup>

Column (1) of Table 4 reports Probit estimates of the average marginal effects of our covariates on subjects’ decision to ignore information. We find that ignorance of free carbon-footprint information is significantly reduced (by 23 percentage points) when information additionally reveals the social norm, which confirms our result in Section 4. Further, people who are skeptical or unsure about anthropogenic climate change are more likely to choose ignorance: for skeptics the difference is 31 percentage points, while for those who are unsure the difference is 24 percentage points.

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<sup>6</sup> We also estimated a model in which we included dummy variables indicating subjects’ stated level of adjustments in daily life due to environmental concerns (for a description of these dummy variables, see Section 3). When combined, however, these dummy variables were highly collinear with the variable measuring subjects’ stated importance of the environment. We dropped them from the regression.

## 6. RESULTS III: DETERMINANTS OF WTP FOR CARBON OFFSETS

Columns (2) and (3) of Table 4 report two OLS estimates (with and without outliers) of the determinants of WTP for carbon offsets. The estimates confirm the implications of the  $t$ -tests in Section 4. The WTP for carbon offsets declines when subjects choose to ignore information, but this result is not statistically significant. Also, when excluding outliers ( $\text{WTP} > \$250$ ), the result that WTP for carbon offsets is higher for those that choose information is no longer statistically significant. The only robust determinant of WTP is the importance people assign to the environment.

Column (4) of Table 4 reports Probit estimates of the average marginal effects of our covariates on subjects' decision to opt out from buying carbon offsets altogether. Consistent with the results of Section 4, the probability of not purchasing carbon offsets increases (by 16 percentage points) if people ignore information. Further, all control variables enter with the expected sign. A one-unit increase in the stated importance people attach to the environment reduces their probability of not purchasing carbon offsets by 4 percentage points. For skeptics of anthropogenic climate change, the probability is 21 percentage points higher, and for those who are unsure, it is 16 percentage points higher.

## 7. CONCLUDING REMARKS

We examine strategic ignorance of the harm one may cause to the environment, and how such ignorance may be mitigated by social pressure. Our theory suggests people benefit from ignoring information about the harm they cause, because ignorance reduces feelings of guilt. However, if information entails knowledge of what other people do to offset the harm, ignorance can increase feelings of shame.

In an experiment involving an imaginary long-distance flight, we find that people avoid free information on the carbon footprint of the trip. That finding alone tells us that taking the information is associated with a cost. We find some evidence that ignorance may be used strategically—ignorance seems to reduce pro-environmental behavior as measured by the

willingness to buy carbon offsets. This finding is in line with prior findings in the literature—both on strategic ignorance of the impact of one’s actions on others (Dana et al., 2007; Larson and Capra, 2009; Van der Weele, 2012) and on strategic self-ignorance (Thunström et al., 2013)—indicating that ignorance may be used as an excuse to pursue one’s (immediate) self interest.

We also examine if ignorance impacts the mean WTP for carbon offsets, but find no evidence that it does. This suggests strategic ignorance toward environmental harm is somewhat weak. We can think of a couple of explanations. First, the hypothetical nature of our experiment implies that our measure of behavioral change (stated WTP) may be subject to hypothetical bias. Second, the inner conflict between what one “should do” and what one “wants to do” may not be as strong for pro-environmental behavior as it is for, e.g., behavior that affects our own health or other people’s wealth. Research shows that people believe the impact of climate change is going to be larger in places where they do not live (Gifford et al., 2009). The distance in time and space increases the anonymity of those affected by climate change, and people are found to be less generous to others when “others” are anonymous (Charness and Gneezy, 2008). The inner conflict may be mitigated also by uncertainty about the effectiveness of carbon-offset purchases (i.e., people may have heard of outright scams, or broader controversies over the additionality of projects funded through carbon-offsets).

Consistent with the prediction of our theoretical model, we find that ignorance is mitigated if the information offered includes the share of air travelers that buy carbon offsets. Learning about the social norm does not significantly affect WTP, however, but that is to be expected given how low the social norm is: only 3–4 percent of air travelers in fact buy carbon offsets.

Finally, we find that information avoidance of carbon dioxide emissions is stronger for those who deny or are unsure of humans’ contribution to climate change. This suggests that some of the ignorance reported in this study might be due to “confirmation bias”—the information itself may be associated with disutility if it disconfirms people’s world beliefs (Smith et al., 2008).

We encourage future research to further explore (ideally in non-hypothetical contexts) the existence of strategic ignorance of environmental harm, and the impact on such ignorance of social norms regarding pro-environmental behavior.

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TABLE 1. Summary statistics.

	Control group 1	Control group 2	Treatment group 1	Treatment group 2	Min	Max
	Mean	Mean	Mean	Mean		
Female	0.436	0.389	0.481	0.290	0	1
Importance of environment <sup>a</sup>	4.709	4.358	4.450	4.484	1 <sup>b</sup>	7
Climate-change skeptic	0.145	0.222	0.346	0.097	0	1
Climate-change unsure	0.255	0.241	0.222	0.484	0	1
Climate-change believer	0.600	0.537	0.432	0.419	0	1
Chose no information			0.531	0.286	0	1
WTP for carbon offsets (\$)	35.538	34.717	48.479	39.607	0	1000 <sup>c</sup>
Share of subjects with WTP = 0	0.212	0.170	0.362	0.143	0	1
N	55	54	81	31		

<sup>a</sup> On a scale 1–7, 1=unimportant, 7=very important.

<sup>b</sup> For groups C1 and T2 the min value is 2.

<sup>c</sup> The max WTP for the different groups is C1: 250; C2: 500 T1: 1000; T2: 200. Also, 8 subjects (3 in C1, 1 in C2, 1 in T1, and 3 in T2) failed to answer the WTP question.



TABLE 2. Mean WTP.

$<^*$ $p = 0.05$		
<div style="border: 1px solid black; padding: 5px; text-align: center;"> <math>x^{T1n}</math>  18.07  (5.09)  <math>n = 42</math> </div>	$<^{**}$ $p = 0.04$	<div style="border: 1px solid black; padding: 5px; text-align: center;"> <math>x^{C1}</math>  35.54  (6.90)  <math>n = 52</math> </div>
		$<$ $p = 0.16$
		<div style="border: 1px solid black; padding: 5px; text-align: center;"> <math>x^{T1i}</math>  82.09  (31.85)  <math>n = 38</math> </div>
$<^*$ $p = 0.43$		$>$ $p = 0.27$
<div style="border: 1px solid black; padding: 5px; text-align: center;"> <math>x^{T2n}</math>  31.25  (15.26)  <math>n = 8</math> </div>	$<$ $p = 0.85$	<div style="border: 1px solid black; padding: 5px; text-align: center;"> <math>x^{C2}</math>  34.72  (9.58)  <math>n = 53</math> </div>
		$<$ $p = 0.53$
		<div style="border: 1px solid black; padding: 5px; text-align: center;"> <math>x^{T2i}</math>  44.16  (11.55)  <math>n = 19</math> </div>
$<$ $p = 0.51$		

TABLE 3. Mean WTP (dropping three outliers >\$250).

$<^{**}$ $p = 0.03$		
<div style="border: 1px solid black; padding: 5px; text-align: center;"> <math>x^{T1n}</math>  18.07  (5.09)  <math>n = 42</math> </div>	$<^{**}$ $p = 0.04$	<div style="border: 1px solid black; padding: 5px; text-align: center;"> <math>x^{C1}</math>  35.54  (6.90)  <math>n = 52</math> </div>
		$<$ $p = 0.80$
		<div style="border: 1px solid black; padding: 5px; text-align: center;"> <math>x^{T1i}</math>  38.04  (7.33)  <math>n = 36</math> </div>
$<^*$ $p = 0.43$		$<$ $p = 0.66$
<div style="border: 1px solid black; padding: 5px; text-align: center;"> <math>x^{T2n}</math>  31.25  (15.26)  <math>n = 8</math> </div>	$>$ $p = 0.74$	<div style="border: 1px solid black; padding: 5px; text-align: center;"> <math>x^{C2}</math>  25.77  (3.50)  <math>n = 52</math> </div>
		$<$ $p = 0.14$
		<div style="border: 1px solid black; padding: 5px; text-align: center;"> <math>x^{T2i}</math>  44.16  (11.55)  <math>n = 19</math> </div>
$<$ $p = 0.51$		

TABLE 4. Determinants of ignorance and WTP for carbon offsets

	(1)	(2)	(3)	(4)
	PROBIT	OLS	OLS	PROBIT
	$\frac{\partial \Pr(n)}{\partial x}$	$\frac{\partial \text{WTP}}{\partial x}$	$\frac{\partial \text{WTP}}{\partial x}$	$\frac{\partial \Pr(\text{WTP} = 0)}{\partial x}$
Offered social info	-0.231** (0.100)			
Ignored info		-4.768 (17.270)	-3.648 (6.917)	0.158** (0.080)
Chose info		30.532* (15.880)	6.684 (6.443)	0.005 (0.069)
Female	-0.028 (0.089)	5.422 (13.438)	10.225* (5.413)	0.016 (0.056)
Importance of environment	-0.058** (0.029)	9.372** (4.663)	6.567*** (1.878)	-0.044** (0.018)
Climate-change skeptic	0.312*** (0.107)	-16.722 (17.642)	-9.374 (7.074)	0.213*** (0.082)
Climate-change unsure	0.235** (0.096)	-12.390 (16.369)	-15.222** (6.606)	0.155** (0.072)
$N$	108	210	207	210
$R^2$		0.07	0.14	
pseudo $R^2$	0.15			0.13

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

Standard errors in parentheses. Model (3) drops three outliers with  $\text{WTP} > \$250$ .

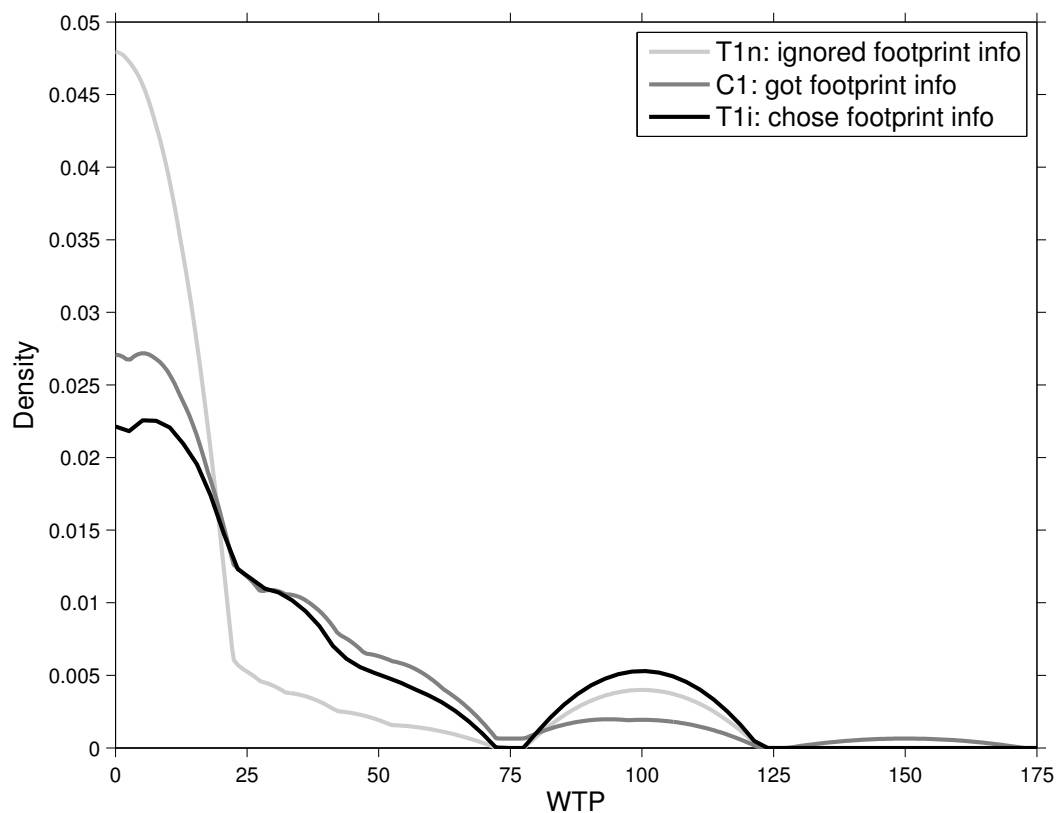


FIGURE 1. Kernel density estimates of WTP for carbon offsets—control group C1 versus subjects in treatment group T1 that chose ignorance (T1n) or to inform themselves (T1i).

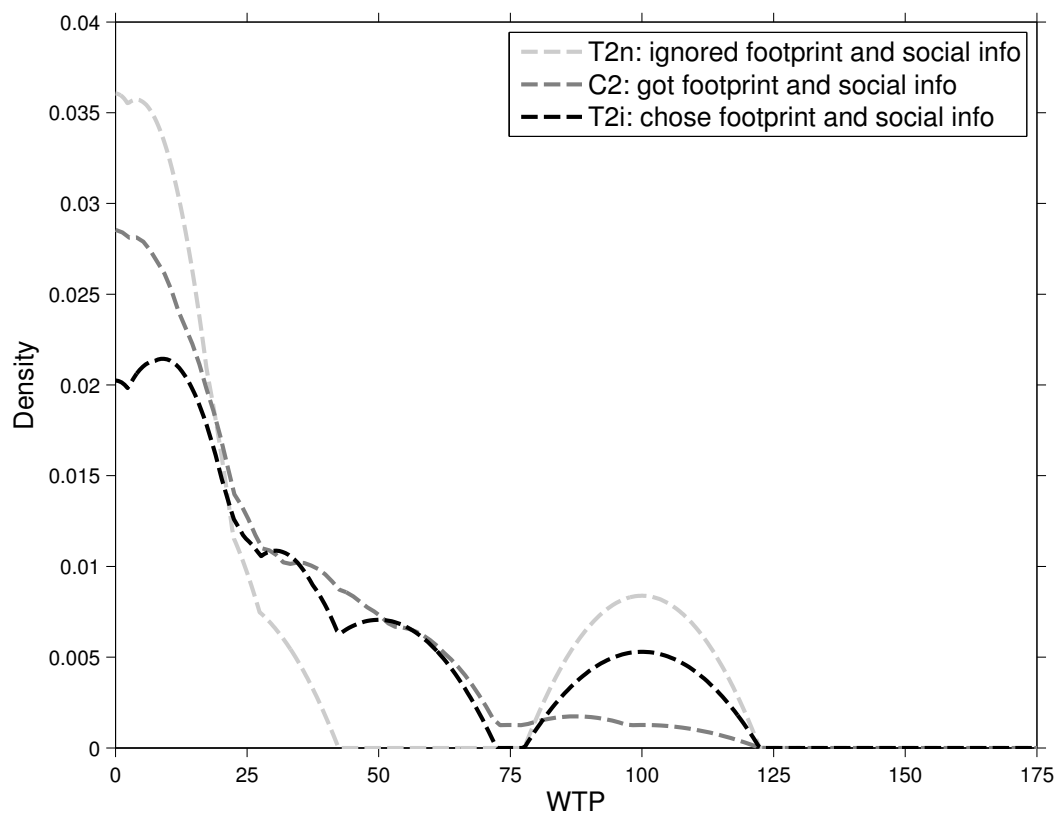


FIGURE 2. Kernel density estimates of WTP for carbon offsets—control group C2 versus subjects in treatment group T2 that chose ignorance (T2n) or to inform themselves (T2i).