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Climate Pledges and Greenwashing: Information Provision Does Not Work

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Abstract

Many firms are making net-zero and carbon neutral pledges. In principle, these pledges should help consumers identify sustainable options, but often they do not correspond to meaningful actions. In response, both in the U.S. and in Europe, courts and policymakers are requiring firms to disclose more information regarding their climate pledges. This strategy assumes that consumers pay attention to the information provided, are able to understand it, and adjust their behavior accordingly. We test this assumption in two studies with representative samples of U.S. residents ($N = 300$, $N = 1500$) and a large-scale eye-tracking study ($N = 500$). First, we show that while people are not aware of the meaning of the most common climate pledges, they are willing to pay a considerable premium for these claims, confirming that an unregulated market may lead to greenwashing. Second, we observe that information provision does not affect respondents when making consequential choices on how much to pay for gift cards of firms that have made a climate pledge. Third, we find that in a realistic setting where respondents receive multiple pieces of information about various products, information regarding climate pledges attracts significant attention. However, it does not improve understanding of climate pledges and actually increases recipients' confusion. Our results add to the growing evidence that individual frame interventions are not a viable shortcut to address systemic issues like global warming.

1. Introduction

In recent years, firms have scrambled to make net-zero and carbon neutrality pledges. More than 3,000 firms have certified their net-zero targets with the Science Based Targets initiative (SBTi), while hundreds more have pledged to become carbon neutral. Moreover, countless products have been marketed as carbon neutral. In principle, firms' climate pledges should help consumers and investors identify sustainable options and guide them toward adopting more sustainable behaviors. In turn, such adjustments in consumption and investment behavior would provide other firms with the right incentives to become more sustainable and help mitigate climate change.

Climate pledges exhibit two critical features. First, consumers who rely on incorrect pledges bear no personal costs as long as they do not discover that the pledge is fake or

less ambitious than it sounds.¹ Second, consumers may experience warm glow, that is, the emotional reward of doing good, when purchasing a product from a firm that has made a climate pledge (Crumpler and Grossman, 2008, Taufik et al., 2015, Hartmann et al., 2017). Put differently, consumers might *benefit* from climate pledges that overstate the sustainability of firms, as long as they do not discover the truth (Enriques et al., 2024). These features of climate pledges suggest that consumers might be willing to pay a premium for an ambitious climate pledge, even if they do not know whether the pledge is genuine or fully understand its true meaning. Consequently, firms may be able to increase their profits by making claims that sound ambitious, even if these claims do not correspond to meaningful actions. Recent evidence provides support for this hypothesis. People do not know the meaning of pledges such as carbon neutrality and net-zero (ASA, October 2022, Carter, 2022), but they are willing to pay for them (Birkenberg et al., 2021). In fact, there is evidence that climate pledges often do not correspond to meaningful actions (“greenwashing”).

The prevalent response to this problem both in Europe and the U.S. has been requiring firms to provide more information regarding their pledges. An amendment to the Unfair Commercial Practices Directive (UCPD), which came into force in 2024, requires firms to disclose a host of additional information regarding any climate pledge they make.² Moreover, European courts have consistently struck down climate pledges on the basis that firms did not provide consumers with sufficient information to understand the meaning of the climate pledge, and hence that the pledge may have misled consumers. In the U.S., the Guides for the Use of Environmental Marketing Claims (“Green Guides”) state that marketers should use “clear and prominent qualifying language” when making general environmental claims, while recent case law suggests that firms should accompany climate pledges with enough information to enable consumers to understand the meaning of the pledge to avoid court scrutiny.

The appeal of information provision is straightforward. By reducing the information asymmetry between consumers and firms, information provision may allow consumers to make more informed choices and to price pledges in a way that better matches their preferences. This strategy, however, assumes that consumers pay attention to the information provided, are able to understand it, and adjust their behavior accordingly.³ We conduct three pre-registered studies to test this assumption.⁴

In our first study, we investigate whether respondents truly have a poor knowledge of carbon neutral and net-zero pledges. We find that in a representative sample of 300 U.S. residents, none is aware of both differences between the two pledges, which confirms that consumers have a limited understanding of these targets.

¹For example, consumers who choose to drink coffee advertised as carbon neutral suffer no harm if the coffee is not truly carbon neutral or if the producer is merely purchasing carbon offsets instead of reducing emissions.

²The European Directive 2024/825 amending the UCPD has also blacklisted specific practices, including carbon neutrality pledges based on carbon offsets.

³Policymakers have sometimes highlighted that there may be value in informing consumers, even when it does not affect their behavior. For a discussion, *see* (Sunstein, 2020). For instance, in 2019 the U.S. Food and Drug Administration (FDA) argued that “a greater public understanding of the negative health consequences of cigarette smoking.” was, in the agency’s view, the principal benefit of its regulation (2019).

⁴The pre-registration materials are available at <https://osf.io/ds8y2>.

In our second study, conducted with a representative sample of 1,500 U.S. residents, we analyze how providing respondents with information regarding carbon neutral and net-zero pledges affects: *i*) respondents’ willingness to pay (WTP) to switch from a \$25 gift card from a firm that has made no climate pledge to a \$25 gift card from a firm that has made either a carbon neutral or a net-zero pledge; *ii*) respondents’ understanding of the climate pledge. In the control condition, where respondents receive no information regarding the meaning of the pledges, we observe that respondents display a high WTP for gift cards of firms with a climate pledge but also have a very poor understanding of the climate pledges. This finding confirms that firms can profit by making pledges that sound ambitious but do not necessarily correspond to meaningful actions.

Moreover, we find that providing respondents with information improves their understanding of carbon neutral and net-zero pledges compared to the control group, while it does not significantly affect their WTP for the gift card from corporations that have made a carbon neutral or a net-zero pledge. Thus, while in this study we find evidence that information provision can improve understanding, it has no significant impact on behavior.

The effect we observe on understanding, however, is likely to represent an upper bound because we study a situation in which respondents only see the information related to climate pledges. On the contrary, in the marketplace, consumers are often exposed to myriad of information pertaining to multiple products, which could enhance their ability to avoid negative information on a climate pledge. For this reason, we carry out a large eye tracking study ($N = 500$) to test how much visual attention respondents pay to climate pledges and whether information provision can help them understand the meaning of such pledges when they are exposed to multiple pieces of information on multiple products. We measure visual attention using webcam based eye tracking, a methodology that has proven to produce reliable estimates (Section 4.3).

We find that information related to climate pledges attracts a significant amount of attention, especially when conveyed using a highly salient framing. Nevertheless, this information does not have any positive effect on respondents’ understanding. Just like in our first study, where we do not provide respondents with any information on climate pledges, we observe that none of the participants correctly identifies the two core features of carbon neutrality. In other words, even though information on climate pledges captures a considerable amount of visual attention when participants are exposed to multiple pieces of information, it fails to effectively enhance participants’ understanding. Moreover, we find that participants who are exposed to the framing that captures the most visual attention are *more* likely to provide an answer in direct contradiction with the information disclosed. This suggests that even when the information is presented following the best practices suggested by the literature (Taufique et al., 2022), it may prove misleading when one accounts for the sheer amount of information to which consumers are exposed.

Contrary to our hypothesis, our results suggest that information provision is not a viable antidote to greenwashing in the context of climate pledges. On the one hand, it does neither lead recipients to make more informed choices nor improve their understanding. On the other hand, it increases confusion and induces recipients to spend time attending to information they do not understand.

At a more general level, our results contribute to the debate on system-level interventions (s-frame) and individual-level interventions (i-frame). Social scientists have often emphasized

how i-frame interventions can have a significant impact (Kahneman, 2013, Halpern, 2016). However, recent evidence highlights that i-frame interventions might not be as effective as indicated by the academic literature (DellaVigna and Linos, 2022, Szaszi et al., 2022, Gal and Rucker, 2022), thus suggesting that a strong emphasis on i-frame solutions may not be appropriate to tackle systemic challenges like global warming. Our results add to the growing evidence that i-frame interventions are not a viable shortcut to address systemic issues. We show that accounting for the full set of recipients’ motivations, including warm glow, and the complex informational environment they find themselves in, provides a more sober assessment of i-frame interventions’ limits.

2. Climate pledges: Psychology, Trends and Regulations

In this section, we will explore the psychological mechanisms associated with climate pledges and why they may lead to greenwashing. Additionally, we will discuss the growing evidence that many pledges are greenwashing and explain how greenwashing in connection to climate pledges is regulated in the US and the EU, highlighting the social relevance of the research question we develop in more detail in the next section.

2.1. *The psychology of climate pledges*

A key feature of climate pledges is that consumers bear no private costs when such pledges do not correspond to meaningful actions, as long as they do not discover the truth (Enriques et al., 2024). A coffee from a carbon neutral company will taste exactly the same, regardless of whether the climate pledge of the coffee producer corresponds to concrete actions. This provides consumers with limited incentives to investigate the true content of the pledges.

As importantly, research suggests that people may even have incentives to avoid learning negative information about climate pledges. Motivated reasoning refers to the tendency of individuals to gather evidence, process information, and recall memories in a way that allows them to reach their preferred conclusion (Epley and Gilovich, 2016). As Kunda (1990) notes, “people motivated to arrive at a particular conclusion attempt to be rational and to construct a justification of their desired conclusion that would persuade a dispassionate observer. They draw the desired conclusion only if they can muster up the evidence necessary to support it.” In other words, motivated reasoning allows people to reach their preferred conclusion only if the information to which they have access leaves enough “wiggle room” (Dana et al., 2007). Climate pledges may provide consumers with the wiggle room they need to keep their consumption habits, while also feeling that they are acting morally. Consumers who purchase plastic water bottles often know that their behavior is not sustainable. However, despite the fact that reducing consumption is generally the only truly sustainable option, if consumers purchase the plastic water bottle from a net-zero company, they may have enough wiggle room to drink their favorite water while feeling that they are doing a positive thing (Etzion, 2022).

Moreover, research shows that people derive utility from contributing to the public good because they experience a sense of “warm glow” (Andreoni, 1990, Taufik et al., 2015, Hartmann et al., 2017), even when they know that their contribution has no impact on the public good (Crumpler and Grossman, 2008).

These psychological mechanisms suggest that the market for climate pledges is likely to result in significant greenwashing. Firms can cater to the demand for warm glow and wiggle room by making confusing pledges that sound more ambitious than they actually are. As we discuss in the next section, this theoretical prediction appears accurate. On the one hand, climate pledges are mushrooming; on the other, greenwashing seems to be pervasive.

2.2. *Climate pledges and greenwashing*

According to the Oxford Net-Zero Tracker, over 70% of the 2,000 largest publicly-traded companies in the world by revenue have set a climate target, while the SBTi reports that over 5,000 companies have made science-based climate pledges. Moreover, markets have been inundated with carbon neutral products. Under the Carbon Neutral protocol alone, 825,000 products have been certified as carbon neutral.⁵

A complicating factor is that there are no universally accepted definitions of net-zero and carbon neutrality. However, key actors like the SBTi, the International Organization for Standardization (ISO) and the United Nations (UN) have converged in identifying two fundamental differences between carbon neutrality claims and net-zero claims (see Appendix). First, carbon neutrality only implies that an actor is counterbalancing CO_2 emissions with carbon offsets without necessarily having reduced emissions. On the contrary, net-zero requires that a company is delivering concrete emission reductions in line with climate science, combined with carbon removal methods used only to offset residual emissions. Second, carbon neutrality may refer to CO_2 emissions only, whereas net-zero encompasses all greenhouse gasses (GHG) emissions.

Against this background, both scholars and non-governmental organizations have provided evidence that firms' strategies are not consistent with their ambitious climate pledges. For instance, the Climate Responsibility Monitor analyzed in-depth the climate pledges of 24 major firms and found that 15 have either low or very low integrity, 5 have moderate integrity and only 2 have a high integrity (Day et al., 2023). Tollefson (2022) published a piece in the journal *Nature* based on this report tellingly titled "Climate pledges from top companies crumble under scrutiny". Li et al. (2022) analyzed the climate pledges made by Chevron, ExxonMobil, BP and Shell and found that, despite the fanfare, they are not transitioning to clean energy business models. Trencher et al. (2023) raise similar concerns with respect to the net-zero pledges of these firms. Moreover, Dietz et al. (2018) analyzed 138 companies accounting for 21% of emissions from all listed companies globally and found that, while most firms have set emission targets aligned with the goals set in the Paris Agreement, the majority has not implemented strategic practices aimed at reducing emissions.

Moreover, firms often communicate their climate strategies in a confusing manner, making it hard even for motivated consumers to accurately assess these strategies. For instance, major firms such as Apple and ENI have used the terms net-zero and carbon neutral as synonyms. Furthermore, some crucial features of climate pledges are often hidden by firms or presented in ways that make comparisons across firms very difficult. For example, Carrefour disclosed only in a footnote that its net-zero target includes less than half of its retail stores,

⁵The list of carbon neutral products under the Carbon Neutral protocol is available at <https://www.carbonneutral.com>.

while CVS employs an emission estimation methodology that makes it particularly easy to meet its emission targets (Orian Peer, 2024).

Absent regulatory interventions, market discipline is unlikely to prevent greenwashing in the future. The psychological mechanisms described above, combined with the complexity of climate pledges and the opacity of firm-specific climate transition plans, makes it unlikely that consumers will punish misbehavior *ex post* Enriques et al. (2024). Therefore, beyond egregious cases, firms do not have to fear severe negative economic or reputational consequences from their abusive behavior.

2.3. Regulatory responses to greenwashing climate pledges

How are policymakers responding to widespread greenwashing?

In Europe, courts and competition authorities have routinely struck down carbon neutrality pledges or similar claims. The most common argument made by the courts is that firms did not provide consumers with sufficient information to understand the meaning of the climate pledge, and hence that the pledge may have misled consumers. Moreover, an amendment to the Unfair Commercial Practices Directive (UCPD) that came into force in 2024 specifies that pledges related to future environmental performance must be clear, objective, publicly available, verifiable and must set out a detailed and realistic implementation plan, thereby pushing firms to disclose more information regarding their climate pledges. Importantly, the amendment also includes among the black-listed marketing practices carbon neutrality claims based on carbon offsets, thus effectively banning this type of claim.

The combined effect of case law and the amendment to the UCPD is that some pledges will be banned, whereas firms that want to make a pledge that has not been blacklisted will have to provide consumers with detailed information regarding the pledge.

In the U.S., the FTC has explicitly refused to provide a definition of the terms “net-zero” and “carbon neutral” on the basis that doing so would exceed its authority and result in “environmental policy-making,” while climate pledges have only recently started to be litigated in U.S. courts. The most important case is *Dorris v. Danone Waters of America*, in which the Federal District Court for the Southern District of New York noted that carbon neutrality is “a technical word not within an average consumer’s common parlance and carrying multiple meanings”, and it highlighted that the defendant “failed to define carbon neutral or direct consumers to another source for an additional definition”. Thus, the Court seemed to imply that firms making carbon neutrality pledges should provide enough information to enable consumers to understand the meaning of the pledge.

Against this background, it seems that the FTC and U.S. courts have no intention of constraining firms’ ability to make climate pledges to the same extent as has happened in Europe. However, *Dorris v. Danone Waters of America* suggests that firms that want to avoid scrutiny by courts should accompany climate pledges with enough information to enable consumers to understand the meaning of the pledge.

3. Mandatory disclosure: hypotheses development

In the previous section we have highlighted that courts and policymakers are currently pursuing two strategies to limit greenwashing involving climate pledges. One is to implement

a mandatory ban of pledges that are more likely to deceive consumers. The other is to require firms to provide more information on climate commitments.

We investigate whether mandatory disclosure would be effective in informing consumers and in helping them adopt more sustainable behavior.⁶ To this end, we test three ways in which information on climate pledges could be provided to improve recipients’ understanding and choices. The first framing provides respondents with the full description of the climate pledges based on the definitions provided by the SBTi (“information” treatment). Because the information is not presented in a concise and easy-to-digest manner, we hypothesize that this format will have a limited impact on respondents’ understanding. Second, we provide respondents with the key features of the pledges organized in bullet points (“bullet points” treatment). Last, we build on the evidence that traffic lights systems can be effective for many retail choices (Thøgersen and Nielsen, 2016, Taufique et al., 2022). We give respondents the same information provided in the bullet points treatment, but in a color-coded manner. Good features appear in green (e.g., the pledge covers all GHGs emissions), whereas bad features appear in red (e.g., the pledge does not require emission reductions).

We hypothesize that information provision can improve respondents’ understanding of climate pledges, especially when the information is presented in a clear and concise manner. Thus, we hypothesize that the traffic lights treatment will be the most effective in fostering understanding for two reasons. First, color-coded associations may help respondents understand whether the information relative to a pledge is positive or negative. Second, the high salience of colors makes it hard to avoid the information presented within the traffic lights.

We further hypothesize that information disclosure can affect recipients’ behavior. Respondents who understand the content of the pledge better may be able to price it in a way that matches their preferences more closely. Thus, understanding the meaning of a pledge may influence respondents’ WTP for the gift card from a corporation that has made such a pledge. Moreover, respondents’ WTP may be affected by the level of warm glow generated by the way in which the information is provided. Similarly, the way in which information is presented may affect the perceived credibility of the climate pledge and, therefore, have an impact on respondents’ WTP. Finally, respondents’ WTP may also be affected by their ability to avoid information. When respondents find it harder to avoid negative information regarding a pledge, they may display a lower WTP for the gift card from the corporation that has made such a pledge.

A crucial factor for understanding whether mandatory disclosure would be effective is that in the marketplace consumers are exposed to a myriad of information. Therefore, we also carry out a study using web-based eye tracking to test whether respondents would attend information related to climate pledges when they are exposed to more information. We hypothesize that a highly salient framing-like the traffic lights-performs better both in capturing recipients’ visual attention and fostering understanding when the provided information has to compete for attention with other information. Consequently, we further hypothesize that traffic lights will lead to a better understanding.

⁶We provide respondents with information that “sophisticated” actors, such as NGOs or media outlets already possess. Thus, this generic information disclosure regarding the main features of carbon neutrality and net-zero cannot enhance the role played by such actors in informing end-consumers.

One important limitation of eye tracking, however, is that when used alone, it may not provide sufficient information because a given eye movement pattern can be consistent with multiple cognitive processes (Southwell et al., 2020). For instance, a recipient who spends a lot of time looking at a piece of information may either find it very interesting, very hard to understand, or may simply be engaged in mind wandering. For this reason, we combine eye tracking and understanding questions to investigate both the process of information acquisition and the outcome, which allows us to draw more reliable inferences. Returning to our example, recipients who spend time looking at the information and understand it properly are very likely to have truly paid attention to the disclosure.

4. Methods

We conduct three studies cleared by the ethical committees of Bocconi University, the Goethe University and the London School of Economics. In Study I we assess respondents’ knowledge regarding carbon neutral and net-zero climate pledges. In Study II we investigate whether providing respondents with key information related to climate pledges improves their understanding of such pledges and influences their willingness to pay for gift cards from firms making such pledges. In Study III we test whether information provision improves understanding when participants are exposed to multiple product-related information. In addition, we test whether information that attracts more attention also enhances participants’ understanding.

4.1. Study I: baseline understanding

For study I we recruit a representative sample of $n = 300$ U.S. residents on Prolific.co. All participants were paid \$0.67 for taking part in the experiment, equivalent to \$8.07 per hour. In this study, participants answer an open-ended question in which they are asked to describe the two main differences between net-zero and carbon neutrality. The two most important differences are: *i*) net-zero requires deep emission reductions, whereas carbon neutrality does not (“emission reductions”); *ii*) net-zero covers all greenhouse gases, whereas carbon neutrality focuses on CO_2 emissions (“all GHGs”).

We assign two points to respondents who correctly identify both differences, one point to respondents who identify only one difference and zero points to respondents who do not mention either difference. We also collect demographic information about the participants.

7

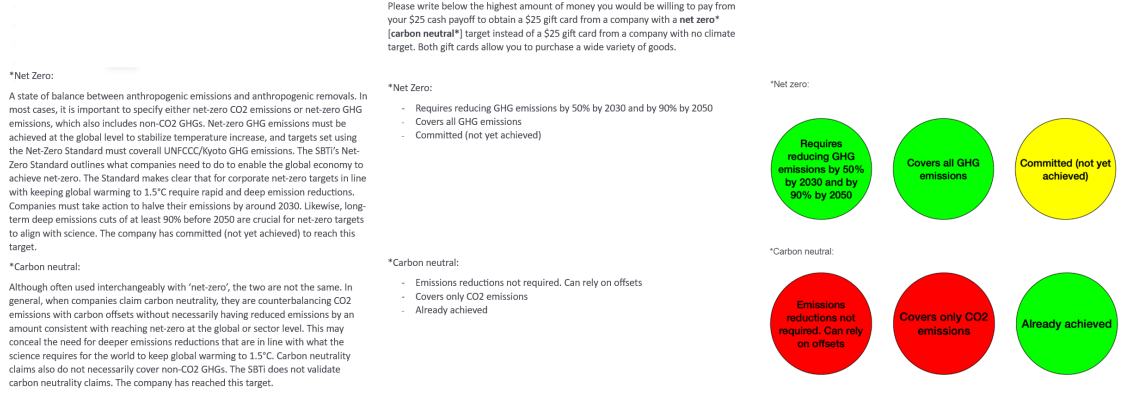
4.2. Study II: WTP for pledges and information provision

For study II, we recruit a representative sample of $n = 1500$ U.S. residents on Prolific.co. All participants were paid \$1.34 for taking part in the experiment, equivalent to \$8.04 per hour. The full protocol of Study II is included in the Appendix.

At the beginning of the experiment, all respondents see the same text explaining that many firms are setting climate targets like carbon neutrality and net-zero, and that we are interested in knowing how much they value these claims. We then explain to respondents that

⁷We further ask other questions that we do not include in the main analysis. The results are consistent with the finding that people have a poor understanding of climate pledges.

Figure 1: Information provided to participants regarding net-zero and carbon neutrality as displayed in the three conditions: (i) Information (left), (ii) Bullet points (center) and (iii) Traffic lights (right).



by taking part in the experiment, they automatically entered a lottery with the possibility to win a \$25 gift card from a company with no climate target and \$25 cash via Prolific.

Participants are informed that they would be asked two questions to state how much of the \$25 cash they might win they would be willing to pay in order to switch from the gift card from a company without a climate target to: *i*) the gift card from a company with a net-zero target, *ii*) the gift card from a company with a carbon neutral target. The order of these two questions is randomized.

Our framework is based on the Becker-DeGroot-Marschak (1964) mechanism as implemented in Kahneman et al. (1990). The BDM has the important advantage of being incentive compatible (Berry et al., 2020) and hence induces truthful valuations. To aid participants' understanding of the mechanism and test their comprehension we asked two questions about the procedure used to elicit WTP and show them the way to answer the question.

Respondents are then randomly assigned to one of four groups: (i) control, (ii) full information, (iii) bullet points and (iv) traffic lights. Participants are asked their WTP for the gift card from firms with a climate target. Figure 1 shows the information that participants see when asked to state their WTP. The pledges cannot be objectively ranked, as net-zero is a more comprehensive goal than carbon neutrality. However, net-zero remains a mere promise, whereas the carbon neutral company has already achieved its goal. For this reason, we do not investigate whether consumers pay more for the "better" target. We only investigate if participants are willing to pay a premium for these pledges, and whether information provision affects the size of such premium.

Immediately after eliciting WTP, we measure participants' warm glow following the elicitation method used in Nunes and Schokkaert (2003) and respondents cognitive load following Paas & Van Merriënboer (1994).

We then test respondents' understanding of the climate pledges in two ways, aimed at measuring different facets of understanding. To measure unprompted understanding, we use the same question asked in Study I, however, this time the coding is carried out by a Master's student to whom we provided a set of instructions to ensure unbiased coding (included in

the Appendix). ⁸ As in Study I, we assign one point for each difference between net-zero and carbon neutrality that a respondent identifies. Thus, unprompted understanding score ranges between 0 and 2.

To measure a component of understanding that we label as visual recognition, we ask eight multiple-choice questions in which participants assign a given feature to either carbon neutrality, net-zero, or neither of the targets. We assign one point for each characteristic they correctly assign to a target. For instance, participants who assign “Emissions’ cut required” to net-zero receive one point. Hence, the score on the multiple-choice questions ranges between 0 and 8. We use this score to measure respondents’ visual recognition because answering these questions correctly required recognizing information to which participants have been exposed in earlier screens.

Afterwards, we ask respondents a battery of questions on their perception of climate pledges and of climate change. Moreover, to measure respondents’ information avoidance we rely on the validated questions developed in Ho et al. (2021). Specifically, we ask the three questions related with avoidance of medical information, as the authors find that these have a strong relationship with avoidance of environmental information. Last, we ask standard demographic questions and whether respondents have ever been informed or realized that they are color blind.

4.3. Study III: Eye tracking

Eye tracking opens a window into how people think and allows researchers to understand what attracts their attention (Holmqvist et al., 2011). While eye tracking has been widely used in research for decades (Rayner, 1998), its potential to offer insights relevant to policymakers has been severely constrained by two factors. First, conducting experiments used to require expensive and invasive tools. Second, studies had to be carried out in a laboratory, which allowed researchers to recruit only relatively homogeneous samples.

However, advances in computer vision now enable researchers to use scalable eye tracking relying only on participants’ webcams (“webcam based eye tracking”) (Hutt et al., 2024). On the one hand, this approach may make participants less mindful of the fact that their eyes are being tracked, which may lead to more natural behavior and thus increase the external validity of the results. On the other hand, webcam based eye tracking enables researchers to recruit large and more heterogeneous samples, thereby enhancing the representativeness of the findings. A growing body of scholarship is providing evidence that webcam based eye tracking is sufficiently accurate to address a wide array of research questions (Xu et al., 2015, Papoutsaki et al., 2017, Semmelmann and Weigelt, 2018, Valliappan et al., 2020, Yang and Krajbich, 2021, Hutt et al., 2024).

In light of these developments, eye tracking can now provide valuable insights into the costs and benefits of information provision. For example, if recipients are not affected by the information provided by policymakers, it could be because they did not see it. Alternatively, recipients may see the information but they may not care about it or may not understand it. In the former case, a policymaker needs to reconsider how the information is presented,

⁸As a robustness check, we also code the answers ourselves. The results of the analysis based on our coding are presented in the Appendix and are in line with the results presented in the paper.

whereas in the latter, they need to reconsider the content of the disclosure or, more radically, the viability of transparency-centered interventions. Thus, eye tracking enables policymakers to diagnose what is going wrong, which in turn helps in finding a solution. Moreover, even when information provision produces the desired effects in terms of understanding and behavior, it imposes a cognitive tax on the recipients. Eye tracking enables researchers to capture an important dimension of this cognitive tax, namely how much time recipients spend paying (visual) attention to the disclosure. Everything else equal, if recipients require significant time to understand the information, information provision is less likely to be cost-effective, even if it produces the desired effects.

For study III, we recruit a sample of 500 U.S. residents on Prolific.co. All participants were paid \$1.2 for taking part in the experiment, equivalent to \$8.04 per hour. The full protocol of Study III is included in the Appendix. This study involves remote eye tracking carried out through a widely used platform called i-Motions.

After consenting to taking part in the experiment, participants undergo calibration to ensure proper eye tracking. They are then informed they would view three fictional smart watches not currently on the market and would be asked to indicate their preference.

To increase external validity, we present the information regarding the smart watches in a way that mimics how Apple disclosed information regarding its carbon neutral Apple Watch Series 9 (see Figure 3). For all three smart watches we report information about the characteristics, the performance and the price of the watch. For one of the fictitious smart watches we also report information about the climate pledge (Carbon neutrality).⁹ The order in which respondents see the three smart watches is randomized.

As in Study II, participants randomly assigned to the control condition only see that the watch is carbon neutral. Participants assigned to the bullet points condition see key characteristics of the carbon neutral pledge in bullet points format. Participants assigned to the traffic lights condition see information presented using a color-coded traffic light system (see Figure 3).

We defined one Area of Interest (AOI) for eye tracking analysis (Figure 3) that is sufficiently large to allow us to obtain reliable results, even if our eye tracking technology is less accurate than the one used in studies conducted in the lab. Our main variables of interest are time to first fixation (TTFF) and dwell time (both in absolute terms and in percentage terms). The TTFF of an AOI is the time from the presentation of a stimulus until the AOI is first entered and it captures the conspicuity of the AOI (Holmqvist et al., 2011). The dwell time instead indicates the time spent looking at the AOI, and therefore indicates the time that a participant has looked at the information contained in the AOI. This can indicate that the participant is interested in the content of the AOI, but can also indicate that the participant is having difficulty in extracting general information (Holmqvist et al., 2011).

Immediately after seeing the three smart watches, participants are asked which one they like the most. Afterwards, we ask respondents “Carbon neutrality claims have TWO key features. What do you think they are? (maximum 300 characters) Please do not search for the information online. You will be paid even if you do not provide the correct answer! Answer to the best of your ability”. The correct answer is that carbon neutrality does

⁹The smart watch pictures were created with the AI online image generator ‘OpenArt’.

not require emission reduction and it only refers to CO_2 emissions. We code the answers manually. We then ask respondents about their cognitive load, a question on the state of their eyes and one on whether they are using a vision correction. We conclude by asking demographic questions.

5. Results

5.1. Study I: Respondents' knowledge about climate pledges

Study I confirms that people have a poor understanding of these pledges (ASA, October 2022, Carter, 2022). Only 10% of participants in our sample correctly identify one of the differences between net-zero and carbon neutral pledges (mean=0.102, SD=0.303), and no participant identifies both. Demographics are not significant predictors of participants' knowledge of the climate targets (see Appendix).

5.2. Study II

In presenting the results for Study II, we first discuss the effect of information provision on understanding and then its effect on the WTP for a gift card from a company with a climate pledge.

For within-group comparisons, we rely on p-values and t-statistics computed using a two-sided paired t-test with unequal variances. For within-target comparisons, we report the results of ordered logit regressions interacting the treatment groups with each level of the mechanisms, controlling for consistency and participants' demographics using robust standard errors. In both cases, we report the p-value from two-sided tests.

To investigate whether the impact of the mechanisms differs by level, we run regressions interacting each level of the mechanism with the treatment groups.

5.2.1. The effect of information provision on understanding

In line with our pre-registration, we find that all treatments improve respondents' understanding of carbon neutral and net-zero pledges compared to the control group and that more concise disclosure formats have a larger impact on respondents' understanding (Tables 1 and ??). While in the control group respondents have an average understanding score of 3.343, those in the information condition score 4.244 ($p < 0.001$, Cohen's $d=0.51$), those in the bullet points condition score 5.291 ($p < 0.001$, Cohen's $d=1$) and those in the traffic lights condition score 4.702 ($p < 0.001$, Cohen's $d=0.7$).

Table 1: Summary statistics by group and total (mean and standard deviation) for understanding variables in Study II.

	All	Control	Group Information	Bullet Points	Traffic Lights
Unprompted understanding	0.088 (0.284)	0.038 (0.191)	0.085 (0.279)	0.133 (0.340)	0.095 (0.294)
Visual recognition	3.948 (1.977)	3.019 (1.460)	3.734 (1.836)	4.781 (2.061)	4.239 (2.049)
Total understanding	4.400 (2.163)	3.343 (1.531)	4.244 (1.984)	5.291 (2.293)	4.702 (2.266)

We find that these differences are significant and robust. In the full specification where we run an ordered logit regression with robust standard errors interacting the treatment

Figure 2: A screenshot taken from the first page of the Apple Watch Series 9 Sustainability Report (top left) and the visuals regarding the three smart watches designed for the third experiment. The treatments consisted of changes in the presentation of the smart watch NexusWrist (bottom right)

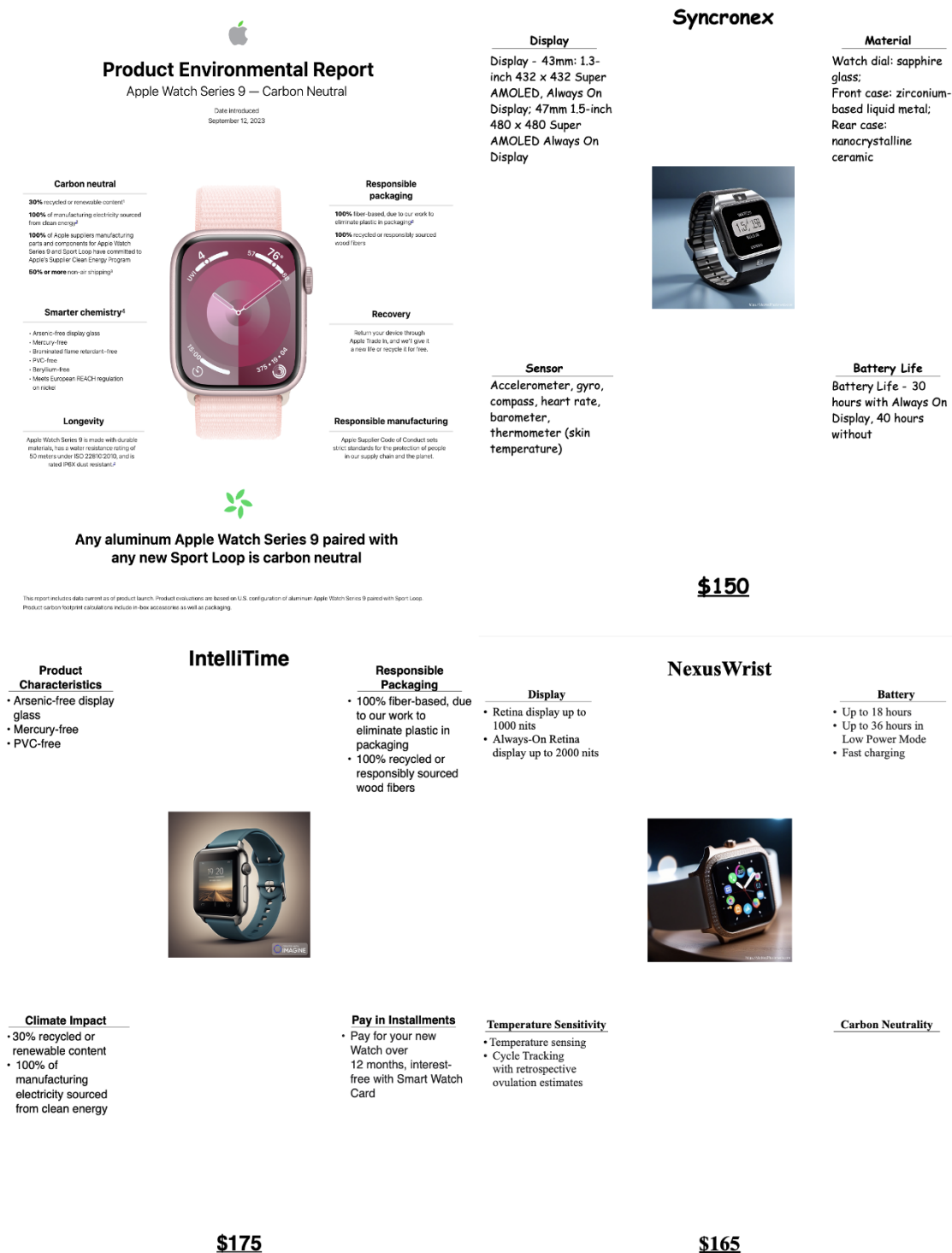
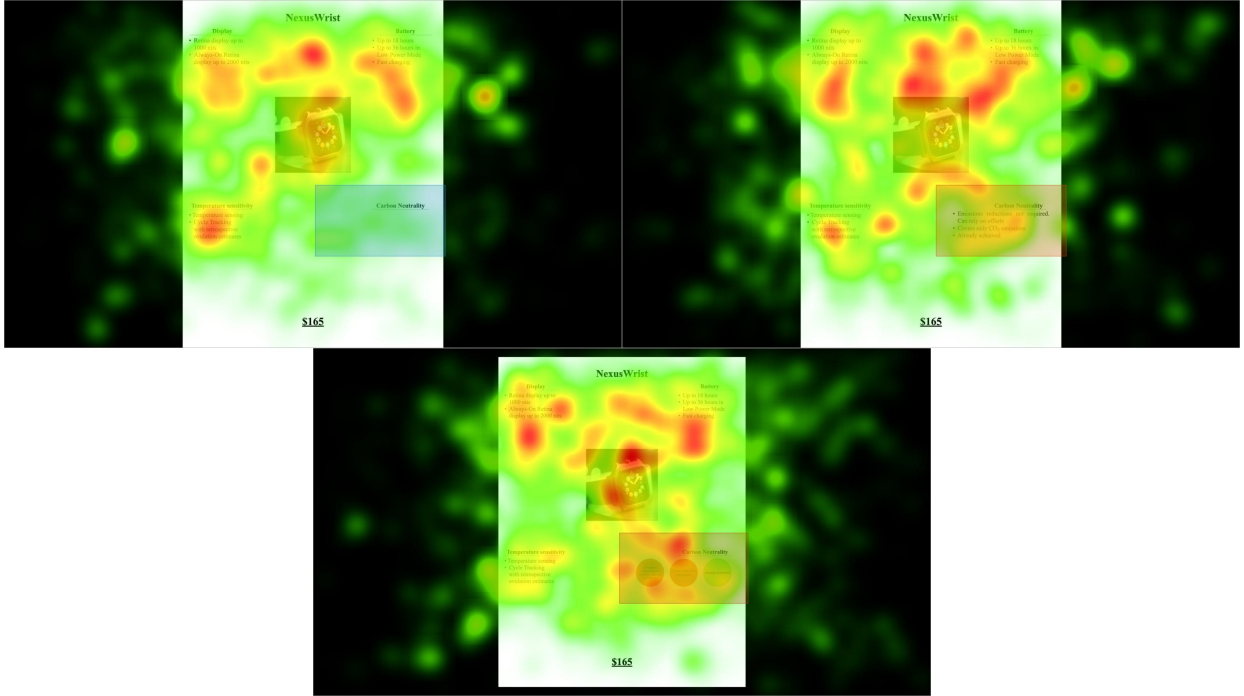


Figure 3: Heat-maps showing the AOI and respondents’ fixations distribution while looking at the treated picture in the a) control group (top-left), b) bullet points group (top-right), c) traffic lights group (bottom-center)



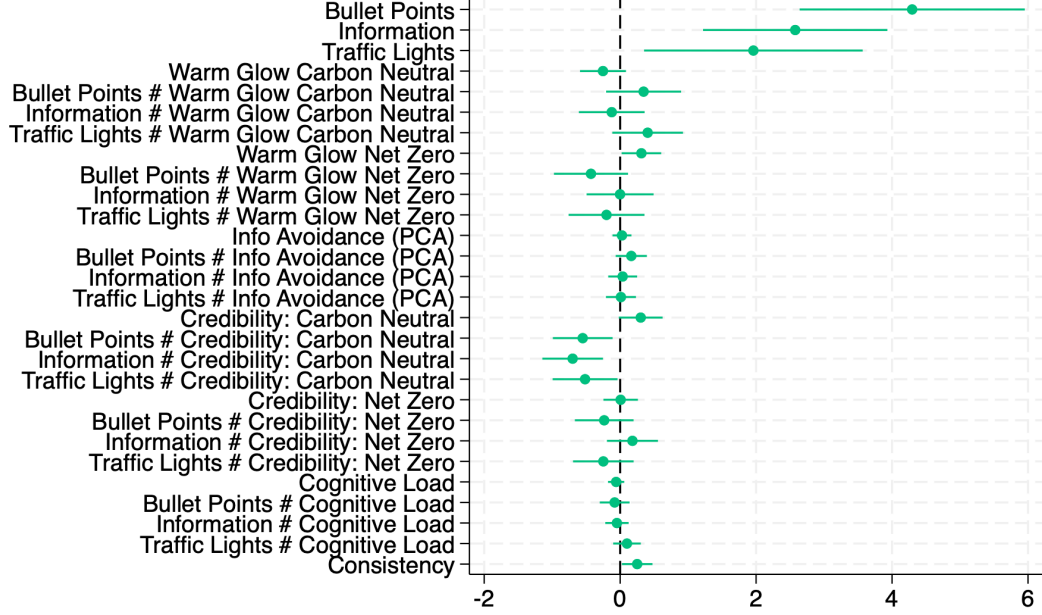
groups with information avoidance, cognitive load, credibility, warm glow, consistency and controlling for participants’ demographics all treatments are still significant predictors of the level of understanding.

We also observe significant differences among treatment groups. The bullet points condition outperforms both the information condition ($p < 0.001$, Cohen’s $d=0.49$) and the traffic lights condition ($p = 0.0004$, Cohen’s $d=0.26$). The traffic-lights condition outperformed the information condition ($p = 0.003$, Cohen’s $d=0.22$). These effects are robust to a number of specifications. Furthermore, the traffic lights group does not outperform the information treatment group (see Table ?? and Appendix). At a first glance, this suggests that a certain kind of information provision can help consumers understand the meaning of climate pledges.

We also look at the open-ended questions and the multiple-choice questions separately, because they measure different facets of understanding. For the open-ended question, all treatments significantly improved understanding compared to the control group (information: $p < 0.001$, $d=0.36$; $p < 0.001$, $d=0.35$; $p < 0.001$, $d=0.27$). We observed no statistically significant difference among the treatment groups without controlling for demographics. With respect to visual recognition, all treatment groups have robust effects and outperform the control group (see Table ??). These results suggest that information provision improves visual recognition and that the way information is provided matters for visual recognition.

With respect to the multiple-choice questions, the treatment groups outperformed the control group (information: $p < 0.001$, $d=0.43$; bullet-point: $p < 0.001$, $d=0.98$; traffic-lights: $p < 0.001$, $d=0.68$). The bullet-points condition performed better than the others. Participants in the bullet-points group outperformed both respondents in the information

Figure 4: Drivers of understanding: the odds ratios and confidence intervals reported are obtained from an ordered logit regression with robust standard errors regressing the understanding score on the group, the mechanisms (warm glow, information avoidance, credibility, cognitive load), an interaction of the group with each mechanism, the participant’s consistency in choices and demographics.



treatment ($p < 0.001$, $d=0.54$) and in the traffic-lights groups ($p < 0.001$, $d=0.26$), while the traffic-lights group performed better than those in the information group ($p < 0.001$, $d=0.26$). Turning to unprompted understanding conditional on our sets of controls, we observe that only the bullet points treatment has a significant effect compared to the control group (see Table ??). We observe no statistically significant difference among the treatment groups (see Table ??). This suggests that information provision has a weaker effect on unprompted understanding and that the format in which the information is provided has limited relevance.

We study the interaction coefficients to investigate the mechanisms that may affect understanding. Besides the treatments, only the perceived credibility of the pledge affects the level of understanding (see Fig. 4 and Table ??). The perceived credibility of the climate pledge significantly raises total understanding in the control group, and it lowers total understanding in the treatment groups compared to the control group.

5.2.2. Willingness to Pay

We turn to analyze respondents’ WTP for the two pledges. Participants demonstrate a considerable WTP for both net-zero and carbon neutral pledges (see Table 2). For the full sample, respondents are willing to pay an average of \$6.49($SD=6.11$), or 26% of the value of the gift card, to switch from a gift card from a firm without a climate target to one with a carbon neutral target, and \$7.15 ($SD= 6.35$), or 28.6% of the value of the gift card, for a net-zero target. Such premia provide firms with powerful incentives to make climate pledges.

In the control condition, the difference in the WTP between carbon neutral and net-

Table 2: Mean and standard deviation for the questions used to assess the participants' WTP by group in Study II.

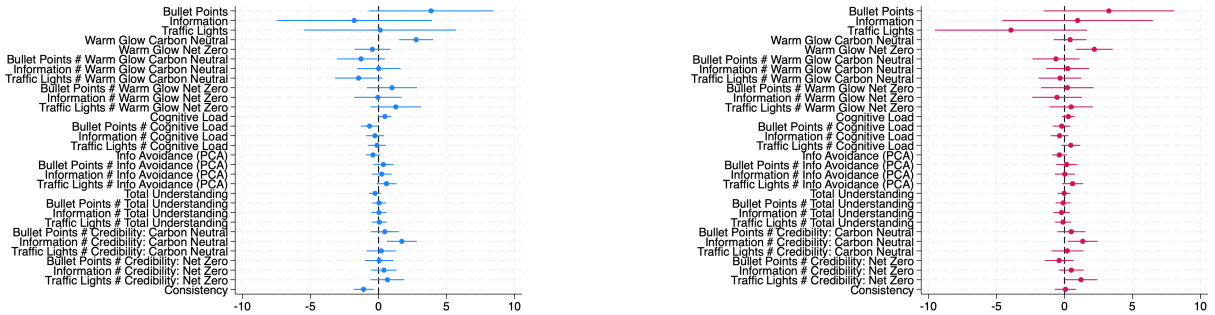
	Group									
	All		Control		Information		Bullet Points		Traffic Lights	
	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd
WTP carbon neutral	6.49	6.11	7.03	6.19	6.30	6.12	6.19	5.72	6.46	6.41
WTP net zero	7.15	6.35	7.18	6.31	7.09	6.07	6.57	5.87	7.75	7.05
WTP Difference	0.65	3.99	0.15	3.87	0.79	3.41	0.38	4.37	1.30	4.15
Observations	1487		370		365		375		377	

zero targets is only \$0.15 (SD= 3.86, $p=0.46$). Such a small wedge is consistent with most respondents being unaware of the differences between the two targets. This wedge increases in the treatment conditions: information (\$0.79, SD=3.41, $p < 0.001$), bullet-points (\$0.38, SD= 4.37, $p = 0.096$), and traffic-lights (\$1.3, SD= 4.15, $p < 0.001$). However, these differences are not significant when we control for the mechanisms (see Tables ?? and ??).

The only mechanism that has a significant impact on the WTP for climate pledges is warm glow (Fig. 5).¹⁰ As predictable, respondents are willing to pay more when they experience more warm glow in connection with a climate pledge. Importantly, we find that understanding is *not* a significant driver of the WTP for climate targets.

We report the full regression tables in the Appendix.

Figure 5: Drivers of the WTP: the figure reports the coefficients and confidence intervals from OLS regressions using the WTP for the climate pledge as a dependent variable. The regressions are ran with robust standard errors. In the regressions we control for the group the participant was assigned to, the mechanisms, the interaction between each mechanism and each treatment group, the participant's consistency in choices and demographics.



¹⁰We note that the treatments only affect the level of warm glow for carbon neutrality, with the information condition and the traffic light condition lowering the level of warm glow with respect to the control group. These results are not robust and disappear when considering differences across treatments and hence are not presented in the paper.

5.3. Study III

We carry out a third study in which we test how much visual attention respondents pay to information related to climate pledges and whether they understand such information when they were exposed to multiple pieces of information on multiple products.

To test differences across the treatment groups, we rely on two-sample two-sided t-test using unequal variances and their associated t-statistic. In both cases we report the p-value from two-sided tests.

5.3.1. Respondents' attention when they are exposed to multiple pieces of information

For our eye tracking study, we only select participants for which eye tracking quality was above 50% and accuracy was at most 10.0.

All relevant measures suggest that traffic lights are most effective in attracting visual attention. Compared to the control and bullet points groups, more people attend the AOI, the TTFF is lower, dwell time is longer, and participants spend a higher percentage of their time looking at the treated area (see Table 3). Bullet points are also effective in attracting attention, albeit less than traffic lights. Compared to the control group, more respondents in the bullet points group attended to the AOIs, however their average TTFF was slightly higher. Moreover, respondents in the bullet points group also had a higher dwell time, that is, they spent a higher percentage of the time looking at the AOI.

5.3.2. Respondents' understanding of climate pledges when they are exposed to multiple pieces of information

In Study III, we explore participants' understanding of carbon neutrality when exposed to multiple product-related information, mimicking real-life scenarios. Notably, as in Study I, no respondent in the entire sample identifies both key features of carbon neutrality.

This suggests that the positive effect of information provision on understanding disappears when respondents are exposed to multiple pieces of information related to several products, as it routinely happens in real life. In light of this finding, we conduct an additional test to determine if respondents in the bullet points and traffic lights conditions are less likely to provide information directly conflicting with the disclosure. We observe the opposite effect.

Respondents in the traffic lights condition are significantly more likely to incorrectly associate carbon neutrality with emission reductions, low emissions, or no emissions compared to the control group. The mean proportion of respondents providing information conflicting with the disclosed information is 18.5% (SD = 0.389) in the control group, 17.8% (SD = 0.384) in the bullet points group, and 28.9% (SD = 0.455) in the traffic lights group. The difference between the traffic lights and control groups is statistically significant (diff = 0.105, $p = 0.026$), while the difference between the bullet points and control groups is not (diff = 0.006, $p = 0.882$).

Logit regression run with robust standard errors and controlling for demographics and cognitive load reveal similar results (see Appendix). While there is no statistically significant difference between the bullet points and the control groups (OR=0.93, $p=0.818$), participants in the traffic lights condition are more likely to list the wrong characteristic than those in the control group (OR=1.67, $p=0.072$). Participants in the traffic lights group are also more likely to list the wrong answer than those in the bullet points condition (OR= 1.75, $p=0.08$).

Table 3: Summary statistics and t-tests for the Dwell Time(%), Dwell time (ms) and TTFF in Study III. Row 1 reports the number of respondents who had no fixations in the AOI, Row 2 reports the mean and standard deviations (in parentheses) for Dwell Time(%) in each treatment group conditional on having at least one fixation in the AOI. Row 3 reports the mean and standard deviations (in parentheses) for the total number of observations in each group. Row 4 and 5 report results for Dwell time (ms) and row 6 for the TTFF. Columns 5 and 6 report the differences between the bullet points (BP) group and the control group and the traffic lights (TL) group and the control group, respectively. The p-values reported refer to two-sided t-tests with unequal variances.

	Control	Bullet Points	Traffic Lights	BP-control	TL-control
no fixation detected in the AOI	82	54	32	-28	-50
Dwell Time (%)					
Conditional on fixation detected	9.083494 (10.61764)	19.23102 (18.51998)	21.16405 (18.99483)	10.14753, p<0.0001	12.08055, p<0.0001
Unconditional	4.569273 (8.781777)	11.91782 (17.30339)	16.87766 (18.97549)	7.348544 , p<0.0001	12.30839, p<0.0001
Dwell Time (ms)					
Conditional on fixation detected	1576.276 (2185.844)	3318.202 (3172.62)	4111.075 (5067.211)	1741.926, p<0.0001	2534.8, p<0.0001
Unconditional	792.9144 (1736.054)	2056.35 (2970.496)	3278.452 (4815.628)	1263.436, p<0.0001	2485.538, p<0.0001
TTFF	7407.847 (4969.921)	7803.32 (5706.999)	6417.813 (6059.126)	395.4728, p=0.6290	-990.0339, p=0.1985
N	165	142	158	307	323

6. Discussion

We find that respondents display both a very high willingness to pay for climate pledges and a very low understanding of their meaning. This suggests that firms may be able to charge significant premia by making claims that are less ambitious than they sound. For this reason, we tested whether providing consumers with information pertaining to the core characteristics of climate pledges would help them understand climate pledges and make more informed choices.

In our main study, we observe that information provision does not affect behavior, but it improves respondents’ understanding of the climate pledges. At first glance, this may suggest that at least a policymaker who places independent value on recipients’ understanding of climate pledges should endorse information provision. However, any positive effect on understanding disappears in our third study when we account for the fact that in the marketplace people are exposed to myriad of information. On the one hand, we find that when recipients are exposed to multiple pieces of information related to multiple products, salient disclosure leads to engagement but does not improve understanding. On the other hand, we observe that traffic lights, the framing that attracts the most visual attention, leads people to say more frequently that carbon neutrality implies emission reduction. This is in direct contrast to the information we provide.

These findings are consistent with the idea that information on complex issues – especially when presented in a setting in which consumers are already flooded with information – may, at best, enhance shallow forms of understanding like visual recognition, but is unlikely to improve unprompted understanding. One hypothesis is that respondents see the terms “emissions reduction” in the traffic lights condition, and automatically associate the idea with carbon neutrality, even if the disclosure at which they are looking states the exact opposite. These findings suggest that in a realistic setting in which consumers are exposed to multiple pieces of information, all that information provision may achieve is to increase consumers’ confusion and impose a cost on them because they waste time looking at a disclosure they do not understand.

Our results relate to the debate on systemic frame (s-frame) interventions and individual frame (i-frame) interventions. Social scientists have often emphasized how i-frame interventions can have a big impact (Kahneman, 2013, Halpern, 2016). However, recent evidence has suggested that i-frame interventions have a smaller impact than usually assumed (DellaVigna and Linos, 2022, Szaszi et al., 2022, Gal and Rucker, 2022). Our findings further reinforce the idea that for a systemic challenge like climate change an i-frame solution like information provision should not be considered even a partial substitute for systemic interventions.

One counterargument would be that there might be learning over time. Respondents in our study see our disclosure for the first time. If a regulator imposes mandatory disclosure of information on such pledges, consumers would be routinely exposed to this information and hence may have more opportunities to learn its meaning. As we do not study the role of learning, we cannot estimate the importance of this effect.

7. Conclusion

Mandatory disclosure is a widespread response to market failures and is also a mechanism available to authorities and courts in the context of climate pledges 2.3. While some schol-

ars have argued that it systematically fails to address the problems it is intended to solve (Ben-Shahar and Schneider, 2011), others are more optimistic and highlight evidence indicating that disclosure mandates can affect behavior and help consumers make more informed choices (Sunstein, 2020). We conduct three studies to investigate the role that mandatory disclosure can play in the context of firms’ climate pledges. We find that information provision does not lead recipients to make more informed choices. Instead, it leads to increased confusion. Overall, our results are in line with the recent suggestion that, in many instances, i-frame policies may not be an effective substitute for, or even complement of, s-frame policies (Chater and Loewenstein, 2023). Moreover, our results highlight the risk of finding false positives when studies do not account for important mechanisms (e.g., warm glow) or contextual factors such as the sheer amount of information to which consumers are exposed.

References

- Andreoni, J., 1990. Impure altruism and donations to public goods: A theory of warm-glow giving. *The economic journal* 100, 464–477.
- ASA, October 2022. Environmental claims in advertising - qualitative research report .
- Becker, G.M., DeGroot, M.H., Marschak, J., 1964. Measuring utility by a single-response sequential method. *Behavioral science* 9, 226–232.
- Ben-Shahar, O., Schneider, C.E., 2011. The failure of mandated discourse. *University of Pennsylvania Law Review* 159, 647.
- Berry, J., Fischer, G., Guiteras, R., 2020. Eliciting and utilizing willingness to pay: Evidence from field trials in northern ghana. *Journal of Political Economy* 128, 1436–1473.
- Birkenberg, A., Narjes, M.E., Weinmann, B., Birner, R., 2021. The potential of carbon neutral labeling to engage coffee consumers in climate change mitigation. *Journal of Cleaner Production* 278, 123621.
- Carter, E., 2022. Most u.s. consumers don’t know what ‘carbon neutral’ means .
- Chater, N., Loewenstein, G., 2023. The i-frame and the s-frame: How focusing on individual-level solutions has led behavioral public policy astray. *Behavioral and Brain Sciences* 46, e147.
- Crumpler, H., Grossman, P.J., 2008. An experimental test of warm glow giving. *Journal of public Economics* 92, 1011–1021.
- Dana, J., Weber, R.A., Kuang, J.X., 2007. Exploiting moral wiggle room: experiments demonstrating an illusory preference for fairness. *Economic Theory* 33, 67–80.
- Day, T., et al., 2023. Corporate climate responsibility monitor 2023. NewClimateInstitute-forClimatePolicy and Global Sustainability .
- DellaVigna, S., Linos, E., 2022. Rcts to scale: Comprehensive evidence from two nudge units. *Econometrica* 90, 81–116.

- Dietz, S., Fruitiere, C., Garcia-Manas, C., Irwin, W., Rauis, B., Sullivan, R., 2018. An assessment of climate action by high-carbon global corporations. *Nature Climate Change* 8, 1072–1075.
- Enriques, L., Romano, A., Tuch, A., 2024. Green gatekeepers. forthcoming *Minnesota Law Review* .
- Epley, N., Gilovich, T., 2016. The mechanics of motivated reasoning. *Journal of Economic perspectives* 30, 133–140.
- Etzion, D., 2022. The proliferation of carbon labels. *Nature Climate Change* 12, 770–770.
- FDA, 2019. Tobacco products; required warnings for cigarette packages and advertisements URL: <https://www.federalregister.gov/documents/2019/08/16/2019-17481/tobacco-products-required-warnings-for-cigarette-packages-and-advertisements>.
- Gal, D., Rucker, D.D., 2022. Experimental validation bias limits the scope and ambition of applied behavioural science. *Nature Reviews Psychology* 1, 5–6.
- Halpern, D., 2016. Inside the nudge unit: How small changes can make a big difference. Random House.
- Hartmann, P., et al., 2017. Warm glow vs. altruistic values: How important is intrinsic emotional reward in proenvironmental behavior? *Journal of Environmental Psychology* 52, 43–55.
- Ho, E.H., Hagmann, D., Loewenstein, G., 2021. Measuring information preferences. *Management Science* 67, 126–145.
- Holmqvist, K., Nyström, M., Andersson, R., Dewhurst, R., Jarodzka, H., Van de Weijer, J., 2011. Eye tracking: A comprehensive guide to methods and measures. oup Oxford.
- Hutt, S., Wong, A., Papoutsaki, A., Baker, R.S., Gold, J.I., Mills, C., 2024. Webcam-based eye tracking to detect mind wandering and comprehension errors. *Behavior Research Methods* 56, 1–17.
- Kahneman, D., 2013. Daniel kahneman’s gripe with behavioral economics [interview by jesse singal]. *The Daily Beast* 26.
- Kahneman, D., Knetsch, J.L., Thaler, R.H., 1990. Experimental tests of the endowment effect and the coase theorem. *Journal of political Economy* 98, 1325–1348.
- Kunda, Z., 1990. The case for motivated reasoning. *Psychological bulletin* 108, 480.
- Li, M., Trencher, G., Asuka, J., 2022. The clean energy claims of bp, chevron, exxonmobil and shell: A mismatch between discourse, actions and investments. *PloS one* 17, e0263596.
- Nunes, P.A., Schokkaert, E., 2003. Identifying the warm glow effect in contingent valuation. *Journal of Environmental Economics and Management* 45, 231–245.

- Orian Peer, N., 2024. Corporate climate targets: Between science and climate washing. U of Colorado Law Legal Studies Research Paper Forthcoming, NYU Environmental Law Journal, Forthcoming .
- Paas, F.G., Van Merriënboer, J.J., 1994. Variability of worked examples and transfer of geometrical problem-solving skills: A cognitive-load approach. *Journal of educational psychology* 86, 122.
- Papoutsaki, A., Laskey, J., Huang, J., 2017. Searchgazer: Webcam eye tracking for remote studies of web search, in: *Proceedings of the 2017 conference on conference human information interaction and retrieval*, pp. 17–26.
- Rayner, K., 1998. Eye movements in reading and information processing: 20 years of research. *Psychological bulletin* 124, 372.
- Semmelmann, K., Weigelt, S., 2018. Online webcam-based eye tracking in cognitive science: A first look. *Behavior Research Methods* 50, 451–465.
- Southwell, R., Gregg, J., Bixler, R., D’Mello, S.K., 2020. What eye movements reveal about later comprehension of long connected texts. *Cognitive Science* 44, e12905.
- Sunstein, C.R., 2020. *Too much information: understanding what you don’t want to know*. MIT Press.
- Szaszi, B., et al., 2022. No reason to expect large and consistent effects of nudge interventions. *Proceedings of the National Academy of Sciences* 119, e2200732119.
- Taufik, D., Bolderdijk, J.W., Steg, L., 2015. Acting green elicits a literal warm glow. *Nature Climate Change* 5, 37–40.
- Taufique, K.M., Nielsen, K.S., Dietz, T., Shwom, R., Stern, P.C., Vandenbergh, M.P., 2022. Revisiting the promise of carbon labelling. *Nature Climate Change* 12, 132–140.
- Thøgersen, J., Nielsen, K.S., 2016. A better carbon footprint label. *Journal of Cleaner Production* 125, 86–94.
- Tollefson, J., 2022. Climate pledges from top companies crumble under scrutiny. *Nature* .
- Trencher, G., Blondeel, M., Asuka, J., 2023. Do all roads lead to paris? comparing pathways to net-zero by bp, shell, chevron and exxonmobil. *Climatic Change* 176, 83.
- Valliappan, N., et al., 2020. Accelerating eye movement research via accurate and affordable smartphone eye tracking. *Nature communications* 11, 4553.
- Xu, P., Ehinger, K.A., Zhang, Y., Finkelstein, A., Kulkarni, S.R., Xiao, J., 2015. Turkergaze: Crowdsourcing saliency with webcam based eye tracking. *arXiv preprint arXiv:1504.06755* .
- Yang, X., Krajbich, I., 2021. Webcam-based online eye-tracking for behavioral research. *Judgment and Decision making* 16, 1485–1505.

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