

A carbon price by another name may seem sweeter: Consumers prefer upstream offsets to
downstream taxes

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Abstract:

Consumers are influenced, not only by prices, but also by how those prices are labelled, and by the policies that undergird those prices. Steps to limit carbon emissions, including putting a “price” or a “limit” on emissions, can be undertaken in a variety of ways, and these policies are associated with different labels, including carbon "taxes", "permits", or "offsets." Furthermore, the emissions can be regulated at many different points in the production and usage system: "upstream" regulations are applied to the extraction and importation of fossil fuels, while "downstream" regulations are applied to the sale of products and services. From a conventional economic standpoint, these points of regulation should have roughly equivalent impacts on carbon emissions. However, the impact of different policy choices and of "upstream" vs "downstream" frames on consumer perceptions and preferences is largely unknown. In several studies examining consumer preferences in the airline industry, we find that consumers respond significantly more favorably to a description of upstream offsets than to other frames such as downstream taxes. Furthermore, these framing differences are moderated by political ideology, such that Republicans show a particular distaste for downstream taxes.

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How do consumers react to regulations on carbon emissions? Regulations can increase the cost of carbon intensive activities such as flying, and these cost increases should influence consumer choices, but does it matter to consumers which policies are used, how the policies affect cost, and how these costs are labeled? Previous literature suggests that product attribute framing can have a substantial impact (Levin, Schneider, & Gaeth, 1998). In a classic study, consumers were willing to pay more for a burger labeled as 75% meat than one labeled 25% fat, even after tasting it (Levin & Gaeth, 1988). Likewise, costs labeled as "taxes" are more odious to consumers than other equivalent financial costs, and this is particularly true for political conservatives (Hardisty & Weber, 2010; Sussman & Olivola, 2011). In this paper, we examine consumer preferences for three different policy types (taxes, permits, and offsets), and we explore a novel dimension of policy labeling, which is whether the labeling indicates that the regulation is being applied "upstream" on the production and importation of fossil fuels or "downstream" on the goods and services for which the fossil fuels are being consumed.

The debate in conventional economic theory on the *type* of policy instrument - price-based regulation (e.g., taxes) vs. quantity-based regulation (e.g., cap-and-trade) - is well developed elsewhere and we do not repeat it here. With regard to the *point of regulation*, according to conventional economic theory, in the absence of market power, transactions costs, or other distortions, regulation of environmental pollutants is most cost-effective when applied at the point (upstream or downstream in a production process) that ensures the greatest flexibility in terms of means for reducing emissions (see Mansur 2012). In the case of fossil fuels, assuming there is no way to scrub out or remove the emissions before they are combusted, upstream or

downstream regulations provide the same chances of reducing emissions, making the two approaches theoretically equivalent from a conventional economics point of view. Unless prohibited by regulations, entities regulated upstream will tend raise their prices and thus pass the carbon price through to consumers, transmitting the carbon price downstream. Similarly, if consumers facing a downstream carbon price respond by reducing their demand, producers will then see the same reduction in profits as if they had faced the carbon price upstream and correspondingly passed on the cost to consumers.

Given this theoretical equivalence of points of regulation, an upstream point of monitoring and regulation for fossil fuels (for example, requiring permits for the mining and importation of fossil fuel based on its carbon content) has a number of economic advantages relative to more downstream monitoring and regulation (such as a permit at the point where power plants burn the coal, or a tax levied at the point of sale to consumers). In particular, economists have argued for the value of upstream regulation based on its administrative simplicity (requiring fewer sources to be monitored) and ability to ensure a broader economic coverage of all sources consuming fossil fuels in the economy, improving cost-effectiveness and reducing potential for emissions leakage (e.g. Stavins 2007).

Despite the theoretical rationale for an upstream approach, policy makers in most existing and proposed emissions trading systems to date have chosen to regulate fossil fuel emissions at more downstream points; this entails significantly higher administrative costs and a reduction of coverage for sources below certain thresholds and sectors such as transportation. These choices have often had a behavioral justification. The argument is that downstream regulation increases the salience of the price and has different consequences in terms of managerial attention. These

will induce greater innovation and behavioral change to reduce emissions, reducing the costs of the policy, even as the overall cap or price is still maintained under either type of regulation.

While these behavioral arguments for downstream regulation are perceived wisdom in some policy circles, they are largely “anecdotal” from an academic perspective as noted by Aldy and Pizer (2009). Some recent surveys have suggested that manager responses to quantity-based regulations such as emissions caps do have a behavioral component, with greater responses when companies are “short” versus “long” allowances (Martin, Muûls, and Wagner, 2011). But salience might vary with the context. From a consumer perspective, studies in the tax arena have shown that consumers are more responsive to taxes that are embedded in a product’s price, versus placed on a bill as an-add on to the sticker price (Chetty, Looney, and Kroft, 2009). Some economists staunchly refute the behavioral arguments (Stavins 2007), while others call for downstream regulation precisely on these merits (Hanemann 2009). Others have suggested that even if there is a salience issue, an upstream point of regulation could be coupled with other interventions (emissions reporting requirements, information campaigns) to increase salience and price response downstream at the same time that the benefits of an upstream system are maintained.

Depending on the type of policy (price vs. quantity), carbon regulation raises the *price* of carbon producing activities to make them less economically appealing; or carbon regulation limits the *quantity* of allowable emissions, so as to induce emitters to find better, cheaper, faster ways of cutting emissions, a response intensified if banking and trading are allowed. Carbon regulation might also send a message to *consumers* that society thinks these activities are bad (similar to a "sin tax" or a workplace smoking ban for cigarettes), and may thereby induce consumers to voluntarily reduce their carbon emissions (above and beyond the effect of the price

change or quantity restriction). This latter purpose, sometimes called the communication of "injunctive norms," has been found to be important for decreasing energy usage in residential homes in California (Shultz et al., 2007). Depending on whether and how it is communicated, moving carbon regulation upstream may hide this injunctive norm from consumers, and thus decrease the effectiveness of the regulation for changing consumer behavior.

On the flip side, some countries or states may be looking to make carbon regulation *more* attractive to consumers. For example, one country may implement a carbon regulation for air travel (in and out of that country), while a neighboring country does not. In this case, consumers would face a choice between paying carbon fee when traveling to one country but not the other. The country that implements the carbon regulation may want to maintain consumer demand for air travel to the country, and therefore look for the frame that is most appealing (or least unappealing).

These issues are especially relevant in the context of policies recently adopted by the International Civil Aviation Organization (ICAO), the UN specialized agency for the sector, one of the largest and fastest growing contributors to global greenhouse gas emissions. The sector produces emissions on par with a top-ten emitting nation and these are expected to increase three to four times over 2010 levels by 2040, based on current trends. In October 2016, ICAO agreed on a package of policies, including a market-based measure, to limit annual emissions for most international flights for the years 2021-2035, with the limit fixed at 2019-2020 levels (ICAO 2016). The Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) is voluntary for countries over its first phase (2021-2025), though mandatory for airlines of nations that choose to participate in that phase, and mandatory for most but not all international flights thereafter. Based on current levels of participation, the international aviation sector's demand for

offsets by 2035 is estimated at about 2.5 billion tons, once in-sector reductions and the potential use of sustainable alternative fuels are taken into account. Many countries are still deciding whether or not to opt in and thus impose carbon offsetting requirements on arriving and departing flights. Airlines and their regulators will also have to determine how best to communicate (explicitly or otherwise) the associated carbon costs to their customers.

In a series of six studies, we test consumer perceptions of upstream vs. downstream carbon regulation labels in the aviation industry, along with three different policies: tax, permit, and offset. A tax fixes a price on emissions, a tradable permit system fixes the quantity of emissions (with the resulting price of emissions equal to the market value of permits), and an offset system requires a quantity emissions to be compensated for by buying credits for verified emissions reductions achieved by sources not regulated by the program. Each of these results in a price on emissions, and our question is whether only the level of the price itself or also the policy approach, as well as the corresponding point of regulation, matters to consumers. In combination, our two point of regulation frames and three policy frames result in six unique carbon price labels. We compare these six labels with two control conditions: a "no-fee" control in which there is no carbon price, and a "no-information" control in which there is a carbon fee added to the price but where this is not highlighted or explained to consumers in any way.

In Study 1, we compared these eight conditions in an exploratory fashion and found that the "upstream offset" combination was more desirable to consumers than any other combination of frames, and that the "downstream tax" combination was the worst. In Study 2, we replicated the key results and also found that the policy description is critical for the observed framing effects. In Study 3, we again replicated these results and further found that they are moderated by participants' political affiliation - self-identified Republicans show a strong distaste for the

downstream tax frame. In Study 4, we again replicated these results and found that the same effects could be elicited with a much shorter, more actionable, two-sentence version of the upstream offset policy description. In Studies 5 and 6, we compared a shorter upstream offset policy description against shorter versions of the upstream tax, downstream tax, and downstream offset descriptions; we found that the upstream offset description was again more desirable to consumers than any other combination of frames among U.S. consumers (Study 5) and one of the most desirable among Indian consumers as well (Study 6).

Study 1: Method

Participants

Participants were 416 residents of the United States (52% men; M age = 35.31 years [SD = 11.41]) who were recruited through Amazon.com's Mechanical Turk website in exchange for a small payment, and who fully completed the measures described below.¹ These procedures were administered and completed online, on SurveyMonkey.com. Participants had a median household income of \$40,000 - \$60,000 and 40% classified themselves as Democrats, 17% as Republicans, 32% as Independents, 5% as "Other", 2% as Green.

Experimental Manipulation: Proposed Carbon Regulatory Policies

After consenting to participate in the study, respondents were randomly assigned to one of eight conditions: upstream tax, upstream permit, upstream offset, downstream tax, downstream permit, downstream offset, no-fee control, or no-information control.

In the six carbon fee labeling conditions, participants were presented with a brief narrative which described proposed legislation to limit carbon dioxide emissions that participants

¹ Some participants completed additional measures as well; these additional measures are not germane to the goals of this investigation, and so are not described below.

were told was currently under consideration. Participants were asked to take their time and read the description carefully because they may be asked to recall information from the description later. In each of the six experimental conditions, the proposed legislation description contained information regarding an aviation-related carbon fee. The specific dollar costs and predicted effects of this fee were the same across conditions (e.g., a \$5.70 price increase on flights from New York to Los Angeles). However, the "stream" (upstream vs downstream) and "frame" (tax vs. offset vs. permit) were varied between conditions. For example, in the "Upstream Offset" condition the regulatory policy described a proposal for a carbon [*offset*] program for [*aviation fuel production and import*], whereas in the "Downstream Tax" condition, the regulatory policy described a proposal for a carbon [*tax*] on [*airplane travel*]. The six experimental conditions were, "Upstream Tax", "Upstream Offset", "Upstream Permit", "Downstream Tax", "Downstream Offset", and "Downstream Permit". Other than varying the stream and the undergirding policy, the content in each of the six experimental conditions was identical or nearly identical in length and content. (See Online Supplemental Materials).

Participants in the two additional control conditions (the "No-Information Control" condition and the "No-Fee Control" condition), were not asked to read a proposed regulatory policy at all and instead directly moved on to the dependent measures described below.

Measure of Pro-Environmental Flight Preference

Immediately following the manipulation, participants in the six experimental conditions were asked to imagine that they were planning a vacation and were presented with three pairs of similarly priced flights to little known vacation destinations (e.g., "Flight A to Isla Guamblin" vs. "Flight B to Isla Melchor"); for each pair of flight decisions, Flight B included an "additional \$14.00 carbon tax (or offset, or permit) on aviation fuel production and importation (or airplane

travel).” The exact wording of the additional \$14.00 carbon fee on Flight B varied between each of the six experimental conditions. For example, one flight pair decision in the Upstream Offset condition had participants choose between “Flight A to the Island of Tortola for \$625.25 OR Flight B to the Island of Anegada for \$605.25 plus an additional \$14.00 carbon offset on aviation fuel production and importation.” We used approximate current market prices for these flights (based on departure from Miami, Florida), and determined the \$14.00 price of the carbon fee based on our rough estimate of the carbon cost to consumer for flights of this length. For each flight pair, participants indicated how likely they would be to buy Flight B instead of Flight A using a 7-point scale (from "1- Definitely Not" to "7- Definitely").² Two of the three flight pairs differed slightly in price difference (Flight B was \$6.00 cheaper and \$4.00 more expensive than Flight A in these two flight pair decisions), and a third flight pair differed more dramatically in price difference (Flight B was \$20 more expensive than Flight A after a carbon fee had been applied).

Participants in the two additional control conditions underwent slightly different procedures: In the “No-Information Control” condition, the \$14.00 carbon fee applied to Flight B in each of the flight pair decisions was embedded into the price of Flight B with no additional information provided. For example, one flight pair decision in the No-Information Control condition had participants choose between, “Flight A to the Island of Tortola for \$625.25 OR Flight B to the Island of Anegada for \$619.25.” This control condition allowed us to examine whether preferences for Flight B in our experimental conditions were driven by the given

² For each flight pair, participants also indicated their preferred flight (“Which of these two flights would you prefer to buy, Flight A or Flight B?”). Results from analyses on this dichotomous choice variable are not reported but are consistent with those of the continuous choice measure and can be found in the Online Supplemental Materials.

explanations of additional carbon fees or by something idiosyncratic about Flight B (e.g., price, destination).

In the “No-Fee Control” condition, the \$14.00 carbon fee was not applied to Flight B in each of the flight pair decisions. For example, one flight pair decision in the No-Fee Control condition had participants choose between “Flight A to the Island of Tortola for \$625.25 OR Flight B to the Island of Anegada for \$605.25.” This control condition allowed us to examine how a preference for Flight B in our experimental conditions differed from a preference for the exact same flights when they did not carry an imposed carbon fee and were \$14.00 less expensive.

Finally, participants in all eight conditions provided demographic information (e.g., age, sex, income).³

Study 1: Results

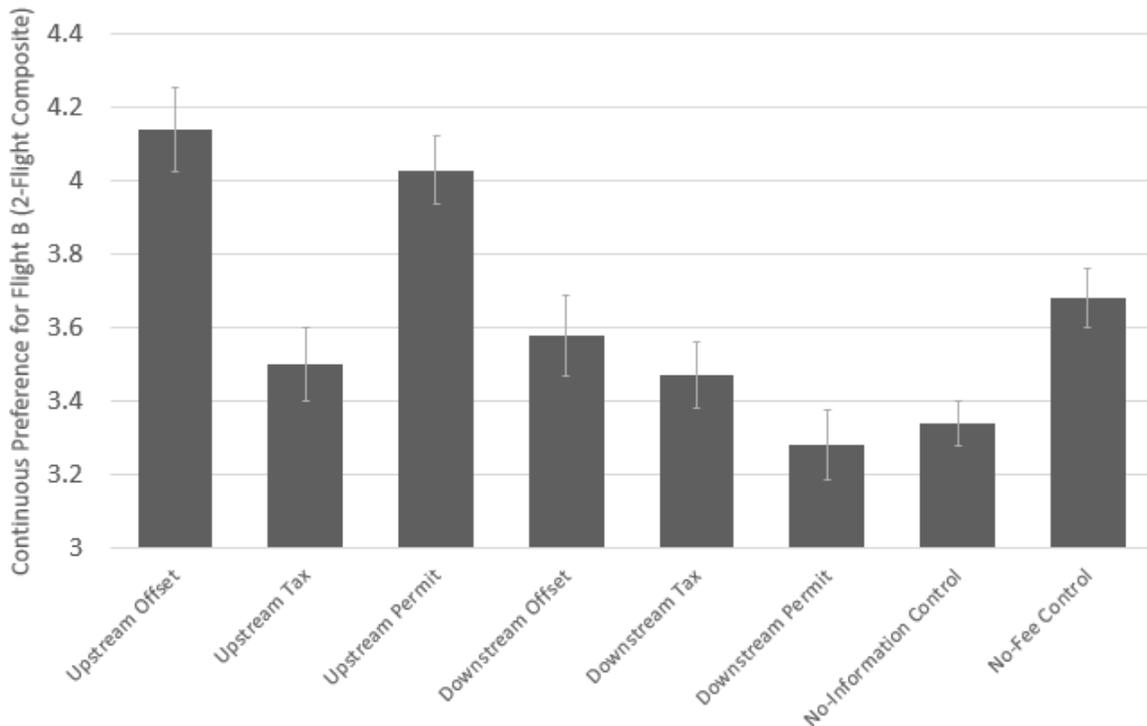
Consistent results were found across flight pair items one and three (in which Flight B was \$6.00 less expensive and \$4.00 more expensive than Flight A respectively) so we collapsed across these two flight pairs in our analyses and figures; this composite continuous flight preference served as our main dependent variable of interest. The second flight pair (in which Flight B was \$20.00 more expensive than Flight A) was analysed separately due to a lack of variability on our continuous and binary flight preference items (e.g., only 17% of participants indicated a preference for Flight B over Flight A when the carbon fee was applied). This lack of variability was likely due to a pronounced price difference between Flight B and Flight A (after

³ Participants in this study also completed the 15-item New Ecological Paradigm (NEP; Dunlap, Van Liere, Mertig, & Jones, 2000) which is designed to assess dispositional environmental attitudes and concerns. Analyses were conducted to test whether any of the primary results (reported below) were moderated by this questionnaire and there was no evidence of meaningful moderating effects so this variable is not discussed further.

the carbon fee was applied, Flight B was \$20 more expensive than Flight A) in this particular flight pair choice.

To test whether experimental condition affected pro-environmental flight preferences (i.e., preference for flights which included a carbon fee), we conducted a one-way analysis of variance (ANOVA) on continuous preference for Flight B (collapsed across flight pair choices 1 and 3), with condition as the independent variable. Results revealed a significant main effect of experimental condition, $F(7,409) = 2.40$, $\eta^2 = 0.85$, $p = .02$. Figure 1 shows that the Upstream Offset condition appears to be most effective at eliciting pro-environmental flight preferences. However, to examine the significance of this effect versus other conditions, we conducted a series of independent samples T-tests.

Figure 1. Mean preference for flights carrying a \$14.00 carbon fee within each condition in Study 1.



Preference for flights carrying a \$14.00 carbon fee in the Upstream Offset condition was significantly greater when compared to the Upstream Tax condition, $t(106) = 2.12$, $d = 0.41$, $p = .04$, Downstream Tax condition, $t(106) = 2.38$, $d = 0.46$, $p = .02$, and Downstream Permit condition, $t(101) = 2.90$, $d = 0.58$, $p = .01$; it was marginally greater when compared to the Downstream Offset condition, $t(107) = 1.79$, $d = 0.34$, $p = .08$, and no different when compared to the Upstream Permit condition, $t(91) = 0.40$, $d = 0.08$, $p = .69$. This preference in the Upstream Offset condition was also significantly greater when compared to the No-Information Control condition in which participants did not read a proposed regulatory policy and no information was given regarding the carbon fee, $t(91) = 3.00$, $d = 0.63$, $p = .003$. Finally, individuals in the Upstream Offset condition were marginally more likely to prefer flights carrying a carbon fee when compared to the No-Fee Control condition in which the \$14.00 carbon fee was not even applied, $t(95) = 1.67$, $d = 0.34$, $p = .10$.

Looking separately at the second flight pair choice (in which there was a more pronounced, \$20 price difference between Flight B and Flight A after a carbon fee was applied), we conducted an ANOVA with condition as the independent variable. Results revealed a significant main effect of experimental condition, $F(7,409) = 2.07$, $\eta^2 = 0.82$, $p = .045$. We conducted an additional series of independent samples T-tests to examine whether the Upstream Offset condition was more effective than other experimental conditions at eliciting pro-environmental flight preferences; however, none of these tests were significant (all p 's > .09).

Study 1: Discussion

Individuals who had read a brief description (119 words in length) of a proposed regulation for a carbon fee described as a “carbon offset on aviation fuel production and importation” consistently reported a greater preference to purchase flights carrying a \$14.00 carbon fee (versus similarly priced flights with no carbon fee) than, a) individuals who read other brief descriptions (95-134 words in length) describing the carbon fee under different frames (i.e., “carbon tax”, “carbon permit”) and/or at a different stream (i.e., “on airplane travel”), b) individuals who did not read any description of an additional carbon fee and for whom this \$14.00 fee was embedded in the cost of the flight, and c) individuals who did not read any description of an additional carbon fee and for whom this \$14.00 fee was not even applied to the cost of the flight. Ancillary results with a third flight pair item (in which flight pairs were less similarly priced) suggests that this effect may be attenuated when the price disparity between flights is larger.

The findings of Study 1 are intriguing but rather preliminary. One important question which cannot be addressed in Study 1 is whether the success of the Upstream Offset condition in eliciting pro-environmental flight choice preference is due to the brief description which

preceded our dependent measures or due to the attribute framing of the carbon fee within the dependent measures themselves; the six experimental conditions which included a brief description describing the additional carbon fee at varying frames and streams *also* included a description of the carbon fee within the descriptions of the flights themselves (e.g., in the Upstream Offset condition, participants were asked to choose between a “Flight A to the Island of Tortola for \$625.25 OR Flight B to the Island of Anegada for \$605.25 *plus an additional \$14.00 carbon offset on aviation fuel production and importation*”). Given the practical problem of consumer engagement when purchasing flights (i.e., some consumers may not have the time nor desire to read even the briefest of descriptions), an important question becomes, is it necessary to have consumers first read a description describing a proposed carbon fee, or could the same effect be noted when a description of the fee has been integrated into the flight prices themselves?

With this in mind, Study 2 was designed to a) replicate the main findings of Study 1, and b) ascertain whether these effects could also be elicited in the absence of a brief description describing a proposed carbon emissions policy.

Study 2: Method

Participants

Participants were 280 residents of the United States (51% men; *M* age = 37.03 years [*SD* = 11.81]) who were recruited through Amazon.com’s Mechanical Turk website in exchange for a small payment, and who fully completed the measures described below. These procedures were administered and completed online, on SurveyMonkey.com. Participants had a median household income of \$40,000 - \$60,000 and 36% classified themselves as Democrats (21% as Republicans, 35% as Independents, 4% as “Other”, 4% as Libertarians, 1% as Green).

Experimental Manipulation: Proposed Carbon Regulatory Policies

After consenting to participate in the study, respondents were randomly assigned to one of six conditions.

Four conditions, the Upstream Offset, Downstream Tax, No-Information Control, and No-Fee Control conditions were identical to those included in Study 1. In addition, two new conditions were added to Study 2. In the “No-Policy Upstream Offset” and “No-Policy Downstream Tax” conditions, participants skipped the description of the proposed regulatory policy and went directly to the flight preference items, where they received the labels for the additional carbon fee.

Measure of Pro-Environmental Flight Preference

Immediately following the manipulation, participants in Study 2 underwent an identical procedure to those in Study 1, this time, with four additional flight pairs added and one previous flight pair removed. (Adding additional flight pairs allowed for greater confidence that the previously noted effects were not due to something idiosyncratic about the two flight pair choices included in the main analyses of Study 1). For each of the six flight pairs, participants were asked to imagine that they were planning a vacation, and presented with two similarly priced flights to little known vacation destinations (e.g., “Flight A to Isla Guambin” vs. “Flight B to Isla Melchor”); Flight B included an additional \$14.00 carbon fee which was either labelled as a, “\$14.00 carbon offset on aviation fuel production and importation” in the Upstream Offset and No-Policy Upstream Offset conditions or labelled as a, “14.00 carbon tax on airplane travel” in the Downstream Tax and No-Policy Downstream Tax conditions.

Again, in the “No-Information Control” condition, the \$14.00 carbon fee applied to Flight B was embedded into the price of Flight B with no additional information provided. In the

“No-Fee Control” condition, the \$14.00 carbon fee was not applied to Flight B. How likely participants would be to buy Flight B instead of Flight A on a 7-point scale (from "1- Definitely Not" to "7- Definitely") was the main dependent variable of interest. Five of the flight pairs differed slightly in price difference (in each case, the price of Flight B differed from that of Flight A by no more than +/- \$6), and a sixth flight pair differed more dramatically in price difference (Flight B was \$10 more expensive than Flight A after a carbon fee had been applied).

Finally, participants in all six conditions provided demographic information (e.g., age, sex, income).

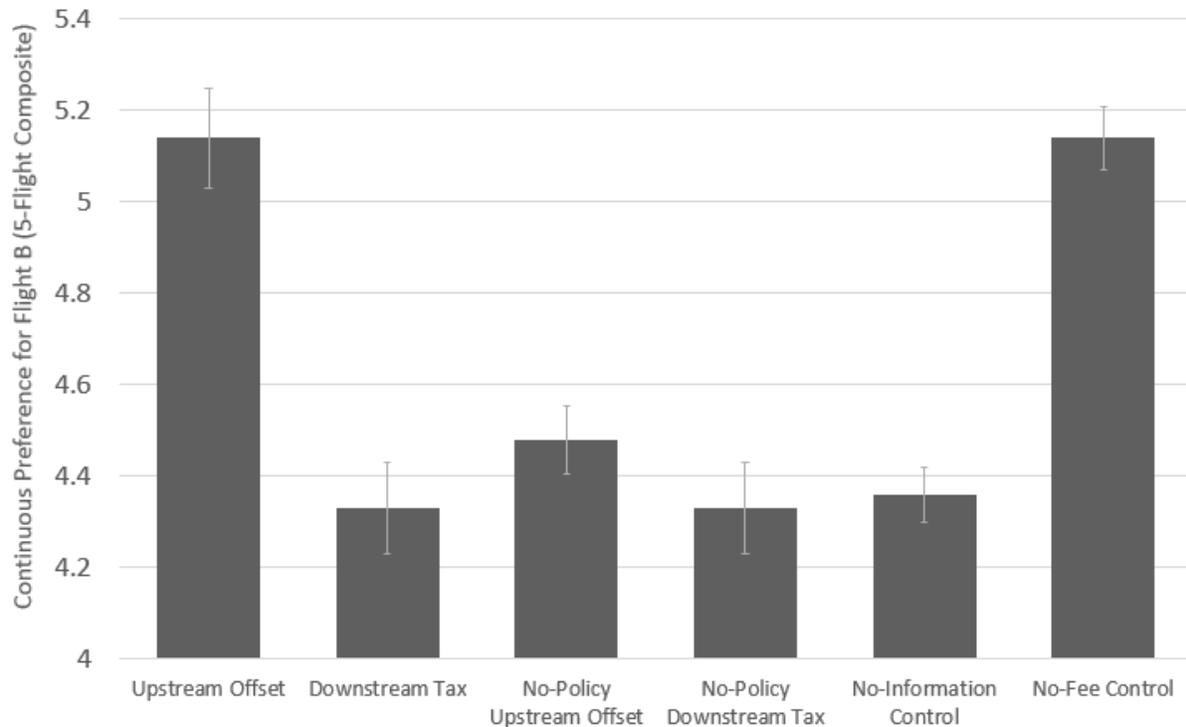
Study 2: Results

Consistent results were found across the five similarly priced flight pair items (in which Flight B differed from that of Flight A by no more than +/- \$6) so we collapsed across these five flight pairs in our analyses and figures; this composite continuous flight preference served as our main dependent variable of interest. The sixth flight pair (in which Flight B was \$10.00 more expensive than Flight A) was analysed separately due to a lack of variability on our continuous and binary flight preference items (e.g., only 19% of participants indicated a preference for Flight B over Flight A when the carbon fee was applied). This was likely due to the more pronounced price difference between Flight B and Flight A in this particular flight pair choice.

As in Study 1, to test whether experimental condition affected pro-environmental flight preferences (i.e., preference for flights which included a carbon fee), we conducted an ANOVA on continuous preference for Flight B (collapsed across all five similarly priced flight pair choices), with condition as the independent variable. Results revealed a significant main effect of the experimental condition, $F(5,274) = 5.04$, $\eta^2 = 0.96$, $p < .001$. Figure 2 shows that the Upstream Offset condition, again, appears to be most effective at eliciting pro-environmental

flight preferences. However, to examine the significance of this effect versus other conditions, we conducted a series of independent samples T-tests.

Figure 2. Mean preference for flights carrying a \$14.00 carbon fee within each condition in Study 2.



Preference for flights carrying a \$14.00 carbon fee in the Upstream Offset condition was significantly greater when compared to the Downstream Tax condition, $t(70) = 2.63$, $d = 0.62$, $p = .01$, No-Policy Upstream Offset condition, $t(89) = 2.57$, $d = 0.56$, $p = .01$, and No-Policy Downstream Tax condition, $t(78) = 2.66$, $d = 0.61$, $p = .01$. This preference in the Upstream Offset condition was also significantly greater when compared to the No-Information Control condition in which participants did not read about a proposed regulatory policy and no information was given regarding the carbon fee, $t(79) = 3.35$, $d = 0.77$, $p = .001$. Finally, individuals in the Upstream Offset condition were no less likely to prefer flights carrying a

carbon fee when compared to the No-Fee Control condition in which the \$14.00 carbon fee was not even applied, $t(82) = 0.52$, $d = 0.01$, $p = .96$.

In contrast, preference for flights carrying a \$14.00 carbon fee in the No-Policy Upstream Offset was no different when compared to the No-Policy Downstream Tax condition, Downstream Tax condition, and the No-Information Control condition (all t 's < 0.68 , all d 's < 0.13 , all p 's $> .50$), and significantly lower when compared to the No-Fee Control condition, $t(111) = -3.19$, $d = 0.61$, $p = .002$.

Looking separately at the sixth flight pair choice (in which there was a more pronounced, \$10 price difference between Flight B and Flight A after the carbon fee was applied), we conducted a separate ANOVA with condition as the independent variable. Results revealed a significant main effect of experimental condition, $F(5,277) = 4.90$, $\eta^2 = 0.96$, $p < .001$. We conducted an additional series of independent samples T-tests to examine whether the Upstream Offset condition was more effective than other experimental conditions at eliciting pro-environmental flight preferences; however, none of these tests were significant (all p 's $> .21$).

Study 2: Discussion

In corroboration with Study 1, these findings suggest that reading a brief description (119 words in length) summarizing a proposed regulation for a carbon fee described as a “carbon offset on aviation fuel production and importation” consistently increases a preference to purchase flights carrying a \$14.00 carbon fee (versus similarly priced flights with no carbon fee). Results from Study 2 also extend the main findings from Study 1, suggesting that the brief description which precedes flight pair choices is integral to eliciting this behavioral change. Ancillary results with an additional flight pair item (in which flight pairs were less similarly

priced) provides further evidence that this effect may be attenuated when the price disparity between the choices is larger.

One interpretation of the main results is that the more information consumers have about a particular pro-environmental policy, the more likely they will be to make pro-environmental flight choices, regardless of how any carbon fee described in the policy is worded. This explanation cannot be ruled out by the results of Study 2 because—though care was taken to make both descriptions nearly identical in length and content (while still being real-world valid)—there was a (potentially nontrivial) difference in length between the Upstream Offset description (119 words) and the Downstream Tax description (96 words). With this in mind, Study 3 sought—not only to replicate the main findings of Studies 1 and 2 on a considerably larger sample—but to further refine the wording of the Downstream Tax regulatory policy description. Specifically, an additional, content-matched sentence was added to the Downstream Tax regulatory policy description that made it identical in length to the Upstream Offset description (see Online Supplemental Materials).

In addition, the larger sample of participants included in Study 3 allowed us to examine whether noted effects meaningfully differed among Republicans, Independents, and Democrats.

Study 3: Method

Participants

Participants were 401 residents of the United States (52% women; M age = 39.00 years [$SD = 12.79$]) who were recruited through Amazon.com's Mechanical Turk website in exchange for a small payment, and who fully completed the measures described below. These procedures were administered and completed online, on SurveyMonkey.com. Participants had a median

household income of \$40,000 - \$60,000 and 45% classified themselves as Democrats (20% as Republicans, 30% as Independents, 2% as “Other”, 2% as Libertarians, 1% as Green).

Experimental Manipulation: Proposed Carbon Regulatory Policies

After consenting to participate in the study, respondents were randomly assigned to one of four conditions.

Three conditions, the Upstream Offset, No-Information Control, and No-Fee Control conditions were identical to those included in Studies 1 and 2. In Study 3, the Downstream Tax condition was nearly identical to that included in Studies 1 and 2, however, the regulatory policy description was slightly modified to provide more experimental control. Specifically, an additional sentence was added to the Downstream Tax regulatory policy description to ensure that—other than “frame” and “stream”—it was nearly identical in content and exactly identical in length (119 words) to that of the Upstream Offset regulatory policy description.

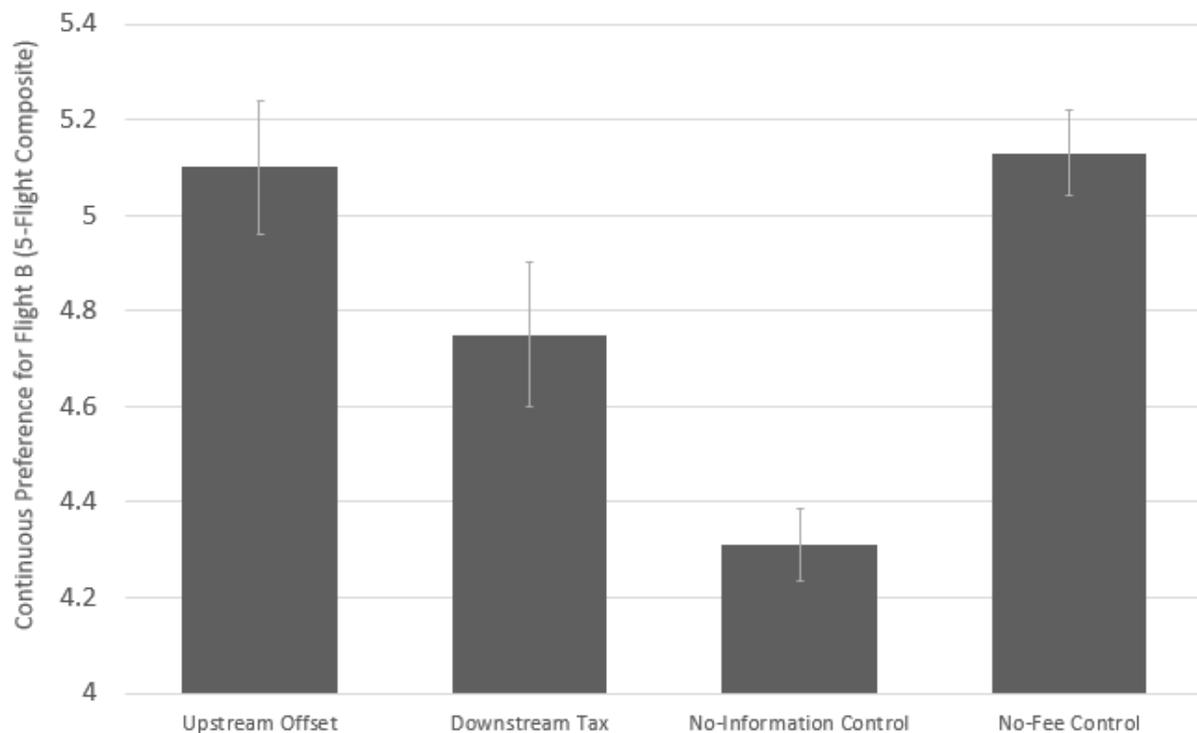
Measure of Pro-Environmental Flight Preference

Immediately following the manipulation, participants in Study 3 underwent an identical procedure to those in Study 2 (except one previous flight pair choice—in which Flight B was \$10 more expensive after the carbon fee was applied—was removed). How likely participants would be to buy Flight B instead of Flight A on a 7-point scale (from "1- Definitely Not" to "7- Definitely") collapsed across five flight pair items served as our main dependent variable of interest. This dependant variable was identical to that used in our main analyses of Study 2. Participants in all four conditions also provided demographic information (e.g., age, sex, income, political orientation).

Study 3: Results

To test whether experimental condition affected pro-environmental flight preferences (i.e., preference for flights which included a carbon fee), we conducted an ANOVA on continuous preference for Flight B (collapsed across all flight pair choices), with condition as the independent variable. Results revealed a significant main effect of the experimental condition, $F(3,397) = 10.60$, $\eta^2 = 0.99$, $p < .001$. Figure 3A shows that the Upstream Offset condition appears to be most effective at eliciting pro-environmental flight preferences. However, to examine the significance of this effect versus other conditions, we conducted a series of independent samples T-tests.

Figure 3A. Mean preference for flights carrying a \$14.00 carbon fee within each condition in Study 3.



Preference for flights carrying a \$14.00 carbon fee in the Upstream Offset condition was marginally greater when compared to the Downstream Tax condition, $t(191) = 1.73$, $d = 0.25$, $p = .09$ and significantly greater when compared to the No-Information Control condition, $t(189) = 4.92$, $d = 0.72$, $p < .001$. Finally, individuals in the Upstream Offset condition were no less likely to prefer flights carrying a carbon fee when compared to the No-Fee Control condition in which the \$14.00 carbon fee was not even applied, $t(219) = -0.19$, $d = 0.03$, $p = .85$.

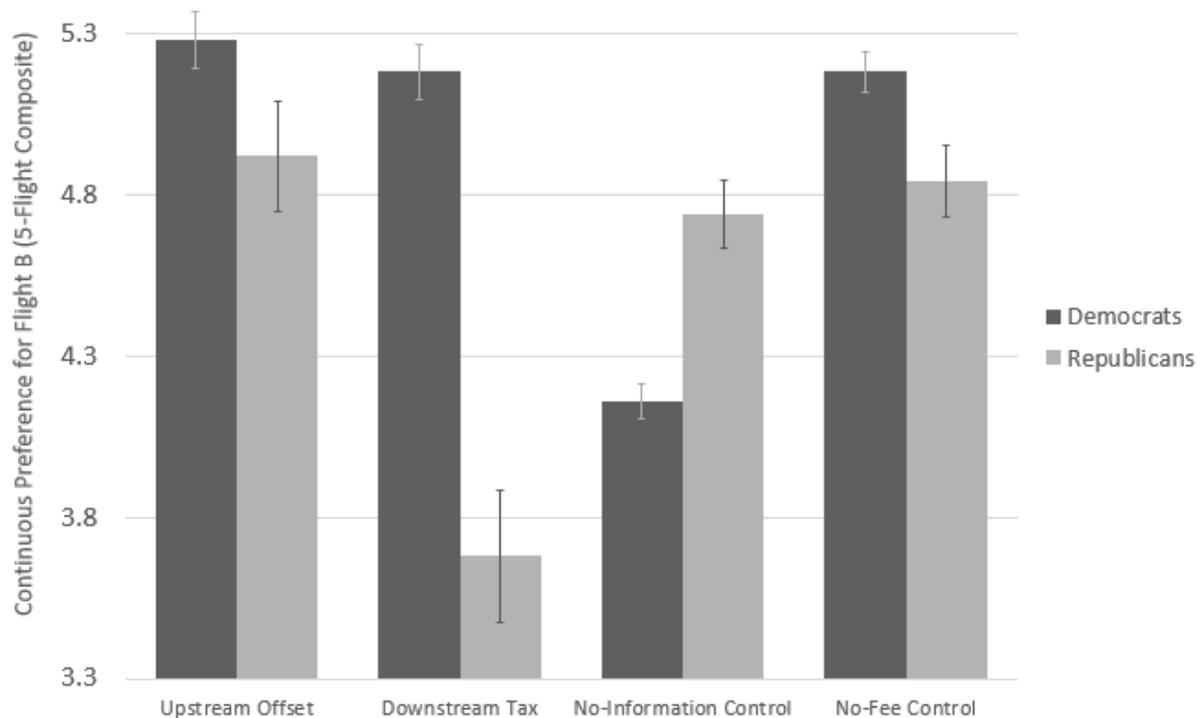
Preference for flights carrying a \$14.00 carbon fee in the Downstream Tax condition was significantly greater when compared to the No-Information Control condition, $t(178) = 2.56$, $d = 0.38$, $p = .01$. Preference for these flights was significantly weaker when compared to the No-Fee Control condition in which the \$14.00 carbon fee was not even applied, $t(208) = -2.28$, $d = 0.32$, $p = .02$. These results suggest that the Downstream Tax policy description (which differed slightly from that of Study 2) was somewhat effective at eliciting preference for pro-environmental flight choices, at least when compared to not giving any description at all. However, unlike the Upstream Offset policy description, the Downstream Tax policy was less effective when compared to a condition in which the \$14.00 carbon fee was not applied.

The relatively larger sample size of Study 3 allowed for potentially meaningful comparisons between Democrats ($n = 182$) and Republicans ($n = 81$) in the noted pattern of effects.⁴ First, we conducted a 4 (Experimental Condition) x 2 (Political Party Affiliation) ANOVA on preference for flights carrying a \$14.00 carbon fee and found a significant interaction between experimental condition and political party affiliation, $F(3,255) = 6.91$, $\eta^2 = 0.98$, $p < .001$. Next, two ANOVAs were conducted separately for Democrats and Republicans

⁴ Our sample also included a number of participants who identified as “Independents” ($n = 119$). Results pertaining to this political party affiliation are not discussed in detail but, in general, pro-environmental flight preference for this group fell between that of Republicans and Democrats regardless of regulatory policy condition.

with condition as the independent variable and significant main effects were found in both political groups; $F(3,178) = 12.44$, $\eta^2 = 0.99$, $p < .001$ and $F(3,77) = 3.08$, $\eta^2 = 0.91$, $p = .03$, for Democrats and Republicans respectively. Figures 3B and 3C show that the Upstream Offset condition appears to be most effective at eliciting pro-environmental flight preferences among both Democrats and Republicans. However, to examine the significance of these effects versus other conditions, we conducted a series of independent samples T-tests.

Figure 3B. Mean preference for flights carrying a \$14.00 carbon fee within each condition among Democrats and Republicans in Study 3 separately.

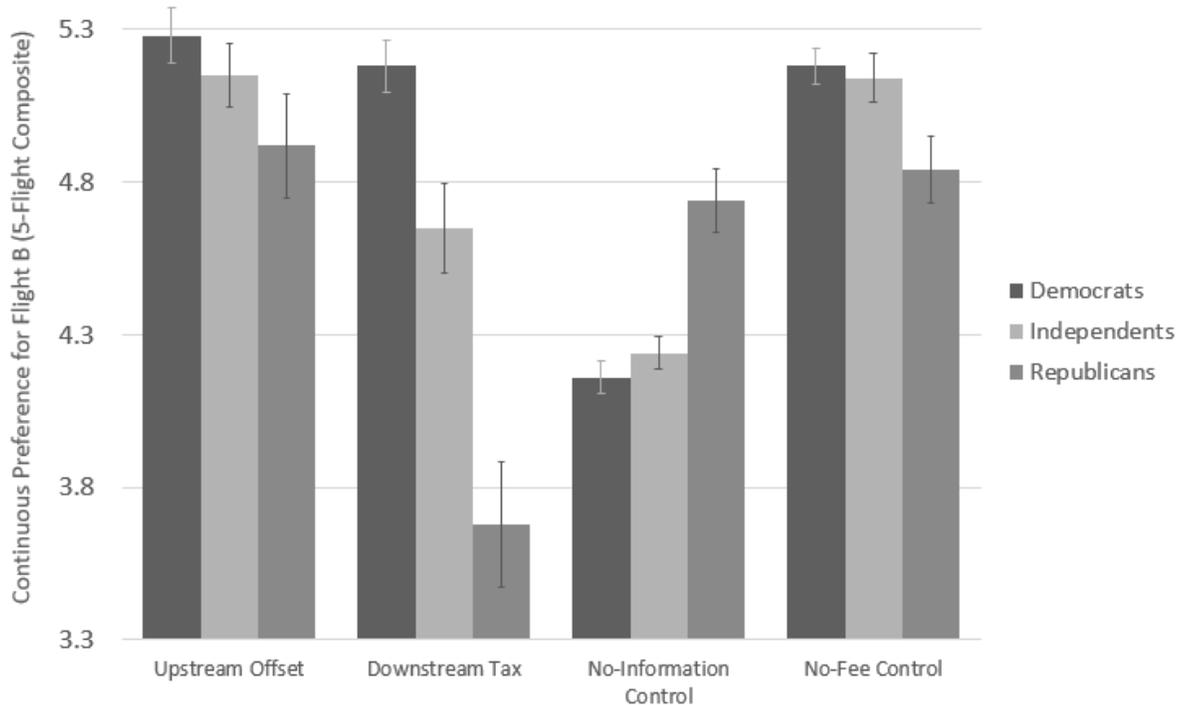


Among Democrats, preference for flights carrying a \$14.00 carbon fee in the Upstream Offset condition was no different when compared to the Downstream Tax condition, $t(81) = 0.44$, $d = 0.09$, $p = .66$, significantly greater when compared to the No-Information Control condition, $t(80) = 5.44$, $d = 1.21$, $p < .001$ and no different when compared to the No-Fee Control

condition, $t(97) = 0.52$, $d = 0.10$, $p = .61$. Among Republicans, this preference in the Upstream Offset condition was significantly greater when compared to the Downstream Tax condition, $t(41) = 2.31$, $d = 0.74$, $p = .03$, and no different when compared to the No-Information Control condition, $t(41) = 0.38$, $d = 0.13$, $p = .70$ and No-Fee Control condition, $t(45) = 0.18$, $d = 0.06$, $p = .86$, respectively.

Additional t-tests suggest that in the Upstream Offset condition, preference for flights carrying a \$14.00 carbon fee did not differ between Democrats and Republicans, $t(65) = 1.05$, $d = 0.26$, $p = .30$. However, in the Downstream Tax condition, Republicans showed distinctly lower preference for flights carrying a \$14.00 carbon fee than Democrats, $t(57) = 4.03$, $d = 1.19$, $p < .001$.

Figure 3C. Mean preference for flights carrying a \$14.00 carbon fee within each condition among Democrats, Independents, and Republicans in Study 3 separately.



Study 3: Discussion

The primary results of Study 3 are consistent with those of Studies 1 and 2. Individuals who had read a brief description (119 words in length) summarizing a proposed regulation for a carbon fee described as a “carbon offset on aviation fuel production and importation” reported a greater preference to purchase flights carrying a \$14.00 carbon fee (versus similarly priced flights with no carbon fee) than individuals who read another brief description (which was identical in length) describing the carbon fee as a “carbon tax on airplane travel”.

The “Upstream Offset” policy wording was also more effective at eliciting pro-environmental flight choices than not reading any description of an additional carbon fee embedded into the cost of a flight. Though weaker than the “Upstream Offset” policy wording, the “Downstream Tax” wording was at least more effective than not reading any description of an added carbon fee at all. Finally, preference to purchase flights carrying a \$14.00 carbon offset on aviation fuel production and importation was no different than preference to purchase these *same* flights at \$14.00 cheaper. This overall pattern of results was largely consistent among both Democrats and Republicans; however, Republicans may be less inclined to make pro-environmental flight choices after reading a brief description describing a proposed carbon tax on airplane travel.

An important caveat on this research is that the “upstream offset” frame was only effective if consumers read a short description of the policy and it is not clear whether one specific part of the description was critical, or if it was a more general understanding and engagement with the content. Study 4 was conducted to shed light on which parts of the policy description are critical and to see whether similar effects could be elicited using a much shorter policy description.

Study 4: Method

Participants

Participants were 385 residents of the United States (50% women; M age = 38.77 years [$SD = 11.96$]) who were recruited through Amazon.com's Mechanical Turk website in exchange for a small payment, and who fully completed the measures described below. These procedures were administered and completed online, on SurveyMonkey.com. Participants had a median household income of \$40,000 - \$60,000 and 41% classified themselves as Democrats (26% as Republicans, 26% as Independents, 3% as "Other", 4% as Libertarians, 1% as Green).

Experimental Manipulation: Proposed Carbon Regulatory Policies

After consenting to participate in the study, respondents were randomly assigned to one of four conditions.

Three conditions, the Upstream Offset, No-Information Control, and No-Fee Control conditions were identical to those included in Studies 1, 2, and 3. In Study 4, a fourth condition was added; in the "Shorter Upstream Offset" condition, the Upstream Offset regulatory policy description was shortened dramatically, from 119 words to 28 words. Specifically, several ostensibly superfluous sentences were removed from the Upstream Offset regulatory policy description, with only the two sentences retained that made the "frame" and "stream" clear to participants. (See Online Supplemental Materials for exact wording).

Measure of Pro-Environmental Flight Preference

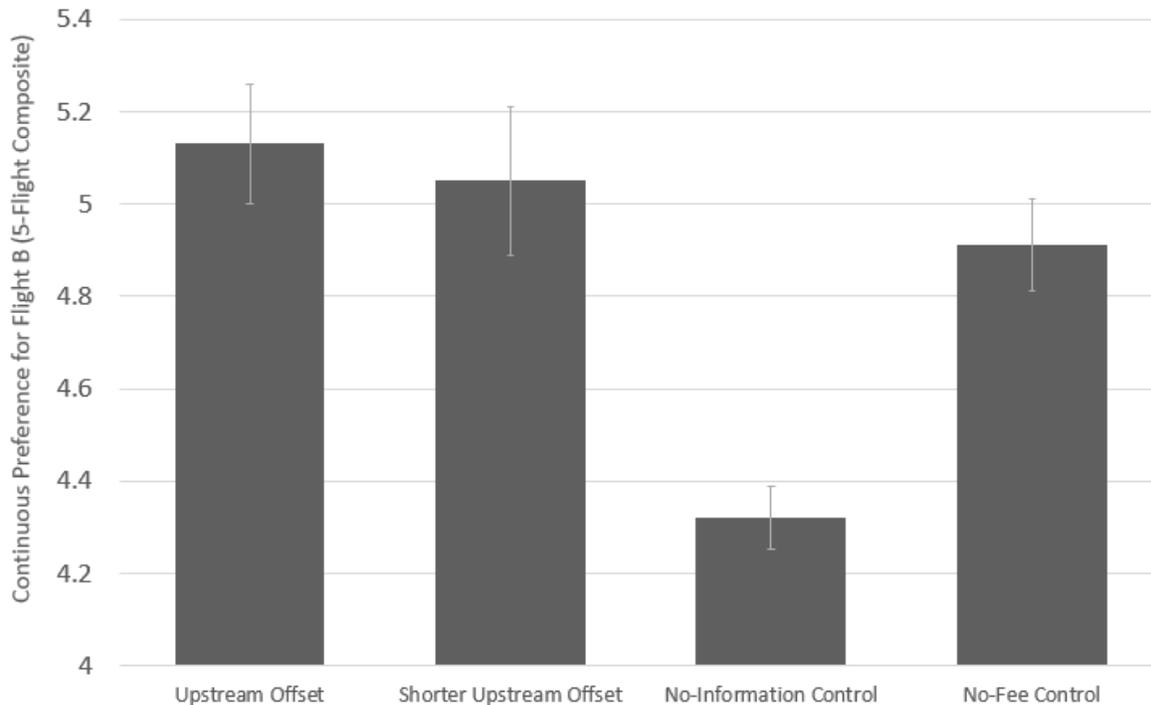
Immediately following the manipulation, participants in Study 4 underwent an identical procedure to those in Study 3. How likely participants would be to buy Flight B instead of Flight A on a 7-point scale (from "1- Definitely Not" to "7- Definitely") collapsed across five flight pair items again served as our main dependent variable of interest. This dependant variable was

identical to that used in our main analyses of Study 3. Participants in all four conditions also provided demographic information (e.g., age, sex, income, political orientation).

Study 4: Results

To test whether experimental condition affected pro-environmental flight preferences (i.e., preference for flights which included a carbon fee), we conducted an ANOVA on continuous preference for Flight B (collapsed across all flight pair choices), with condition as the independent variable. Results revealed a significant main effect of the experimental condition, $F(3,381) = 10.08$, $\eta^2 = 0.99$, $p < .001$. Figure 4 shows that the Upstream Offset condition appears to be most effective at eliciting pro-environmental flight preferences, followed closely by the Shorter Upstream Offset condition. To examine the significance of this effect versus other conditions, we conducted a series of independent samples T-tests.

Figure 4. Mean preference for flights carrying a \$14.00 carbon fee within each condition in Study 4.



Preference for flights carrying a \$14.00 carbon fee in the Shorter Upstream Offset condition was not statistically different when compared to the Upstream Offset condition, $t(191) = 0.38$, $d = 0.06$, $p = .70$. Further individuals in the Shorter Upstream Offset condition were more likely to prefer flights carrying a carbon fee when compared to the No-Information Control condition, $t(178) = 4.56$, $d = 0.69$, $p < .001$ and no less likely to prefer flights carrying a carbon fee when compared to the No-Fee Control condition in which the \$14.00 carbon fee was not even applied, $t(170) = 0.73$, $d = 0.11$, $p = .47$.

Study 4: Discussion

The primary results of Study 4 are consistent with those of Studies 1, 2, and 3 while adding an important additional nuance. Compared to individuals who had a read a brief description (119 words in length)—individuals who had read an even briefer description (28 words in length) summarizing a proposed regulation for a carbon fee described as a “carbon offset on aviation fuel production and importation” reported a similar preference to purchase

flights carrying a \$14.00 carbon fee (versus similarly priced flights with no carbon fee). The shorter upstream offset policy wording was also more effective at eliciting pro-environmental flight choices than not reading any description of an additional carbon fee embedded into the cost of a flight. Finally, preference to purchase flights carrying a \$14.00 carbon offset on aviation fuel production and importation in the shorter upstream offset condition was no different than preference to purchase these *same* flights at \$14.00 cheaper.

The results of Study 4 are intriguing and important. However, it is not clear whether other shorter policy descriptions (e.g., Downstream Offset) would also be effective at eliciting pro-environmental behavioral change. Study 5 was conducted to test whether similar effects could be elicited using a much shorter Downstream Offset, Downstream Tax, and Upstream Tax policy descriptions.

Study 5: Method

Participants

Participants were 585 residents of the United States (60% men; *M* age = 34.82 years [*SD* = 11.29]) who were recruited through Amazon.com's Mechanical Turk website in exchange for a small payment, and who fully completed the measures described below. These procedures were administered and completed online, on SurveyMonkey.com. Participants had a median household income of \$40,000 - \$60,000 and 41% classified themselves as Democrats, 19% as Republicans, 32% as Independents, 2% as "Other", <1% as Green.

Experimental Manipulation: Proposed Carbon Regulatory Policies

After consenting to participate in the study, respondents were randomly assigned to one of six conditions: upstream tax, upstream offset, downstream tax, downstream offset, no-fee control, or no-information control.

In Study 5, all of the policy descriptions were extremely brief (between 35 and 38 words) and, other than varying the stream and frame of the proposed carbon fee, the content of the regulatory policy in each of the four carbon-fee labelling conditions was identical. (See Online Supplemental Materials). The No-Information Control, and No-Fee Control conditions were identical to those included in previous studies: Participants in these conditions were not asked to read a proposed regulatory policy at all and instead directly moved on to the dependent measures described below.

Measure of Pro-Environmental Flight Preference

Immediately following the manipulation, participants in Study 5 underwent nearly identical procedures to those in Studies 3 and 4.⁵ How likely participants would be to buy Flight B instead of Flight A on a 7-point scale (from "1- Definitely Not" to "7- Definitely") collapsed across five flight pair items again served as our main dependent variable of interest. This dependant variable was used in our main analyses of Study 5. Participants in all six conditions also provided demographic information (e.g., age, sex, income, political orientation).

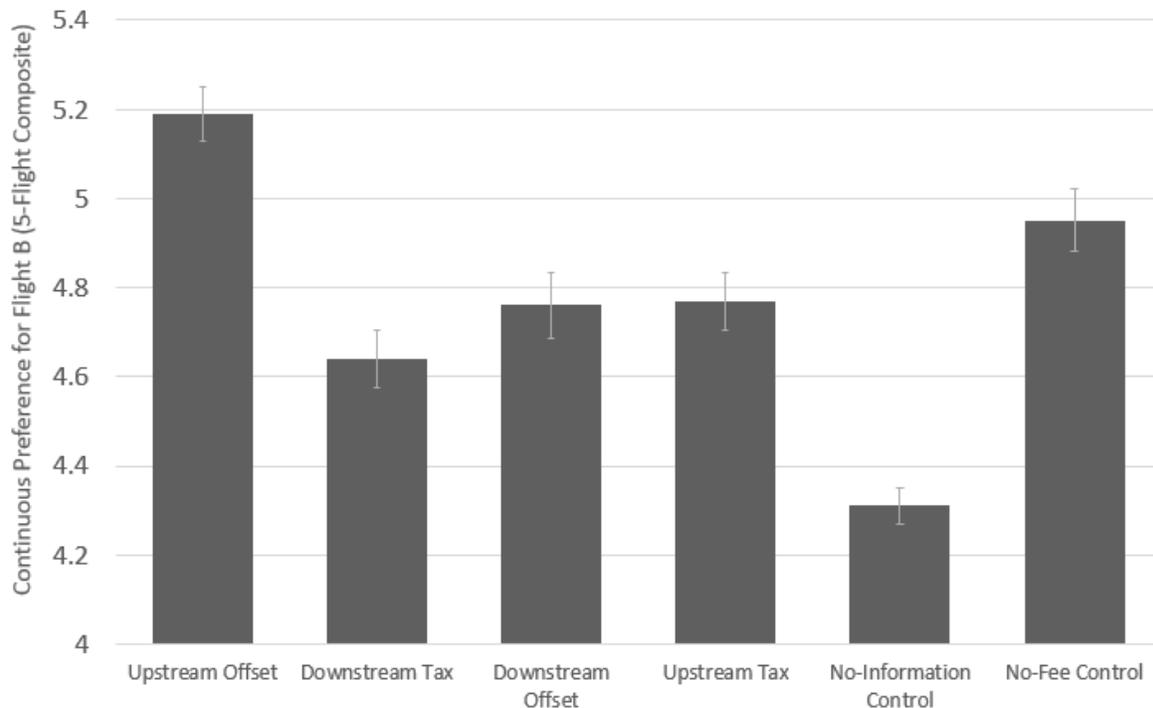
Study 5: Results

To test whether experimental condition affected pro-environmental flight preferences (i.e., preference for flights which included a carbon fee), we conducted an ANOVA on continuous preference for Flight B (collapsed across all flight pair choices), with condition as the independent variable. Results revealed a significant main effect of the experimental condition, $F(5,582) = 6.07$, $\eta^2 = 0.05$, $p < .001$. Figure 5 shows that the shorter Upstream Offset condition

⁵ Procedures were identical except for one minor change: In the downstream conditions of Study 5, the \$14.00 fee was applied to "airplane travel *and cargo*" rather than just "airplane travel." We made this change to ensure for a more controlled comparison between the upstream and downstream conditions in terms of both length and content.

appears to be most effective at eliciting pro-environmental flight preferences when compared to shorter versions of the Upstream Tax, Downstream Offset, Downstream Tax conditions, as well as the two control conditions. To examine the significance of this effect versus other conditions, we conducted a series of independent samples T-tests.

Figure 5. Mean preference for flights carrying a \$14.00 carbon fee within each condition in Study 5.



Preference for flights carrying a \$14.00 carbon fee in the Upstream Offset condition was significantly greater when compared to the Downstream Tax condition, $t(206) = 3.03$, $d = 0.42$, $p < .01$, the Downstream Offset condition, $t(205) = 2.24$, $d = 0.31$, $p = .026$, the Upstream Tax condition, $t(191) = 2.29$, $d = 0.33$, $p = .023$, and the No-Information Control condition, $t(199) = 6.01$, $d = 0.85$, $p < .001$. Further, individuals in the Upstream Offset condition were marginally *more* likely to prefer flights carrying a carbon offset on aviation fuel production an importation when compared to the No-Fee Control condition in which the \$14.00 carbon fee was not even applied, $t(197) = 1.54$, $d = 0.21$, $p = .13$.

Study 5: Discussion

Even when comparing much briefer policy descriptions, the primary results of Study 5 are consistent with those of previous studies. Individuals who had read an extremely brief description (38 words in length) of a proposed regulation for a carbon fee described as a “carbon offset on aviation fuel production and importation” consistently reported a greater preference to purchase flights carrying a \$14.00 carbon fee (versus similarly priced flights with no carbon fee) than, a) individuals who read other brief descriptions (35-37 words in length) describing the carbon fee under different frames (i.e., “carbon tax”) and/or at a different stream (i.e., “on airplane travel and cargo”), b) individuals who did not read any description of an additional carbon fee and for whom this \$14.00 fee was embedded in the cost of the flight, and c) individuals who did not read any description of an additional carbon fee and for whom this \$14.00 fee was not even applied to the cost of the flight (this latter preference was marginally greater).

A major limitation thus far has been our reliance on American participants. An important question thus remains: would these results hold in other English-speaking countries? Study 6 was conducted to test whether the effects noted in Study 5 could also be elicited among residents of India.

Study 6: Method

Participants

Participants were 235 residents of India (77% men; M age = 31.70 years [SD = 8.67]) who were recruited through Amazon.com’s Mechanical Turk website in exchange for a small payment, and who fully completed the measures described below.⁶ These procedures were

⁶ 155 additional participants were excluded from analyses after demonstrating a lack of proficiency with the English language. Specifically, these participants responded incorrectly to at least one of two language competency questions administered at the outset of the study. (See Online Supplemental Materials).

administered and completed online, on SurveyMonkey.com. Participants had a median household income of 400,000 - 500,000 Indian Rupees (roughly equivalent to \$6,173 - \$7,716 USD).

Experimental Manipulation: Proposed Carbon Regulatory Policies

After consenting to participate in the study, respondents were randomly assigned to one of six conditions: In Study 6, all conditions—the upstream tax, upstream offset, downstream tax, downstream offset, no-fee control, and no-information control conditions—were identical to those in Study 5.

Measure of Pro-Environmental Flight Preference

Immediately following the manipulation, participants in Study 6 underwent a nearly identical procedure to those in Study 5.⁷ (See Online Supplemental Materials). How likely participants would be to buy Flight B instead of Flight A on a 7-point scale (from "1- Definitely Not" to "7- Definitely") collapsed across five flight pair items again served as our dependent variable of interest. Participants in all six conditions also provided demographic information (e.g., age, sex, income).

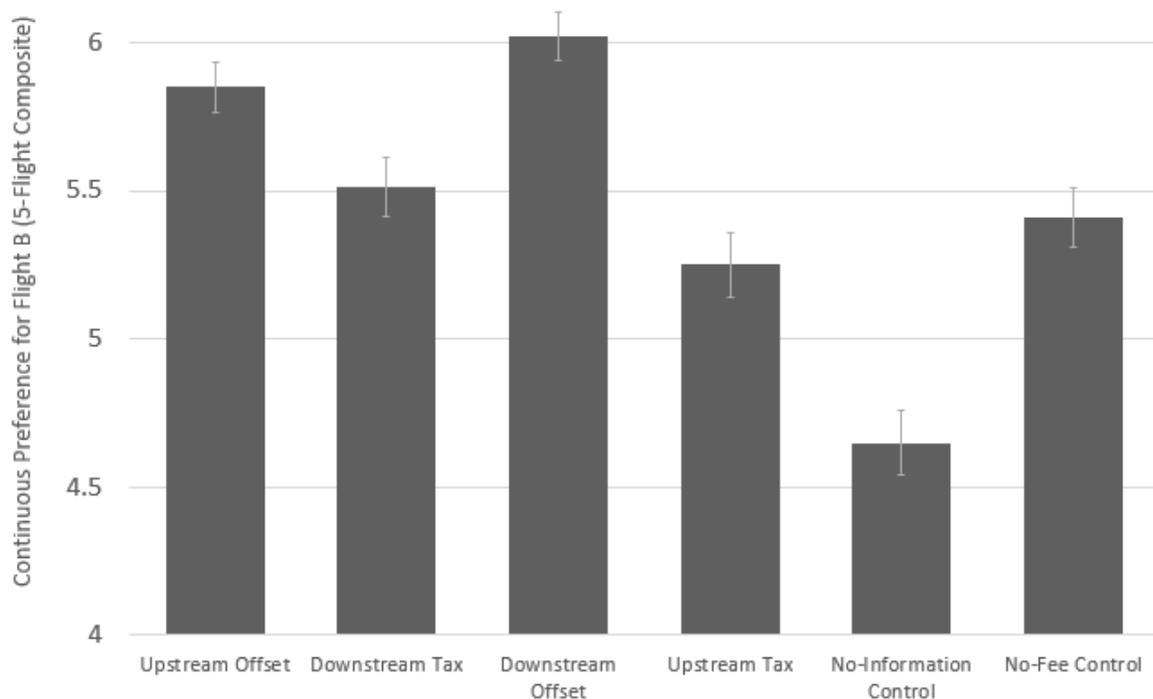
Study 6: Results

To test whether experimental condition affected pro-environmental flight preferences (i.e., preference for flights which included a carbon fee), we conducted an ANOVA on continuous preference for Flight B (collapsed across all flight pair choices), with condition as the independent variable. Results revealed a significant main effect of the experimental condition, $F(5,232) = 5.53, \eta^2 = 0.11, p < .001$. Figure 6 shows that the Downstream Offset condition

⁷ Procedures were identical to those of Study 5 except flight and carbon fee prices were converted from U.S. dollars into Indian Rupees at a rate of 17 rupees to 1 U.S. dollar. This conversion rate was based upon data suggesting that 17 rupees in India (on average) has an equivalent purchasing power to \$1 USD in the US (<https://data.oecd.org/conversion/purchasing-power-parities-ppp.htm>).

appears to be most effective at eliciting pro-environmental flight preferences among Indian participants, followed closely by the Upstream Offset condition. To examine the significance of this effect versus other conditions, we conducted a series of independent samples T-tests.

Figure 6. Mean preference for flights carrying a 238 Indian Rupee (\$14.00 USD) carbon fee within each condition in Study 6.



Preference for flights carrying a 238 Indian Rupee (\$14.00 USD) carbon fee in the Downstream Offset condition was not statistically different when compared to the Upstream Offset condition, $t(91) = 0.73$, $d = -0.17$, $p = .47$. Further, individuals in the Upstream Offset condition were more likely to prefer flights carrying a carbon fee when compared to the Upstream Tax condition, $t(79) = 2.22$, $d = 0.51$, $p = .03$, and the No-Information Control

condition, $t(72) = 4.36$, $d = 1.07$, $p < .001$; they did not differ when compared to the Downstream Tax condition, $t(86) = 1.36$, $d = 0.29$, $p = .18$. Finally, individuals in the Upstream Offset condition were marginally *more* likely to prefer flights carrying a carbon fee when compared to the No-Fee Control condition in which the 238 Indian Rupee (\$14.00 USD) carbon fee was not even applied, $t(88) = 1.72$, $d = 0.36$, $p = .09$.

Study 6: Discussion

Indian individuals who had read an extremely brief description (38 words in length) of a proposed regulation for a carbon fee described as a “carbon offset on aviation fuel production and importation” consistently reported a relatively strong preference to purchase flights carrying a 238 Indian Rupee (\$14.00 USD) carbon fee (versus similarly priced flights with no carbon fee). Among Indians, this pro-environmental flight preference in the Upstream Offset condition was equal to that of the Downstream Offset and Downstream Tax conditions, but was greater when compared to the Upstream Tax condition and the No-Information control condition where the 238 Indian Rupee (\$14.00 USD) carbon fee was embedded in the cost of the flight. Finally, replicating results from American participants, this pro-environmental flight preference in the Upstream Offset condition was marginally greater when compared to individuals who did not read any description of an additional carbon fee and for whom this 238 Indian Rupee (\$14.00 USD) fee was not even applied to the cost of the flight.

The relative success of the Downstream Offset and Downstream Tax conditions is a difference relative to the US studies to be explored in future research. However, the primary results of Study 6 are largely consistent with those of previous studies among American participant. These results from Indian respondents suggest that “Upstream Offset” carbon fee

labels may inspire pro-environmental flight preferences, and may do so in English-speaking countries outside of the United States.

General Discussion

Across six studies, consumers were consistently more likely to choose a flight with a carbon price when the additional price was described as a "carbon offset for aviation fuel production and import" than when it was described using other frames, such as a "carbon tax for airplane travel". Notably, this *upstream offset* frame was popular enough among consumers that it counteracted the expected preference to avoid the \$14 additional cost of the fee.

The description of the point of regulation (upstream vs downstream) does seem to have a notable impact on consumer preferences. A "downstream" carbon offset was not nearly as popular as an "upstream" carbon offset (e.g., Study 1). Why? It could be that the upstream offset, by being placed on the production & importation of fossil fuels, makes the consumer feel that they can still go ahead and enjoy their flight without feeling that flying is sinful, while the downstream offset/tax conditions makes them feel guilty for something they have already decided to do. The implications for policy are somewhat nuanced. Countries or states that wish to enact a carbon fee may want to use the "upstream offset" frame, especially if competing with other countries without a carbon fee. Our results suggest that consumers may in fact prefer airline flights with an upstream carbon offset; this preference may be strong enough to counteract any additional cost to the country or state that implements it; and the implementing country could potentially realize further benefits if the offset investment helps finance sustainable low-carbon development in that country. Furthermore, aviation consumers might be more accepting of "upstream offset" regulation than "downstream tax" regulation. In fact, our findings suggest that customers may be more willing to purchase tickets that include appropriately described

carbon offsets, even if the cost is higher; these descriptions may still be effective even when they are as short as 28 words in length (Study 4).

These findings have policy implications for the new market-based measure adopted for the international civil aviation sector, which has an offsetting program as a central feature, with a relatively upstream point of obligation at the level of airlines. Our research suggests that airlines might wish to highlight their carbon offset purchases for their customers in order to increase customer receptivity. Our findings also suggest that participation in CORSIA could thus bring overall economic benefits rather than costs for participating airlines and that countries may thus benefit from opting-in to the initial voluntary phase. Future research could further examine if customer preferences vary with the type of offset and how best to communicate about offsets to customers to elicit the most favorable response.

On the flip side, policy-makers need to consider carefully what goal they have in mind for emissions regulation. If the goal of emissions regulation is to limit emissions, a carefully vetted upstream offset program with strong offset quality requirements may be useful. If, however, the goal of a carbon fee is to reduce the demand for carbon intensive goods and services, a higher carbon fee may be needed compared to the overall cost of the goods and services. Otherwise, given positive consumer responses, neither the downstream tax nor the "upstream offset" frame may reduce demand for the carbon intensive activity, even as emissions are being reduced through the program in other ways.

Another important consideration is the observed difference between consumers from different political parties, seen in Study 3. While Republicans responded negatively to the "downstream tax" framing, Democrats did not, and Independents were somewhat in the middle, similar to the results of previous research (Hardisty, Johnson, & Weber, 2010). The current

results may to some extent reflect political contexts. A further important consideration is that the respondents were mostly residents of the U.S. Though similar results were noted among respondents in India (Study 6), the results may or may not generalize to consumers in non-English speaking countries and cultures.

Future research should explore *why* the "upstream offset" is desirable to consumers, examine up to what price point this is the case, and attempt to further refine what parts of the policy description are critical. Also, other product domains should be explored. In particular, consumer leisure air travel may be seen as a relatively discretionary expenditure and therefore an acceptable target for carbon regulation. However, other product domains such as business air travel, commuters' car travel, or home electricity may be less seen as less discretionary and consumers may therefore have greater concerns about carbon regulation in these domains. Finally, alternative points of regulation, such as "mid-stream" regulation (e.g., of factories or product distributors), could usefully be explored.

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