The (indirect) Effects of Windfall Funds on Sustainability Behavior: Insights for Carbon Fee Dividends

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ABSTRACT

Motivated by proposed Carbon Dividend legislation in the U.S., we test the impacts of a monetary windfall on sustainability behavior under information conditions about the source of the funds. We find that windfall funds, particularly when presented as a refund, positively impact stated intent to engage in transportation-related sustainable behaviors. Evidence suggests that participants are sensitive to compensation amounts, where a higher compensation amount led to a higher rate of sustainable behavior intention. We also find a small positive spillover effect from individuals who intend to spend the windfall on transportation-related activities and their stated future sustainable behavior, although results are driven by differences across participants' source of environmental motivation. Socio-demographics may partially explain this result. A connection to the environment, either through previous donations or employment, or a belief in human-induced climate change, produced higher declarations for pro-environmental behavior. Our results provide important insights into the indirect behavioral effects of a (carbon fee) dividend, and provide avenues for future research.

Keywords: Windfall effects, Behavioral spillover, Carbon Dividend Act

❧ INTRODUCTION ❧

Addressing global climate change continues to challenge decision-makers and citizens alike. The world must simultaneously move away from the current heavy reliance on carbon-based fuels and invest in energy innovations that meet energy demands. Increasingly, behavioral scientists have called for the levying of carbon taxation to internalize the myriad and extensive externalities associated with carbon use and emissions (Metcalf & Weisbach, 2009; Metcalf, 2009; Weitzman, 2014). This call has been echoed in congress where since 2020 alone, 15 carbon pricing bills have been introduced in the 116 and 117 congresses, and we expect more to be introduced in the future (Hafstead, 2021). One such initiative under consideration in the 116th United States Congress was H.R. 763 Energy Innovation and Carbon

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Dividend Act (2019–2020)[1]. This legislation proposed collecting increasing- over- time carbon emission fees on producers and importers of carbon-based fuels, as well as the creation of a Carbon Dividend Trust Fund. The purpose of the fund would be to reallocate collected fees to American residents who, importantly, *may spend it as they choose*. Some of the dividend may be used by citizens to offset the resulting increase in energy prices associated with carbon taxation (Kaufman et al., 2019). Analysis suggests that many households (60%+) will receive a larger dividend payment than their increased cost of energy from the tax (Horowitz et al., 2017). However, it remains an open question whether the reallocation, and spending, of such funds would support, or detract from efforts to pivot away from carbon fuels and towards energy conservation and/or innovation. This is a particularly timely question because while not every carbon tax bill introduced in congress contains a dividend, more than half do, which highlight the increased interest in a carbon tax and dividend approach (Hafstead, 2021).

The current study is motivated by this open question and broader inquiries from the literature regarding behavior from windfall funds and linked sustainability behaviors. The design of our current study allows us to investigate whether information on the source or amount of a 'windfall' impacts an individual's intent to engage in sustainable behaviors. Our results find that windfall funds, particularly when in the form of a refund, have a positive impact on stated intent to engage in pro-environmental behavior. Additionally, we find that not all sustainable behavior is treated equally; survey respondents indicated an intention to participate in pro-environmental behaviors related specifically to transportation (e.g., taking public transportation or riding their bike) when provided with information on the amount and source of windfall funds they may receive. These results suggest that a carbon fee and dividend policy may produce additional, indirect, carbon savings, mainly resulting from changes in transportation behavior. Importantly, our paper serves as a reminder that there is a lot we don't know about the indirect impacts of a carbon fee and dividend approach and provides insight into various avenues for future research.

❧ MONEY MATTERS ☙

"We have nothing to lose. We're playing with house money" - Eshaya Murphy

Extensive literature demonstrates that human behavior is malleable and context dependent (Kahneman & Tversky, 1979; Tversky & Simonson, 1993; Rabin, 1998; Kőszegi & Rabin, 2006). Research demonstrates this context dependency across numerous choice settings including health care (Halpern et al., 2020; Johnson et al., 2013), food choices (Savchenko et al., 2018; Thorndike et al., 2014, Thorndlike et al., 2017; Downs, Loewenstein & Wisdom, 2009; Hanks et al., 2012), finance (Thaler, 1990), charitable donations (Goff, Noblet and Anthony, 2021; Zarghamee et al., 2017; Goff et al., 2017) natural resource management (Noblet et al, 2015; Evans et al., 2017) and individual sustainability choices such as energy use (Noblet & McCoy, 2018; Theotokis & Manganari, 2015). A large body of literature examines the initial and sustained impacts of financial incentives and their variation in effectiveness across environmental domains (energy conservation, recycling, etc.). These studies find that consumers, as targets of financial incentives, often fail to take desired policy actions such as energy conservation (including during peak demand times) or investment in energy efficiency even

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1. For additional information on the language of this bill, visit: https://www.congress.gov/bill/116th-congress/house-bill/763.

when such actions would produce lowest cost long run outcomes (Maki et al., 2016; Mi et al., 2021; Sloot & Scheibehenne, 2022). Mechanisms suggested as explanations for these findings include consumers finding the financial incentives too small relative to the expense of energy to induce behavioral change, consumers may experience conflicts between own intrinsic motivation and the offered incentives, or prefer complementary financial and non-monetary interventions from trusted sources to achieve best results (Stern et al., 1986; Delmas, Fishlein & Asensio, 2013; Jessoe and Rapson, 2014; Mi et al., 2021). Researchers continue to call for additional work that examines the heterogeneity of response to incentives to ensure improved energy policies (Hann & Metcalfe, 2016).

A growing body of work indicates that people act quite differently depending on how money, including policy incentives such as the proposed reallocation of fees in the Carbon Dividend Trust Fund, has become entrusted to them. The phenomenon of 'playing with house money' appears to lead individuals to increase their willingness to engage in riskier behavior, including increased spending (Thaler, 1990; Arkes, et al., 1994). Interestingly, people's behavior is often less self-interested (i.e. more prosocial) when they have experienced a '*windfall*', or been endowed with funds they did not earn through labor or tasks (Thaler and Johnson, 1990; Carlsson, He & Martinsson, 2013). However, this effect has been challenged for public goods contributions (Clark, 2002) with interesting consequences on free-riding behavior (Harrison, 2007). When placed in the role of *trustee* of other people's money, individuals may make increased contributions to a public good, in comparison to own-money contributions (Makowsky, Orman & Peart, 2014). The prosocial impacts of the 'found money effect' also appear to extend to cooperation, where participants who *earned* an endowment were willing to contribute more and cooperate when their laboratory matched partner had the endowment *provided* to them (Spraggon & Oxoby, 2009), providing a further example of increased willingness to take risk, but act prosocially, with other people's money. Consistent with these prior findings, evidence also suggests that when individuals in laboratory experiments earned the endowment used during the experiment they perceived that other experiment participants who took the earned funds away, more strongly violated their property rights, and were more likely to retaliate, than if the endowment funds were not earned (Danková & Servátka, 2015). Importantly, evidence does suggest that behavior post-windfall has been found to differ in lab and field settings (Carlsson, He & Martinsson, 2013). Additionally, evidence suggests that people may treat money that is currently physically held, or has been held, differently than promised funds or objects that represent, but are not actually, currency (Reinstein and Riener, 2012). When disentangling this *tangibility effect* from the *windfall or house money effect,* prior studies have noted that tangibility appears to impact total donation amount, while windfall increased probability of donating (Reinstein and Riener, 2012; Shen and Takahashi, 2017).

Of particular importance to the current study is whether all types of windfall are perceived, and acted upon, equally. Prior work suggests that a windfall framed as a bonus is more likely to be spent, in comparison to a windfall that is a return of funds (i.e. rebate or refund) (Epley & Gneezy, 2007; Epley, Mak & Idson, 2006). Interestingly, few studies have examined whether response to windfall funds are heterogeneous, with limited differences noted to-date (Carlsson, He & Martinsson, 2013). Collectively this literature indicates that the source of money substantially influences behavior, and as such, must be carefully considered when analyzing policy that intends to reallocate funds for citizens to spend as they see fit.

⊌ BEHAVIORAL SPILLOVER ⊌

Given the literature on the potential for windfall funds to be used more prosocially, such action may also be examined through the lens of behavioral spillover. Altering one's behavior based on recent or past experience may lead to spillover effects, i.e., engaging in one pro-environmental behavior changes the likelihood of engaging in future pro-environmental behavior (Nilsson, Bergquist, & Schultz, 2017, 2022; Thøgersen & Noblet, 2012; Truelove et al., 2014; Dolan and Galizzi, 2015; Noblet and McCoy, 2018, Goff et al., 2017). The spillover between sustainability focused behaviors has been found to be positive, in supporting the original pro-environmental behavior (Thøgersen & Crompton, 2009; Thøgersen & Noblet, 2012; Steinhorst, Klöckner, & Matthies, 2015) but also negative, working against the efforts of the original behavioral (Clot, Grolleau, & Ibanez, 2016; Mazur & Zhong, 2010). In the energy and transportation realms, distressing negative spillovers such as the rebound effect appear to actively work against policy efforts to reduce our carbon impacts (Berkhout, Muskens, & Velthuijsen, 2000).

Researchers have turned to investigation of individual attributes, experiences and preferences to learn more about behavioral spillover. Two models that discuss accessibility of related information and attitudes are particularly relevant to the current work. The Attitude Accessibility Model (Bargh, Chaiken, Govender, and Pratto, 1992) notes that participants whose attitudes toward the environment are more salient will be more likely to have these environmental attitudes activated by information related to the environment, such as information about the source (or recipient) of a monetary windfall. Related, recent work in cognitive accessibility, the "frequency with which people interact with or think about something" (Sintov, Geislar and White, 2019 p. 56), has demonstrated that when an individual 'looks back' at their prior behavior the ease of accessing past environmental choices played a key role in explaining pro-environmental behavior (Schley and Dekay, 2015; Sintov, Geislar and White, 2019). These easily accessed experiences and attitudes may help form an individual's self-identity, and importantly their perceived existing level of pro-environmental engagement which may impact their future choices.

Internal environmental motivation may be considered a form of this accessibility , and has also been found to partially explain conflicting findings on the impacts of prior sustainable behavior on an individual's future sustainable choices. High intrinsic environmental motivation appears to mitigate potential licensing or negative spillover (Noblet & McCoy, 2018). Importantly, evidence of behavioral crowding-out exists, particularly in the provision of public goods such as mitigating climate change. When the government funds a public good, individuals choose to allocate fewer funds to the public good (Payne, 2009). This leaves an important open question: if the government (in the form of the Carbon Dividend Trust) is taxing carbon (or carbon-equivalent) emissions to encourage lower individual use, will people change their behavior and limit their own conservation efforts because the government is involved?

This article contributes to three key gaps in the literature on windfall effects and behavioral spillover. First, we examine whether the source of windfall funding (a subsidy, a tax refund or no information on source) impacts an individual's stated future sustainability behavior. Second, we investigate if a threshold windfall amount must exist before we see changes in stated sustainable behavior. Third, we explicitly examine heterogeneity in response to windfall funding. Moreover, this study was designed to directly investigate important policy questions surrounding legislation like the Carbon Dividend Act.

❧ METHOD ❧

Research Design

Our experiment was conducted using the online survey platform Qualtrics and advertised on MTurk for U.S. residents only in September 2018 under the title "Consumer Choices" with a participation payment of at least $1.50[2]. In comparing MTurk participants to social media surveys, in-person lab participants or collegiate samples, prior work indicates that MTurk can provide high quality data because users can complete complex tasks, have higher diversity than many in person samples and are more attentive to instructions than other samples (Casler, Bickel, and Hackett, 2013; Buhrmester, Kwang, and Gosling, 2011; Smith, Sabat, Martinez, Weaver, & Xu, 2015). Following suggested MTurk best-practices at the time of study launch (Goodman, Cryder & Cheema, 2013) we embedded quality control checks throughout the survey; participants who failed these quality control checks were removed from the sample (*n* = 8).

The design of the online survey included multiple sections[3]. Section 1 allowed for (a) random placement of participants into one of three treatments regarding potential additional compensation for participation and the source of these extra funds from parties related to energy efficiency and conservation both in transportation and home energy, and (b) elicited information regarding how said funds would be used (open ended qualitative question) (Figure 1). Section 2 collected information on future sustainable behavior intentions related to energy efficiency and conservation both in transportation and home energy from a prescribed list, which are the focus of this manuscript, for example 'I intend to lower the thermostat on my water heater' (home energy), 'I intend to ride share or carpool' (transportation). Section 3 collected data on environmental motivation consistent with Noblet & McCoy (2018); Section 4 gathered socio demographics on survey participants; and Section 5 gathered information on participants' perceptions of global climate change and environmental/social charitable membership or donation. Participants were restricted to 18 years or older U.S. residents.

The design of our current study allows us to investigate whether information on the source or amount of a 'windfall' impacts an individual's intent to engage in sustainable behaviors. We examine three related hypotheses to determine the pathway for potential influence of windfall on future sustainability behavior:

Hypothesis 1 (H1) - Funding Source Conditions.

We hypothesize that:

(a) *Dose effect*: participants who see *any* information on the source of the windfall funding (either subsidy or tax refund conditions), will express different future sustainability behavior than those who see no information about the funding source (neutral condition).

(b) *Condition effect:* those who see information that the compensation funds are from a previously paid transportation tax (tax refund condition) will express different future sustainability behavior than those who are told that the funds come from a non-profit subsidy (subsidy condition). Consistent with behavioral crowding-out we hypothesize those in the tax refund condition will indicate lower intent to engage in future sustainable behaviors.

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2. IRB approval was obtained prior to conducting the survey.

3. The survey is available by request from the authors.

FIGURE 1

Section 1 funding source conditions (tax refund, subsidy or neutral) and compensation information
(<<COMPENSATION AMOUNT>> $25, $100, $250, $500)

All participants saw:
As you know, you will receive at least $1.50 for participating today.

Your participation today in this survey enters you into a random draw for the potential opportunity to earn an additional <<COMPENSATION AMOUNT>> in compensation.

Participants were randomly assigned to one of the following three conditions:
Tax Refund Condition
In the United States, drivers pay a tax as part of the price of gasoline. Part of these tax funds are used to promote investments in energy efficiency and conservation in both transportation and home energy. The potential compensation payment you are being offered today <<COMPENSATION AMOUNT>> comes from these tax funds that you have already paid into.

Subsidy Condition
We have partnered with a national nonprofit focused on sustainable energy. Private donations to this non-profit are used to promote investments in energy efficiency and conservation in both transportation and home energy. The potential compensation payment you are being offered today <<COMPENSATION AMOUNT>> comes from these private donations made to this national non-profit.

Neutral Condition
No information provided on source of funding.

All participants saw:
To help us understand people's choices, please tell us - how would you spend the <<COMPENSATION AMOUNT >> if you are selected in the random draw?

Hypothesis 2 (H2) - Compensation Threshold.

We hypothesize that those who saw larger compensation amounts will state different intentions to engage in sustainable behaviors than those who saw smaller amounts. From a policy perspective, we seek to understand if there is a threshold amount that a policy must offer to incentivize investments in energy and sustainable behavior.

Hypothesis 3 (H3) - Heterogeneity in response

    (a) Evidence of Moral Balancing.
We hypothesize that participants who state they will use the additional compensation funds on environmental and energy projects in the open-ended question, are less likely to state intention to engage in future sustainable intentions from a prescribed list offered. We test if this relationship is influenced by stated environmental motivation, anticipating that participants with high internal environmental motivation are less likely to exhibit moral balancing behavior.

    (b) Information Processing
We hypothesize that people with differing socio-demographics, environmental perceptions and experiences will respond to the funding source conditions differently, by indicating different levels of intended future behaviors. For example, we hypothesize that individuals who

report being fiscally conservative may find a rebate from a previously paid tax more enticing for engaging in future sustainable behaviors.

⭷ PARTICIPANTS ⭹

Survey participants (*n* = 1,217) were randomly assigned to one of three funding source information conditions in Section 1 of the survey (Figure 1). Treatment 1 of the survey told participants that the source of funding for the potential additional compensation was from a tax fund they had already paid into (hereafter "Tax Refund Condition", *n* = 407), while treatment 2 (*n* = 401) informed respondents that the funding came from private donations to a nonprofit entity (hereafter "Subsidy Condition"). Our control condition (hereafter "Neutral Condition") did not specify the source of potential additional compensation (*n* = 409). We also randomized the amount of funds participants saw for the additional compensation at $25 (*n* = 305), $100 (*n* = 303), $250 (*n* = 304), or $500 (*n* = 305). Participants then responded to the block of future sustainability behaviors, followed by socio-demographics.

⭷ MEASURES ⭹

Dependent Variable(s)

<u>Behavioral Intentions.</u> We collected data using a Likert scale on participants' intentions to engage in a variety of sustainable behaviors including transportation behaviors, energy conservation/efficiency behaviors, and sustainable policy support or donation behaviors. These behaviors individually, and collectively, are the dependent variables for our analysis, which are continuous and bound between 1 and 7. All participants saw the entire fifteen (15) potential behaviors and in the same order[4] Given the bounded nature of our Likert scale data, we ran Tobit regression analysis with a consistent set of control variables including the additional compensation amount, environmental motivation, and other sociodemographic variables as a means of capturing socioeconomic constraints and sustainable behavior preferences that may impact behavioral intentions.

Given that sustainable behavior is often considered within, and across, domains, we also create behavioral domain composite variables based on theory and factor analysis. Factor analysis indicates that two domains emerge from our list of behavioral intentions. The first domain is *Sustainable Transportation Behavior* (α = 0.855; *M* = 4.125, *SD* = 1.942) and the second is *Other Sustainable Behavior* (α = 0.897; *M* = 5.132, *SD* = 1.551). Given our interest in specific behavioral domains we also investigate categories within the second factor that we name *Product Efficiency* (α = 0.630; *M* = 5.045, *SD* = 1.632), *Home Energy Efforts* (α = 0.834; *M* = 5.088, *SD* = 1.606) and *Policy & Donation* (α = 0.794; *M* = 5.027, *SD* = 1.552) (Table 1)[5].

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4. Most of the behaviors primarily focused on positive spillover effects and did not explicitly elicit carbon increasing activities. Future research will benefit from including a broader range of carbon decreasing and increasing activities.

5. Acknowledging that Stern et al. (1999) in the Value-Belief-Norm Theory indicate that sustainable behaviors may be impacted by whether the behavior takes place privately or in a public setting, we also investigated the impact different settings may have on determining behavioral intentions in the identified domains. Our tests revealed no difference in actions across the two settings (see Table A1 for details).

TABLE 1

Summary of Dependent Variable: Dependent Variables, Mean Dependent Variable Likert Scale Response (1=Strongly Disagree, 7=Strongly Agree), and Alpha Values from Factor Analysis.

	Mean Likert Scale Response	Factor 1: Sustainable Transportation Behavior (α = .855)	Factor 2: Other Sustainable Behavior (α = .897)
I intend to ride share or carpool [a]	3.98	.715	
I intend to walk or ride a bike instead of take my car [a]	4.11	.737	
I intend to drive less[b]	4.49	.678	
I intend to increase my use of public transportation (e.g. bus, metro) [a]	3.67	.775	
I intend to avoid drive through lanes (at restaurants, etc.) to reduce car idling [b, c]	4.38	.564	
I intend to take my lunch to work to avoid extra vehicle trips [a, c]	5.27		.544
I intend to keep my vehicle and small engines (e.g. lawn mower) properly tuned [b,c]	5.49		.580
I intend to conserve energy at home by turning the thermostat up or down[b, d]	5.55		.650
I intend to buy locally produced food [b]	5.13		.619
I intend to invest in increased heating/cooling efficiency in my home [b, d]	4.93		.708
I intend to lower the thermostat on my water heater[b,d]	4.83		.671
I intend to invest in energy efficient appliances, even though they may be more expensive [b,d]	5.04		.698
I intend to support policy that invests in energy efficiency[b,e]	5.42		.739
I intend to donate to entities focused on sustainable energy options [a,e]	4.29		.577
I intend to support policy that invests in renewable energy [a,e]	5.37		.679

[a,] public behavior, [b] private behavior; [c,] Product Efficiency [d] Home Energy [e] Supporting policy behavior

Explanatory Variables

Funding Source Condition and Compensation. As described above, all participants were randomly assigned to one of three Funding Source Conditions and to one of five Compensations (Table 2). We test whether participants who saw *any* funding source information (i.e. either tax refund or subsidy), or no information (i.e. neutral condition) differed to allow for testing of H1(a), aka the Dose Effect. To allow for testing of H1(b), the Conditions effect, we create the variable *Condition* where 1=Tax Refund Condition, 2=Subsidy Condition and 3=Neutral Condition. The distribution of *Compensation* across the three conditions is marginally different (X^2 = 11.788, p = 0.067) motivating the inclusion of compensation amount as a control variable in explaining the response to the Funding Source Condition. Importantly, compensation was not hypothetical; as stated in the survey instructions, each participant was placed into a drawing to receive the payment listed on the survey.

Climate change and Environmental Donation/Membership. Participants responded to two questions regarding their perspectives on global climate change on a seven-point Likert scale (1=Strongly Disagree to 7=Strongly Agree). Importantly, we wished to capture whether respondents thought climate change was occurring ("Global Climate Change is happening"), and whether participants thought human activities were responsible ("Global climate change

TABLE 2
Funding Source Conditions and Compensation, number of participants

Compensation Amt.	$25	$100	$250	$500	Total (n)
Survey Type					
Neutral	102	100	113	94	409
Subsidy	96	88	96	121	401
Tax refund	107	115	95	90	407
Total	305	303	304	305	1,217

is caused mostly by human activities"). Respondents then indicated whether they were a member, and/or had previously donated, to an environmental group and/or a social group or cause.

Social/Fiscal leaning. In the United States, global climate change and environmental issues are often associated with liberal or conservative value sets (Dunlap, Xiao and McCright, 2001; McCright and Dunlap, 2011). We capture a respondents self-reported value set on a seven-point Likert Scale ranging from '1=Very Liberal' to '7=Very Conservative' for both Fiscal and Social issues.

Socio-demographics. We capture a range of demographic controls. Participants identified gender, age, religious affiliations, racial and ethnic identity, educational attainment, income, type of employment (including whether a member of the household works in the energy industry), marital status and location (by U.S. state).

Environmental motivation scale. We use the environmental motivation scale (Noblet & McCoy, 2018, adapted from Goplen, 2014) to capture an individual's source of environmental motivation. Participants responded to nine questions on a seven-point Likert scale (from strongly disagree to strongly agree). Factor analysis indicates the design of the questions are consistent with theory and previous work, with two factors emerging (internal and external motivation). Of the nine questions, four capture intrinsic motivations. We create a composite intrinsic motivation score by averaging responses to these four questions ($\alpha = 0.934$). Five questions capture an external focus and we create a composite extrinsic motivation score by averaging responses to these five questions ($\alpha = 0.920$).

⚹ LIMITATIONS ⚹

We recognize that our work has limitations and that these limitations have consequences for our conclusions. However, we also see these limitations as helpful for informing future research. To begin, we recognize that collection of data from MTurk may yield a suboptimal sample. We note that our data collection happened during a time period where other researchers documented a dip in the validity and reliability of MTurk data, likely due to increased participation by computer 'bots' and 'farmers' (those using server farms to bypass location restrictions) (Chmielewski and Kucker, 2020). Additionally, while we used many of the best-practices for MTurk data collection available at the time, the recommendations have substantially shifted (Aguinis, Villamor and Ramani, 2021) with newer work noting that long-relied upon attention check may no longer catch participants who would provide invalid data (Chmielewski and Kucker, 2020). Of particular importance to the interpretation of our results, there are differences between MTurk participants, community samples and students related to money and time value. MTurk participants valued money more than time, in comparison to community samples and were more likely to report themselves as being "tightwads"(Goodman, et al., 2013; p. 218). Further, in comparison to a student sample MTurk

participants were more likely to prefer payoffs with certain outcomes rather than gambles with higher values. Importantly, this may mean our sample is more likely to report engagement in, or future support for, activities that are low in financial cost but may be higher in time-costs than a community sample.

Further, while we do allow for the chance at real compensation, this analysis uses stated preference data and we acknowledge that participants may not reveal true preferences or intentions because of limited incentives to do so and face no consequences for their actions. Our analysis examines factors that may impact likelihood of stating future intent, but we are unable to determine if participants follow through on these behaviors. While a participant's stated intention to engage in future sustainable behaviors (Table 1) can be interpreted as Behavioral Intention, a strong predictor of future behavior consistent with the Theory of Planned Behavior, we are also cognizant of the literature on the gap that exists between intention and actual behavior (Kollmuss & Agyeman, 2002). Work that addresses this gap will continue to be important in the sustainability literature. Further, our respondents were not notified that our survey was a test of windfall effects or related to the Carbon Dividend Act. Pre-existing preferences regarding efforts to curb carbon emissions may not have been accurately captured in this work.

We also acknowledge that many pro-environmental activities offer tradeoffs that are often at opposite ends of the time-money spectrum; that is many time-intensive activities may save money (ex: riding a bike to work; taking work to lunch) and many costly activities are engaged in to preserve time. Our current work did not capture respondents' motivations for, or perceptions of the perceived tradeoffs involved in, their intended future behaviors. Additionally, while we capture income information from our respondents, we recognize that the value of money and time is different across populations.

Finally, our participants do not accurately represent every segment of the U.S. population. Rather, our data is a snapshot of U.S. residents willing to participate in our online survey. Even though we face data collection and sample limitations that may limit the external validity of our results, our data provides interesting and important insights into the windfall effect on future sustainable behavior.

❧ RESULTS ❧

Random Assignment

Our random assignment of participants to condition was successful as respondent profiles from the three Funding Source conditions are only different across the following variables: gender ($F = 4.22$, $p = 0.012$) where fewer men were assigned to the neutral condition, and compensation ($F = 3.91$, $p = 0.02$) where slightly higher compensations were assigned to the subsidy condition (Table 3). These differences motivate the use of a set of consistent control variables in our regression, including gender and compensation amount so that we may isolate the effect of our conditions and compensations. To provide better insight into our data, we analyzed the data as a whole while also breaking down the analysis by multiple groups: all respondents, only respondents in specific treatment conditions, by environmental motivation scores, by compensation amount.

TABLE 3
Participant Profiles across Conditions

	Tax Refund (*n*=407)	Subsidy (*n*=401)	Neutral (*n*=409)
Gender (% male)*	57%	57%	48%
Age (mean; years)	35.09	36.46	36.05
Income (median; $)	51,363	*56,839*	*50,574*
Education (years)	15.47	15.32	15.43
Race (% Caucasian)	73.71	74.81	74.33
Religion (% Christian)	28.26	24.20	24.21
Compensation (mean)	*203.75*	*238.65*	*214.67*
Global Climate Change is happening	6.02	6.00	5.93
Global climate change is caused mostly by human activities	5.71	5.72	5.67
Donate to environmental organization (% donated)	38.57	37.41	39.85
Donate to social organization (% donated)	34.64	32.67	34.72
Internal Motivation (mean)	*5.41*	*5.47*	*5.45*
External Motivation (mean)	*3.79*	*3.77*	*3.77*

*Indicates statistically significant difference across condition

H1: *Funding Source Conditions, Dose Effect*

We find evidence to support our first hypothesis that a Dose effect exists. In analyzing whether merely seeing a funder (either tax refund and subsidy treatments) or not (neutral treatment) affects intentions to participate in sustainability behaviors, we find that participants who saw *either* funder source are more likely to declare intentions to increase *Sustainable Transportation Behaviors* (Table 4 column 2). Participants in either funder type increased their stated desire or likelihood to improve *Sustainable Transportation Behavior* by 0.15 (tax refund) to 0.18 (subsidy) along the Likert scale relative to the neutral survey where no funder type was disclosed[6] (p = 0.10). This result supports previous literature that external motivators, such as seeing a funder type, results in a positive spillover effect (Truelove et al., 2014; Pienaar et al., 2013). This result may also be partially explained by the cognitive accessibility model. Given that respondents make choices about energy and travel every day, they can easily recall their own behavior, find connection with the message from the recent funders to their own identity and/or consider potential changes they could make to be consistent with the recent funding received. Thus, seeing either funder type who "promotes investments in energy efficiency and conservation in both transportation and home energy" increases the likelihood that an individual in our survey will declare an intention to participate in additional *Sustainable Transportation Behavior*. However, the Dose effect, or funding source, is not significant when evaluating Other Sustainable Behavior (see Table 4, Column 3). While we are unable to confirm causation, we hypothesize consistent with the cognitive accessibility model that because respondents regularly make transportation choices this means that the additional cost of adjusting behavior is small, relative to the value of the other actions (e.g., tuning an engine or buying new appliances is costly in both time and money). Time-intensive behaviors may trigger cognitive accessibility, but potentially in a negative way where recalling the extra effort required to do the behavior may limit the desire to engage in the same behavior. Regardless, our results provide valuable insight by highlighting the differences in response between transportation and non-transportation behaviors.

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6. This result continues to hold up when including the additional transportation behavior "I intend to take my lunch to work to avoid extra vehicle trips."

TABLE 4

Regression Analysis on the Effects of Treatment Type, Environmental Motivation, and Demographics on Different Stated Sustainable Behavior

	(1) Combined-All Behaviors	(2) Factor 1 Sustainable Transportation Behavior	(3) Factor 2 Other Sustainable Behavior	(4) Supporting Policy Behavior (e – Table 1)	(5) Product Efficiency (c – Table 1)
Treatment Effects					
Subsidy Treatment	0.008	0.177*	–0.075	–0.096	–0.047
	(0.052)	(0.092)	(0.054)	(0.064)	(0.075)
Tax Refund Treatment	0.037	0.154*	–0.019	0.009	–0.013
	(0.051)	(0.092)	(0.053)	(0.063)	(0.074)
Compensation	–0.000	0.000	–0.000	–0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Environmental Motivation					
Internal Motive Average	0.534***	0.494***	0.585***	0.638***	0.577***
	(0.021)	(0.037)	(0.021)	(0.025)	(0.030)
External Motive Average	0.101***	0.199***	0.056***	0.045**	0.041*
	(0.015)	(0.027)	(0.016)	(0.019)	(0.022)
Demographics					
Social Leaning	0.042**	0.063*	0.033*	0.013	0.032
	(0.018)	(0.032)	(0.019)	(0.022)	(0.026)
Fiscal Leaning	–0.006	–0.049	0.015	–0.006	0.027
	(0.018)	(0.033)	(0.019)	(0.023)	(0.026)
CC Belief	–0.036	–0.088**	–0.016	0.024	–0.007
	(0.024)	(0.044)	(0.025)	(0.030)	(0.035)
CC Human Belief	0.075***	0.085**	0.072***	0.145***	–0.005
	(0.021)	(0.038)	(0.022)	(0.026)	(0.031)
Income	0.001	–0.081***	0.041**	0.011	–0.007
	(0.018)	(0.031)	(0.020)	(0.021)	(0.025)
Age	–0.004**	–0.006*	–0.003	–0.004	–0.001
	(0.002)	(0.004)	(0.002)	(0.003)	(0.003)
Education	0.051**	0.131***	0.0134	0.035	0.086**
	(0.023)	(0.042)	(0.024)	(0.029)	(0.034)
Sex	–0.026	0.113	–0.098**	–0.009	–0.079
	(0.042)	(0.076)	(0.044)	(0.052)	(0.061)
Environmental Group Donation	0.334***	0.453***	0.282***	0.433***	0.266***
	(0.050)	(0.089)	(0.052)	(0.065)	(0.072)
Social Group Donation	0.069	0.171**	0.021	0.123**	–0.065
	(0.049)	(0.087)	(0.051)	(0.060)	(0.070)
Energy-Work Association	0.130	0.462***	–0.052	–0.061	0.080
	(0.083)	(0.150)	(0.086)	(0.102)	(0.120)
Stated Spending on Transportation	0.111	–0.041	0.185*	0.185	0.262*
	(0.101)	(0.180)	(0.105)	(0.124)	(0.147)
Stated Spending on Other Sustainable Behavior	0.078	0.003	0.114	0.138	–0.132
	(0.104)	(0.184)	(0.110)	(0.128)	(0.149)
R^2	0.289	0.126	0.270	0.254	0.136
Dose Test (Prob>F)[a]	0.751	0.100*	0.350	0.186	0.808
Condition Test (Prob>F)[b]	0.577	0.807	0.300	0.097*	0.645

Notes: Each column represents results from a separate regression of grouped sustainability behaviors. Standard errors are reported in parenthesis.
[a]Dose Test evaluates whether seeing any funder (either tax or subsidy) is statistically significantly different from the neutral treatment.
[b]Condition Test evaluates whether the tax funder is statistically significantly different from the subsidy funder.
*** $p < 0.01$; ** $p < 0.05$; * $p < 0.10$.

Environmental motivation, specifically individuals who are internally-motivated, is partly driving the significant Dose effect above. To illustrate this, we ran separate regressions for internally-motivated and externally-motivated individuals[7] (Table 5). As Table 5, Column 2 shows the subsidy condition was marginally significant for internally motivated individuals for *Sustainable Transportation Behaviors* ($B = 0.211$, $p = 0.11$). Here, internally motivated individuals who saw the subsidy increased their stated desire or likelihood to improve *Sustainable Transportation Behaviors* by 0.21 along the Likert scale relative to those internally-motivated individuals who received the neutral survey. Externally-motivated individuals did not exhibit the same response (Table 5, Column 2). Previous literature supports our result that internal motivation can lead to pro-environmental behaviors (Truelove et la., 2014; Clark et al., 2003).

H1: *Funding Source Conditions, Condition Effect*

We also tested for significance and differing behavioral intentions by funding source. Initially, we hypothesized that those in the tax refund condition would indicate lower intent to engage in sustainable behaviors, following previous findings in crowding out literature. However, our overall results show that participants in the tax refund condition indicated positive future pro-environmental responses across regressions while the subsidy treatment was mixed. Notably, we found a significant difference between participants in the tax refund condition and the subsidy condition relating to intended support for pro-environmental policy (Supporting Policy Behavior), $p = 0.097$ (Table 4, Column 4). Those who received the subsidy treatment decreased intended support for *Policy & Donation* by 0.09 on the Likert scale, whereas those who saw the tax refund were more inclined to support policy and donation opportunities by 0.01 on the Likert scale.

Breaking down this Condition effect result further illustrates the differences across motivation types and is likely attributed to externally motivated individuals. Externally motivated subsidy condition participants revealed a negative spillover to future sustainability behavior, primarily attributable to Other Sustainable Behavior (Table 5, Column 1 and 3)[8]. Here, externally motivated individuals in the subsidy condition *decreased* non-transportation sustainable intentions by 0.199 on the Likert scale. The tax treatments led to an *increase* in stated sustainability behavior by 0.027 on the Likert scale. This result is not consistent with internally motivated individuals, where we found (1) no significant difference between the subsidy and tax refund conditions in any of the regression analysis (Table 5, Columns 1–3), and (2) both the subsidy and tax refund treatments exhibit positive spillover effects; internally motivated participants in the subsidy condition demonstrated a significantly positive spillover effect with Sustainable Transportation Behavior ($\beta = 0.211$, $p = 0.041$).

Future research would benefit from teasing out the net effect of crowding out versus the positive spillover effects across the different behavior types. We surmise that the net impact is positive, given that the majority of participants, 78%, identified as internally motivated.

H2: *Compensation Threshold Effects*

In H2, we focused on the potential for the amount of windfall (here, our offered additional compensation) to influence sustainable behavior intentions. Interestingly, Compensation was

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7. An individual was classified as "internally motivated" if their internally motivated (IM) mean was greater than their externally motivated (EM) mean.

8. Externally motivated individuals responded differently between the tax refund and subsidy treatments when accounting for all sustainable behaviors (p=0.050) and in the Factor 2 regression (p=0.063) (Table 5, Columns 1 and 3).

TABLE 5

Regression Analysis on the Effects of Treatment Type, Environmental Motivation, and Demographics on Different Stated Sustainable Behavior Broken Down by using either *Only Internally Motivated Data or Externally Motivated Data*

	(1) Combined- All Behaviors		(2) Factor 1 Sustainable Transportation Behavior		(3) Factor 2 Other Sustainable Behavior	
	Internally Only	Externally Only	Internally Only	Externally Only	Internally Only	Externally Only
Treatment Effects						
Subsidy Treatment	0.015	−0.163	0.211*	−0.135	−0.081	−0.199
	(0.057)	(0.114)	(0.103)	(0.191)	(0.060)	(0.119)
Tax Refund Treatment	−0.204	0.057	0.082	0.118	−0.074	0.027
	(0.057)	(0.109)	(0.103)	(0.182)	(0.60)	(0.113)
Compensation	−0.000	0.000	0.000	0.001*	−0.000*	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Environmental Motivation						
Internal Motive Average	0.566***	0.551***	0.564***	0.838***	0.596***	0.426***
	(0.026)	(0.087)	(0.048)	(0.147)	(0.028)	(0.090)
External Motive Average	0.087***	0.112	0.210***	−0.289*	0.028	0.322***
	(0.018)	(0.097)	(0.033)	(0.165)	(0.019)	(0.101)
Demographics						
Social Leaning	0.049**	0.013	0.067*	0.036	0.043**	−0.000
	(0.020)	(0.040)	(0.037)	(0.067)	(0.021)	(0.042)
Fiscal Leaning	−0.024	0.013	−0.084**	−0.001	0.004	0.021
	(0.020)	(0.042)	(0.037)	(0.070)	(0.021)	(0.044)
CC Belief	−0.010	−0.092**	−0.066	−0.124*	0.014	−0.080
	(0.029)	(0.045)	(0.052)	(0.075)	(0.030)	(0.047)
CC Human Belief	0.061***	0.082*	0.059	0.104	0.063**	0.061
	(0.023)	(0.048)	(0.042)	(0.080)	(0.025)	(0.050)
Income	−0.000	−0.008	−0.103***	−0.071	0.048**	0.019
	(0.019)	(0.039)	(0.035)	(0.064)	(0.020)	(0.040)
Age	−0.005**	−0.008	−0.007*	−0.018*	−0.005**	−0.004
	(0.002)	(0.006)	(0.004)	(0.010)	(0.002)	(0.006)
Education	0.053*	0.043	0.121**	0.170**	0.021	−0.011
	(0.027)	(0.048)	(0.048)	(0.080)	(0.028)	(0.050)
Sex	−0.054	0.072	0.090	0.211	−0.125**	−0.010
	(0.047)	(0.099)	(0.084)	(0.164)	(0.049)	(0.102)
Environmental Group Donation	0.318***	0.237*	0.410***	0.431**	0.278***	0.141
	(0.054)	(0.124)	(0.097)	(0.206)	(0.057)	(0.129)
Social Group Donation	0.040	0.197*	0.090	0.498***	0.016	0.053
	(0.053)	(0.112)	(0.096)	(0.186)	(0.056)	(0.116)
Work Association	0.213	−0.004	0.572***	0.231	0.023	−0.125
	(0.104)	(0.132)	(0.187)	(0.220)	(0.110)	(0.137)
Spend on Transportation	0.154	0.192	−0.127	0.489	0.288**	0.056
	(0.110)	(0.246)	(0.199)	(0.408)	(0.116)	(0.255)
Spend on Other Sustainable Behavior	0.087	−0.029	0.025	0.204	0.112	−0.135
	(0.248)	(0.326)	(0.203)	(0.542)	(0.119)	(0.340)
R^2	0.267	0.405	0.118	0.228	0.238	0.377
Dose Test (Prob>F)[a]	0.825	0.130	0.110	0.397	0.329	0.139
Condition Test (Prob>F)[b]	0.537	0.050**	0.214	0.174	0.902	0.063*

Notes: Each column represents results from a separate regression of grouped sustainability behaviors. Standard errors are reported in parenthesis.
[a]Dose Test evaluates whether seeing any funder (either tax or subsidy) is statistically significantly different from the neutral treatment.
[b]Condition Test evaluates whether the tax funder is statistically significantly different from the subsidy funder.
*** $p < 0.01$; ** $p < 0.05$; * $p < 0.10$.

not significant in influencing sustainable behavior intentions, except when analyzing outcomes by environmental motivation. Externally motivated individuals exhibited our hypothesized relationship where a higher compensation amount led to a higher rate of *Sustainable Transportation Behavior* intentions (β = 0.001, p = 0.095) (Table 5, Column 2). While the coefficient is small, this positive relationship seems appropriate given that externally motivated individuals respond to outside influences. Internally motivated individuals, on the other hand, reacted negatively to higher compensation (β = –0.0002, p = 0.10) (Table 5, Column 3). Again, the coefficient is negligible but does highlight the critical differences between environmental motivation types.

We expanded the analysis to determine whether a windfall threshold must exist before changes in sustainable behavior intentions occur. To do so, we ran separate regressions for each compensation level and across the three types of sustainable behavior groupings (i.e., Combined Behavior, Sustainable Transportation Behavior, and Other Sustainable Behavior). A compensation threshold effect exists for participants in the Tax Refund Condition's Sustainable Transportation Behavior when the payment is $250 ($B$ = 0.363, p = 0.060) and $500 ($B$ = 0.352, p = 0.060) (Table 6) where compensation amounts of $25 and $100 did not significantly influence stated Sustainable Transportation Behavior intentions. The positive relationship between compensation ($250 and above) and Sustainable Transportation Behavior is consistent with literature that people who experience a windfall tend to be more prosocial (Thaler and Johnson, 1990; Carlsson, He & Martinsson, 2013). Importantly, participants noted their intended future choices across a range of behaviors which differed on the time-money scale. Some pro-environmental intentions (ex: I intend to donate to entities focused on sustainable energy options) are costly while others explicitly save the respondent money (I intend to take my lunch to work to avoid extra vehicle trips). A potential explanation for the threshold result may be that higher compensation allows people to engage in costlier environmental activities they would otherwise have been unable to afford. Interestingly, and essential for a carbon fee and dividend policy, our compensation threshold result is associated with the tax refund condition when comparing results by treatment type (Table 6, Columns 3 and 4). There is no compensation threshold effect for the subsidy condition.

H3: *Heterogeneity in Response, Moral Balancing*

An unanswered, and concerning, question surrounding the Carbon Dividend Act is whether 'windfall' dividends may lead to moral licensing. To test this, we provided respondents an opportunity to declare early in our survey their intended use for the windfall funds, with an expectation that our data would reveal negative spillover behaviors from the windfall. That is, those participants who stated an intention to spend on environmental and energy projects would then be less likely to agree to engage in future sustainable actions (i.e. Sustainable Transportation Behavior, Other Sustainable Behaviors). Contrary to our initial expectations, we found that a small positive spillover effect exists instead. As Table 4, Column 3 indicates, individuals that reported a desire to spend the survey compensation on transportation-related activities were more likely to report a willingness or likelihood to participate in Other Sustainable Behavior by 0.19 on the Likert scale. Breaking down the non-transportation sustainable behavior into finer categories shows that the positive spillover mainly impacts actions we categorize in Table 1 as "Product Efficiency" behaviors including reducing car idling, reducing lunch trips by car, and keeping vehicles and small engines tuned (Table 4, Column 5). When we examine the data further, this positive spillover result is mainly driven by internally motivated individuals who increase their willingness to participate in non-transportation related

TABLE 6

Regression Analysis of Factor 1- Sustainable Transportation Behaviors Broken Down *by Compensation*

	(1) $25	(2) $100	(3) $250	(4) $500
Treatment Effect				
Subsidy Treatment	−0.028	0.311*	0.202	0.125
	(0.193)	(0.182)	(0.189)	(0.175)
Tax Refund Treatment	−0.221	0.106	0.363*	0.352*
	(0.188)	(0.170)	(0.192)	(0.186)
Environmental Motivation				
Internal Motive Average	0.472***	0.497***	0.531***	0.493***
	(0.079)	(0.072)	(0.084)	(0.068)
External Motive Average	0.163***	0.197***	0.205***	0.238***
	(0.054)	(0.053)	(0.059)	(0.053)
Demographics				
Social Leaning	0.121*	0.120*	0.018	0.035
	(0.068)	(0.066)	(0.064)	(0.064)
Fiscal Leaning	−0.117*	−0.052	−0.026	−0.038
	(0.071)	(0.067)	(0.065)	(0.065)
CC Belief	−0.087	−0.014	−0.255***	−0.001
	(0.103)	(0.080)	(0.086)	(0.086)
CC Human Belief	0.169**	0.042	0.117	0.019
	(0.078)	(0.072)	(0.081)	(0.076)
Income	−0.014	−0.088	−0.113*	−0.111*
	(0.065)	(0.064)	(0.061)	(0.060)
Age	−0.010	0.000	−0.009	−0.010
	(0.007)	(0.007)	(0.009)	(0.007)
Education	0.128	0.150*	0.135	0.088
	(0.085)	(0.081)	(0.088)	(0.082)
Sex	0.236	0.130	−0.061	0.110
	(0.159)	(0.146)	(0.160)	(0.149)
Environmental Group Donation	0.154	0.343*	0.648***	0.592***
	(0.195)	(0.175)	(0.192)	(0.159)
Social Group Donation	0.086	0.143	0.220	0.252
	(0.175)	(0.163)	(0.193)	(0.169)
Work Association	0.867***	0.457	0.194	0.338
	(0.314)	(0.289)	(0.306)	(0.274)
Spend on Transportation	−0.227	0.013	1.131*	−0.076
	(0.281)	(0.369)	(0.613)	(0.372)
Spend on Other Sustainable Behavior	0.036	−0.464	−0.024	−0.116
	(0.366)	(0.327)	(0.425)	(0.391)
R^2	0.115	0.136	0.132	0.154
Dose Test (Prob>F)[a]	0.441	0.228	0.167	0.160
Condition Test (Prob>F)[b]	0.311	0.245	0.416	0.194

Notes: Each column represents results from a separate regression of grouped sustainability behaviors. Standard errors are reported in parenthesis.
[a]DoseTest evaluates whether seeing any funder (either tax or subsidy) is statistically significantly different from the neutral treatment.
[b]Condition Test evaluates whether the tax funder is statistically significantly different from the subsidy funder.
*** $p < 0.01$; ** $p < 0.05$; * $p < 0.10$.

sustainable behaviors by 0.288 on the Likert scale, which is significant at around the 1% level (see Table 5, Column 3). Finally, the positive spillover relationship does support our other hypothesis that participants with high internal environmental motivations are less likely to exhibit moral balancing behavior.

H3: *Heterogeneity in Response, Information Processing*

In addition to studying moral licensing effects from windfall funding, we were interested in how socio-demographics affect an individual's intentions for future behaviors. As hypothesized, and perhaps not surprisingly, we found that people with differing socio-demographic profiles indicated diverse levels of intended future sustainability actions. The most consistently significant socio-demographic variables included an individual's social leaning (liberal versus conservative), belief that human activities cause climate change, education, age, previous donation(s) to environmental groups, and history of household employment in the energy industry.

An individual's stated social leaning was consistently significant however, the magnitude of the response varied across the analysis (see Tables 4–6). A positive coefficient implies that socially conservative-leaning individuals are more likely to indicate a desire to participate in future sustainable behaviors than more liberal-leaning individuals. While this result may initially seem counter-intuitive, we argue that the sign is indeed correct. Socially conservative individuals generally prefer limited government oversight and may instead support individual intervention, which is consistent with our result. Notably, we found no evidence to support our hypothesis that fiscally conservative individuals participate in reduced future sustainable actions.

Believing in climate change, specifically the acknowledgment that human activities cause climate change, is positively linked to sustainable behavior in our survey. While the magnitude of this trend varies, this positive relationship does add to the current data that connects climate change beliefs to other prosocial behaviors like wearing a mask and participating in social distancing (Jenkins, 2020a, b).

A similar positive relationship exists for education. We found individuals with a higher level of education indicated a higher willingness to participate in transportation-related sustainable behavior (Table 4, Column 2). However, our results seem to differ from earlier literature and surveys that find either no significant link or a negative relationship between higher levels of education and prosocial behaviors (Drummond & Fischoff, 2017; Newport & Dugan, 2015). Interestingly, Newport and Dugan (2015) associated higher levels of education to lower or more extreme anti-social beliefs.

Previous contributions to an environmental group or a household history of employment in the energy industry also produced a consistently significant and positive effect on future sustainable behaviors. Although the magnitude of this effect varies across the regressions, contributions to an environmental group produced the most substantial consistent impact on responses. In particular, the largest influence occurs for those who saw the $250 treatment when evaluating Sustainable Transportation Behaviors (Table 6). These results are consistent with cognitive accessibility models, in recalling past behavior that impacts self-identity, and supports our earlier supposition that higher compensation allows people to engage in costlier environmental activities. Here, an individual who contributed to an environmental group increased their intended Sustainable Transportation Behavior by 0.648 on the Likert scale. This result provides additional support to our previous finding that a positive spillover exists between reported spending of windfall money on sustainable practices and increasing intended future sustainable behavior. Importantly, we continue to find no effect of moral balancing within our survey.

Finally, sustainable behaviors were negatively affected by age throughout our different regression analyses. Older respondents indicated fewer intentions to adjust their behavior in the future, although the magnitude of age on responses was generally undetectable or 0.00. From

a psychology perspective, this is an exciting result because it conflicts with previous literature that links a concern to people beyond self and family, also known as generativity, which usually develops in middle-age and produces higher levels of life satisfaction (McAdams et al., 1993; Schoklitsch & Baumann, 2011). However, our results do not exhibit this generativity as seen in previous literature.

❧ CONCLUSIONS AND POLICY IMPLICATIONS ❧

Our work contributes to the growing literature aimed at understanding potential responses to unexpected compensation, such as carbon tax refunds. We provide evidence that information on the source of funding for unexpected compensation causes people to increase stated desire to participate in transportation-related sustainable behavior. The tax refund treatment, in particular, led to consistently positive spillover effects. This result suggests that a carbon fee and dividend may result in a lower bound of GHG emissions reductions because current reports do not account for the indirect behavioral effects of the dividend. Our results also introduce the idea that there is a minimum threshold that triggers windfall response. Our results would suggest that over time, as the dividend decreases (as jurisdictions move away from carbon-emitting technologies), we may see a reduction in the positive spillover or no additional behavioral effect. As a result, we hypothesize that the additional indirect reduction in emissions is likely the largest early on in the policy when the refund is high. This is because we show that a compensation threshold exists for $250+ in the tax refund treatment. However, we were unable to test changes in behavior to a sequence of payments, so future research should investigate the implications of time-series variation in dividend payments[9].

Importantly, providing information on funder source does not produce a homogeneous effect across citizens. We find that people who have more education, a belief in human-induced climate change, have previously donated to environmental groups, are socially conservative, and are more internally motivated are more likely to state an intention to participate in future sustainable behavior. These findings are consistent with both the attitude accessibility and cognitive accessibility models where these participants can reflect on their own attitudes and behaviors and find their past behavior consistent with future pro-environmental behaviors. In contrast, age is negatively related to prosocial behaviors in our survey. Future research will benefit from exploring these results further. For example, future studies could examine the mechanism behind why the belief in human-induced climate change contributes to more prosocial and environmental behavior (Jenkins, 2020a; Van der Linden, 2015). Also, teasing out the net effect of education is vital because our positive education result contradicts previous research that finds either zero or a negative impact of education on pro-environmental behaviors (Drummond & Fischoff, 2017; Newport & Dugan, 2015). Recognizing these differences across citizens is important in measuring the real impact of a carbon fee and dividend; in some cases, the dividend may induce additional energy savings (e.g., for those who have more education, believe in climate change, etc.,) and in another case may detract from sustainability behaviors (i.e., older citizens).

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9. Another interesting extension is that the dividend, in practice, may seem uncertain, especially since it's supposed to decline (or go to zero) over time. Future research would benefit from examining how the probability of receiving the payment impacts results.

Similarly, we find that windfalls, particularly from a tax refund, have a heterogeneous effect on sustainability behaviors. Tax refunds produced a positive spillover to transportation-related actions, while other sustainable behaviors were less impacted. A potential mechanism could stem from cognitive accessibility and attitude accessibility. The ease of recalling one's own prior transportation behavior, and that of others, may be a link to recognizing the impact of changing transportation behavior on the environment and one's own wallet. In turn, this ability to reflect on whether one's own transportation is consistent with the funding message (that people pay money towards a gas tax that is then used to promote efficiency and conservation); perhaps respondents realize they could skip the gas tax by engaging in improved transportation behaviors now. Although the exact mechanism is unclear and warrants additional study, policy can still glean insights from this result. For example, improving public transportation or providing bike lanes may complement a carbon fee dividend policy.

Our analysis reveals that pro-environmental behaviors are not treated equally and that the source of windfall payments can influence these behavioral outcomes. This is particularly important when discussing a carbon fee and dividend that redistributes tax revenue to citizens. Future research will also benefit from a better understanding of how dividend-adjacent policies, such as using tax revenues to lower corporate and income tax rates, which indirectly act like a windfall, impact behaviors. Implementing a carbon tax has many moving pieces (e.g., Kennedy et al., 2020), and this study provides additional insight into the full accounting of its possible consequences.

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⚓ APPENDIX ⚓

TABLE A1

Regression Analysis on the Effects of Treatment Type, Environmental Motivation, and Demographics on Either *Stated Private or Public Sustainable Behavior*

	(1) Private Sust. Behavior	(2) Public Sust. Behavior
Treatment Effect		
Subsidy Treatment	−0.022	0.546
	(0.056)	(0.066)
Tax Refund Treatment	0.018	0.067
	(0.056)	(0.065)
Compensation	−0.000	0.000
	(0.000)	(0.000)
Environmental Motivation		
Internal Motive Average	0.570***	0.496***
	(0.022)	(0.026)
External Motive Average	0.0627***	0.158***
	(0.016)	(0.019)
Demographics		
Social Leaning	0.044**	0.040*
	(0.020)	(0.023)
Fiscal Leaning	0.004	−0.020
	(0.020)	(0.023)
CC Belief	−0.049*	−0.019
	(0.026)	(0.031)
CC Human Belief	0.071***	0.084***
	(0.023)	(0.027)
Income	0.018	−0.023
	(0.019)	(0.022)
Age	0.000	−0.011***
	(0.002)	(0.003)
Education	0.012	0.109***
	(0.025)	(0.030)
Sex	−0.075*	0.043
	(0.048)	(0.054)
Environmental Group Donation	0.277***	0.425***
	(0.054)	(0.063)
Social Group Donation	0.031	0.125**
	(0.053)	(0.062)
Work Association	0.072	0.212**
	(0.090)	(0.106)
Spend on Transportation	0.169	0.022
	(0.109)	(0.129)
Spend on Other Sustainable Behavior	0.138	−0.015
	(0.111)	(0.131)
R^2	0.247	0.213
Dose Test (Prob>F)[a]	0.774	0.549
Condition Test (Prob>F)[b]	0.475	0.848

Notes: Each column represents results from a separate regression of grouped sustainability behaviors. Standard errors are reported in parenthesis.
[a]Dose Test evaluates whether seeing any funder (either tax or subsidy) is statistically significantly different from the neutral treatment.
[b]Condition Test evaluates whether the tax funder is statistically significantly different from the subsidy funder.
*** $p < 0.01$; ** $p < 0.05$; * $p < 0.10$.

TABLE A2

Regression Analysis on the Effects of Treatment Type, Environmental Motivation, and Demographics on Sustainable Behavior Sub-Categories

	(1) Transportation	(2) Policy Support	(3) Home Energy Behavior	(4) Product Efficiency
Treatment Effect				
Subsidy Treatment	0.204**	−0.096	−0.020	−0.047
	(0.100)	(0.064)	(0.077)	(0.075)
Tax Refund Treatment	0.16*	0.009	−0.003	−0.013
	(0.098)	(0.063)	(0.076)	(0.074)
Compensation	0.000	−0.000	−0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Environmental Motivation				
Internal Motive Average	0.474***	0.638***	0.600***	0.577***
	(0.040)	(0.025)	(0.031)	(0.030)
External Motive Average	0.220***	0.045**	0.085***	0.041*
	(0.029)	(0.019)	(0.023)	(0.022)
Demographics				
Social Leaning	0.061*	0.013	0.069**	0.032
	(0.035)	(0.022)	(0.027)	(0.026)
Fiscal Leaning	−0.044	−0.006	0.001	0.027
	(0.035)	(0.023)	(0.027)	(0.026)
CC Belief	−0.067	0.024	−0.077**	−0.007
	(0.047)	(0.030)	(0.036)	(0.035)
CC Human Belief	0.082	0.145***	0.101***	−0.005
	(0.041)	(0.026)	(0.032)	(0.031)
Income	−0.077	0.011	0.061**	−0.007
	(0.033)	(0.021)	(0.026)	(0.025)
Age	−0.010**	−0.004	−0.002	−0.001
	(0.004)	(0.003)	(0.003)	(0.003)
Education	0.140***	0.035	−0.043	0.086**
	(0.045)	(0.029)	(0.035)	(0.034)
Sex	0.119	−0.009	−0.093	−0.079
	(0.081)	(0.052)	(0.063)	(0.061)
Environmental Group Donation	0.431***	0.433***	0.295***	0.266***
	(0.095)	(0.065)	(0.074)	(0.072)
Social Group Donation	0.217**	0.123**	−0.009	−0.065
	(0.093)	(0.060)	(0.073)	(0.070)
Work Association	0.444***	−0.061	−0.015	0.080
	(0.158)	(0.102)	(0.123)	(0.120)
Spend on Transportation	−0.138	0.185	0.213	0.262*
	(0.193)	(0.124)	(0.150)	(0.147)
Spend on Other Sustainable Behavior	0.007	0.138	0.204	−0.132
	(0.198)	(0.128)	(0.154)	(0.149)
R^2	0.113	0.254	0.153	0.136
Dose Test (Prob>F)[a]	0.092*	0.186	0.963	0.808
Condition Test (Prob>F)[b]	0.680	0.097*	0.830	0.645

Notes: Each column represents results from a separate regression of grouped sustainability behaviors. Standard errors are reported in parenthesis.
[a]Dose Test evaluates whether seeing any funder (either tax or subsidy) is statistically significantly different from the neutral treatment.
[b]Condition Test evaluates whether the tax funder is statistically significantly different from the subsidy funder.
*** $p < 0.01$; ** $p < 0.05$; * $p < 0.10$.

TABLE A3

Regression Analysis on the Effects of Treatment Type, Environmental Motivation, and Demographics on Different Stated Sustainable Behavior using either *Only Tax Refund Treatment Data or Subsidy Treatment Data*

	(1) Combined- All Behaviors		(2) Factor 1- Sustainable Transportation Behavior		(3) Factor 2- Other Sustainable Behavior	
	Tax	Subsidy	Tax	Subsidy	Tax	Subsidy
Treatment Effect						
Compensation	0.000	−0.000	0.001**	−0.000	−0.000	−0.000
	(0.000)	(0.000)	(0.000)	(0.053)	(0.038)	(0.000)
Environmental Motivation						
Internal Motive Average	0.485***	0.583***	0.340***	0.625***	0.556***	0.560***
	(0.036)	(0.038)	(0.059)	(0.069)	(0.039)	(0.039)
External Motive Average	0.123***	0.111***	0.232***	0.219***	0.071**	0.061**
	(0.028)	(0.027)	(0.045)	(0.047)	(0.030)	(0.028)
Demographics						
Social Leaning	0.066*	0.002	0.150***	−0.008	0.030	0.006
	(0.036)	(0.030)	(0.058)	(0.053)	(0.038)	(0.031)
Fiscal Leaning	0.015	0.003	−0.028	−0.057	0.032	0.034
	(0.036)	(0.030)	(0.059)	(0.053)	(0.039)	(0.031)
CC Belief	−0.034	−0.046	−0.053	−0.117	−0.031	−0.016
	(0.045)	(0.444)	(0.072)	(0.080)	(0.048)	(0.046)
CC Human Belief	0.108***	0.055	0.159***	0.034	0.085**	0.067*
	(0.038)	(0.040)	(0.061)	(0.069)	(0.040)	(0.040)
Income	0.041	−0.007	0.005	−0.117**	0.056	0.048*
	(0.034)	(0.028)	(0.054)	(0.049)	(0.036)	(0.029)
Age	−0.000	−0.009**	−0.003	−0.008	0.001	−0.010***
	(0.004)	(0.004)	(0.006)	(0.007)	(0.004)	(0.004)
Education	−0.005	0.051	−0.027	0.176**	0.010	−0.009
	(0.045)	(0.040)	(0.072)	(0.069)	(0.048)	(0.040)
Sex	0.022	−0.061	0.065	0.123	−0.002	−0.154**
	(0.080)	(0.074)	(0.130)	(0.131)	(0.086)	(0.077)
Environmental Group Donation	0.249***	0.422***	0.345**	0.524***	0.206**	0.381***
	(0.092)	(0.088)	(0.150)	(0.155)	(0.098)	(0.091)
Social Group Donation	0.123	−0.025	0.162	0.015	0.108	−0.034
	(0.091)	(0.085)	(0.146)	(0.149)	(0.097)	(0.087)
Work Association	−0.010	0.102	0.252	0.499	−0.154	−0.112
	(0.145)	(0.155)	(0.232)	(0.271)	(0.154)	(0.159)
Spend on Transportation	0.071	−0.107	−0.166	−0.564	0.188	0.102
	(0.145)	(0.209)	(0.234)	(0.366)	(0.155)	(0.215)
Spend on Other Sustainable Behavior	0.216	0.119	0.302	−0.004	0.196	0.102
	(0.223)	(0.140)	(0.357)	(0.245)	(0.240)	(0.144)
R^2	0.250	0.296	0.130	0.141	0.227	0.282

Notes: Each column represents results from a separate regression of grouped sustainability behaviors. Standard errors are reported in parenthesis.
*** $p < 0.01$; ** $p < 0.05$;* $p < 0.10$.

TABLE A4
Regression Analysis on the Effects of Treatment Type, Environmental Motivation, and Demographics on Different Stated Sustainable Behavior using *Only $25 Treatment Data*

	(1) Combined- All Behaviors	(2) Factor 1- Sustainable Transportation Behavior	(3) Factor 2- Other Sustainable Behavior
Treatment Effect			
Subsidy Treatment	–0.044	–0.028	–0.041
	(0.109)	(0.193)	(0.110)
Tax Refund Treatment	–0.105	–0.221	–0.054
	(0.106)	(0.188)	(0.107)
Environmental Motivation			
Internal Motive Average	0.531***	0.472***	0.580***
	(0.044)	(0.079)	(0.044)
External Motive Average	0.043	0.163***	–0.014
	(0.031)	(0.054)	(0.031)
Demographics			
Social Leaning	0.062	0.121*	0.031
	(0.039)	(0.068)	(0.039)
Fiscal Leaning	–0.011	–0.117*	0.041
	(0.040)	(0.071)	(0.041)
CC Belief	–0.057	–0.087	–0.044
	(0.058)	(0.103)	(0.058)
CC Human Belief	0.139***	0.169**	0.128***
	(0.044)	(0.078)	(0.044)
Income	0.010	–0.014	0.024
	(0.037)	(0.065)	(0.037)
Age	–0.009**	–0.010	–0.009**
	(0.004)	(0.007)	(0.004)
Education	0.062	0.128	0.030
	(0.048)	(0.085)	(0.048)
Sex	–0.030	0.236	–0.174*
	(0.090)	(0.159)	(0.091)
Environmental Group Donation	0.190*	0.154	0.216*
	(0.111)	(0.195)	(0.112)
Social Group Donation	0.033	0.086	0.003
	(0.099)	(0.175)	(0.100)
Work Association	0.248	0.867***	–0.066
	(0.178)	(0.314)	(0.179)
Spend on Transportation	0.037	–0.227	0.172
	(0.158)	(0.281)	(0.159)
Spend on Other Sustainable Behavior	0.130	0.036	0.184
	(0.207)	(0.366)	(0.209)
R^2	0.253	0.115	0.250
Dose Test (Prob>F)[a]	0.614	0.441	0.872
Condition Test (Prob>F)[b]	0.574	0.311	0.902

Notes: Each column represents results from a separate regression of grouped sustainability behaviors. Standard errors are reported in parenthesis.
[a]Dose Test evaluates whether seeing any funder (either tax or subsidy) is statistically significantly different from the neutral treatment.
[b]Condition Test evaluates whether the tax funder is statistically significantly different from the subsidy funder.
*** $p < 0.01$; ** $p < 0.05$; * $p < 0.10$.

TABLE A5

Regression Analysis on the Effects of Treatment Type, Environmental Motivation, and Demographics on Different Stated Sustainable Behavior using *Only $100 Treatment Data*

	(1)	(2) Factor 1- Sustainable	(3)
	Combined- All Behaviors	Transportation Behavior	Factor 2- Other Sustainable Behavior
Treatment Effect			
Subsidy Treatment	0.090	0.311*	−0.025
	(0.094)	(0.182)	(0.101)
Tax Refund Treatment	0.068	0.106	0.055
	(0.087)	(0.170)	(0.095)
Environmental Motivation			
Internal Motive Average	0.510***	0.497***	0.537***
	(0.036)	(0.072)	(0.039)
External Motive Average	0.143***	0.197***	0.118***
	(0.027)	(0.053)	(0.029)
Demographics			
Social Leaning	0.046	0.120*	0.018
	(0.034)	(0.066)	(0.037)
Fiscal Leaning	−0.014	−0.052	0.002
	(0.034)	(0.067)	(0.037)
CC Belief	0.012	−0.014	0.025
	(0.041)	(0.080)	(0.044)
CC Human Belief	0.059	0.042	0.075*
	(0.034)	(0.072)	(0.040)
Income	0.031	−0.088	0.090**
	(0.033)	(0.064)	(0.036)
Age	−0.004	0.000	−0.006
	(0.004)	(0.007)	(0.004)
Education	0.009	0.150*	−0.060
	(0.041)	(0.081)	(0.045)
Sex	0.076	0.130	0.069
	(0.075)	(0.146)	(0.081)
Environmental Group Donation	0.328***	0.343*	0.322***
	(0.090)	(0.175)	(0.098)
Social Group Donation	0.128	0.143	0.123
	(0.084)	(0.163)	(0.091)
Work Association	0.157	0.457	−0.021
	(0.149)	(0.289)	(0.161)
Spend on Transportation	0.171	0.013	0.255
	(0.190)	(0.369)	(0.205)
Spend on Other Sustainable	0.197	−0.464	0.300
Behavior	(0.168)	(0.327)	(0.183)
R^2	0.364	0.136	0.329
Dose Test (Prob>F)[a]	0.595	0.228	0.697
Condition Test (Prob>F)[b]	0.812	0.245	0.415

Notes: Each column represents results from a separate regression of grouped sustainability behaviors. Standard errors are reported in parenthesis.
[a]Dose Test evaluates whether seeing any funder (either tax or subsidy) is statistically significantly different from the neutral treatment.
[b]Condition Type Test evaluates whether the tax funder is statistically significantly different from the subsidy funder.
*** $p < 0.01$; ** $p < 0.05$; * $p < 0.10$.

TABLE A6

Regression Analysis on the Effects of Treatment Type, Environmental Motivation, and Demographics on Different Stated Sustainable Behavior using *Only $250 Treatment Data*

	(1) Combined-All Behaviors	(2) Factor 1-Sustainable Transportation Behavior	(3) Factor 2-Other Sustainable Behavior
Treatment Effect			
Subsidy Treatment	−0.060	0.202	−0.200*
	(0.109)	(0.189)	(0.112)
Tax Refund Treatment	0.024	0.363*	−0.138
	(0.111)	(0.192)	(0.114)
Environmental Motivation			
Internal Motive Average	0.540***	0.531***	0.594***
	(0.046)	(0.084)	(0.048)
External Motive Average	0.078**	0.205***	0.021
	(0.034)	(0.059)	(0.035)
Demographics			
Social Leaning	0.026	0.018	0.026
	(0.037)	(0.064)	(0.038)
Fiscal Leaning	0.016	−0.026	0.041
	(0.037)	(0.065)	(0.038)
CC Belief	−0.097**	−0.255***	−0.035
	(0.049)	(0.086)	(0.050)
CC Human Belief	0.070	0.117	0.039
	(0.046)	(0.081)	(0.048)
Income	−0.020	−0.113*	0.024
	(0.035)	(0.061)	(0.037)
Age	−0.000	−0.009	0.004
	(0.005)	(0.009)	(0.005)
Education	0.086*	0.135	0.060
	(0.051)	(0.088)	(0.052)
Sex	−0.124	−0.061	−0.180*
	(0.091)	(0.160)	(0.095)
Environmental Group Donation	0.407***	0.648***	0.302***
	(0.111)	(0.192)	(0.114)
Social Group Donation	0.115	0.220	0.073
	(0.111)	(0.193)	(0.115)
Work Association	0.050	0.194	−0.026
	(0.177)	(0.306)	(0.182)
Spend on Transportation	0.632*	1.131*	0.383
	(0.353)	(0.613)	(0.365)
Spend on Other Sustainable Behavior	−0.070	−0.024	−0.126
	(0.242)	(0.425)	(0.250)
R^2	0.256	0.132	0.240
Dose Test (Prob>F)[a]	0.745	0.167	0.190
Condition Test (Prob>F)[b]	0.460	0.416	0.600

Notes: Each column represents results from a separate regression of grouped sustainability behaviors. Standard errors are reported in parenthesis.
[a]Dose Test evaluates whether seeing any funder (either tax or subsidy) is statistically significantly different from the neutral treatment.
[b]Condition Test evaluates whether the tax funder is statistically significantly different from the subsidy funder.
*** $p < 0.01$; ** $p < 0.05$; * $p < 0.10$.

TABLE A7

Regression Analysis on the Effects of Treatment Type, Environmental Motivation, and Demographics on Different Stated Sustainable Behavior using *Only $500 Treatment Data*

	(1) Combined- All Behaviors	(2) Factor 1- Sustainable Transportation Behavior	(3) Factor 2- Other Sustainable Behavior
Treatment Effects			
Subsidy Treatment	−0.025	0.125	−0.093
	(0.102)	(0.175)	(0.104)
Tax Refund Treatment	0.108	0.352*	−0.010
	(0.108)	(0.186)	(0.111)
Environmental Motivation			
Internal Motive Average	0.558***	0.493***	0.620***
	(0.039)	(0.068)	(0.040)
External Motive Average	0.141***	0.238***	0.099***
	(0.031)	(0.053)	(0.032)
Demographics			
Social Leaning	0.034	0.035	0.031
	(0.037)	(0.064)	(0.038)
Fiscal Leaning	−0.120	−0.038	0.002
	(0.038)	(0.065)	(0.038)
CC Belief	−0.015	−0.001	−0.032
	(0.050)	(0.086)	(0.050)
CC Human Belief	0.032	0.019	0.036
	(0.044)	(0.076)	(0.045)
Income	−0.021	−0.111*	0.022
	(0.035)	(0.060)	(0.035)
Age	−0.003	−0.010	−0.000
	(0.004)	(0.007)	(0.004)
Education	0.031	0.088	0.008
	(0.048)	(0.082)	(0.049)
Sex	−0.042	0.110	−0.127
	(0.087)	(0.149)	(0.089)
Environmental Group Donation	0.407***	0.592***	0.311***
	(0.093)	(0.159)	(0.095)
Social Group Donation	0.029	0.252	−0.079
	(0.099)	(0.169)	(0.101)
Work Association	0.095	0.338	−0.044
	(0.161)	(0.274)	(0.163)
Spend on Transportation	0.0123	−0.076	0.050
	(0.218)	(0.372)	(0.222)
Spend on Other Sustainable Behavior	0.090	−0.116	0.181
	(0.229)	(0.391)	(0.234)
R^2	0.322	0.154	0.316
Dose Test (Prob>F)[a]	0.405	0.160	0.607
Condition Test (Prob>F)[b]	0.195	0.194	0.428

Notes: Each column represents results from a separate regression of grouped sustainability behaviors. Standard errors are reported in parenthesis.
[a]Dose Test evaluates whether seeing any funder (either tax or subsidy) is statistically significantly different from the neutral treatment.
[b]Condition Test evaluates whether the tax funder is statistically significantly different from the subsidy funder.
*** $p < 0.01$; ** $p < 0.05$; * $p < 0.10$.

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