Grantham Research Institute on Climate Change and the Environment

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August 2018

Grantham Research Institute on Climate Change and the Environment
Working Paper No. 302

ISSN 2515-5717 (Online)

The Grantham Foundation for the Protection of the Environment

The London School of Economics and Political Science

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Ganga Shreedhar and Susana Mourato*

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Abstract

We examine whether audio-visual media interventions that aim to increase donations towards biodiversity conservation cause pro-environmental spillovers on two subsequent behavioural intentions: The Willingness to Pay (WTP) a green fee and Willingness to Donate (WTD) time to an environmental campaign. In a controlled lab experiment, we exogenously vary the media exposure to brief biodiversity conservation videos and media content on the anthropogenic cause of biodiversity endangerment. We find media exposure has a positive spillover effect on the likelihood of stating a positive WTP, but not on WTD. Media content on the anthropogenic cause of biodiversity endangerment has both a direct causal impact on the amount donated, and an indirect positive effect on the time volunteered, especially for pro-social subjects who have donated to charities outside the lab. These results highlight that media content (on the anthropogenic cause) can cause positive short-run pro-environmental behaviours when there is behavioural similarity (i.e., voluntary contributions of money and time) for subjects who hold a stronger pro-social identity (past donors).

Keywords: Altruism; Biodiversity Conservation; Information and Knowledge, Communication; Experiment; Non-profit Institutions, NGOs; Emotions, Affect

Acknowledgements: We would like to thank the LSE Behavioral research lab - especially Tamara Ansons - for assistance while carrying out this experiment, and Kjell and Daniel for the production of the videos. We also extend a special thanks to Matteo Galizzi, Alessandro Tavoni, Nicholas Hanley, Andries Ritcher, and our colleagues at the Grantham Research Institute and Behavioural Science Departments at the LSE. We gratefully acknowledge funding for this research from LSE Department of Geography and Environment's Staff Research Fund (1-AGE-1886). The opinions expressed in this paper and any errors are our own.

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1 Introduction

Conservation organisations increasingly use persuasive audiovisual media like brief online videos to reach mass audiences. This strategy harnesses the growing tendency for the public to depend on audiovisual and digital modes of mass communication as a source of knowledge about environmental issues (Stamm et al., 2000; Doulton and Brown, 2009; Feldman et al., 2012; Gavin and Marshall, 2011; Schmidt et al., 2013; Sakellari, 2015; Vasi et al., 2015; Painter et al., 2018). Another reason that this strategy is vital is that most individuals are physically removed from conservation sites. There is also a shift towards sedentary activities involving electronic media comes at the expense of recreational choices located in nature (Pergams and Zaradic, 2008, 2006). But as noted by Waters and Jones (2011), there is much-untapped potential to leverage YouTube videos to float direct appeals for public involvement. But to take advantage these types of audiovisual tools and platforms, we need to understand both the direct and indirect effects that videos can have on individual decision-making.

As demonstrated in Paper 1, the narrative content of biodiversity conservation videos can have a direct effect on charitable donations. But they can also have unintentional, spillover effects on subsequent pro-environmental behaviours (PEBs) that are not the primary target of the video intervention. The conceptual framework of behavioural spillovers is useful to explore this possibility. It captures the notion that 'no behaviour sits in a vacuum' (Dolan and Galizzi, 2015). It recognises that an intervention may have unintentional effects on subsequent behaviours that are not directly targeted by it (Truelove et al., 2014). This framework allows us to consider whether the promotion of one pro-environmental behaviour (like watching videos and donating) raises the likelihood that individuals will adopt other PEBs in the following decision period (i.e., positive spillover), or reduces other PEBs (i.e., negative spillover) or even has no effect (i.e., no spillover). In the first case the intervention could be warranted, in the second case it needs reconsideration, and in the third case, we could have over-estimated its effects. The application of this tractable framework may be particularly useful in a conservation setting because organisations often try to amp up citizen engagement by following up donation appeals with smaller requests for future commitments.

Indeed, recent work documents that both positive and negative behavioural spillovers exist. Some studies show that audiovisual environmental media have a positive short-run impact on multiple PEBs, concern, attitudes, and beliefs (e.g., in Howell (2011)). But other studies show that engaging a pro-environmental behaviour may reduce later pro-environmental actions due to moral licensing, unintentional compensatory or offsetting effects. For example, Mazar and Zhong (2010) found people were more likely to act less altruistically and cheat, after buying

green products compared to conventional products.[1] The underlying mechanisms driving the direction of these spillover effects is often unclear, and depend on the intervention context and individual characteristics. Moreover, whether biodiversity conservation videos (and the media content within them) cause pro-environmental spillovers, is an open empirical question, warranting further investigation.

This paper builds on and extends Shreedhar and Mourato (2018), by examining if audiovisual media exposure from the biodiversity conservation videos and facing a donation task cause pro-environmental spillovers on two subsequent non-target behaviours: the Willingness to Pay (WTP) a green fee, and the Willingness to Donate (WTD) time to an environmental campaign. The first novelty of this paper is to extend the previous literature on media effects on behaviour by exploring the direct and indirect effects of both media exposure and content. In particular, we focus on media content about the anthropogenic cause of species endangerment. The second contribution is that we investigate if the similarity between PEBs (e.g., charitable donations of money and time versus willingness to pay a tax) impacts the likelihood of a positive spillover. We consider subjects' pro-sociality as a potential source of inter-subject heterogeneity, which can change the probability of a positive spillover effect between similar PEBs, such as revealed monetary donations and WTD time. As before, pro-social subjects are those who selected into altruistic environments in the real world, a more in-depth investigation into spillover effects of this sub-group is of academic and policy interest.

We found that both media exposure and content have direct and indirect effects on behaviour. Video content on the anthropogenic cause of endangerment increases the amount donated, but not the likelihood of donating. Video exposure increases the likelihood of a positive WTP green fee. We also found that past donors behave differently. They donated more when exposed to the anthropogenic cause of endangerment and were WTD more time when exposed to media content on the anthropogenic cause of endangerment. These findings convey that people's pro-environmental preferences and choices are endogenous to past choices interact with features of the behaviours themselves. Conservation organizations could also benefit by choosing to follow up requests with more similar types of behaviours.

In the next section, we locate our work in two strands of research: firstly, in studies seeking to quantify the behavioural impact of environmental films, and secondly, in studies about pro-environmental (and pro-social) behavioural spillovers. Section three outlines our experimental design, hypotheses, and procedures. Section four presents our results. Section five concludes

[1]For example, moral licensing is one type of behavioural spillover and refers to the effect that when people initially behave in a moral or pro-social way, they are later more likely to display behaviours that are immoral, unethical, or otherwise problematic. See Blanken et al. (2015) et al for a review of the literature on moral licensing.

with a summary of our key findings and discusses potential policy implications and directions for future research.

2 Related literature

2.1 Impacts of audiovisual environmental media

Audiovisual media can increase moral concern and pro-environmental behaviour (PEB), by communicating complex information quickly and memorably, using emotive images and narratives (Moyer-Gusé, 2008; Nicholson-Cole, 2005). Theoretical insights from economics and psychology suggest that audiovisual media can change behaviour through various conduits, such as increasing knowledge about the problem, and changing preferences, attitudes, beliefs and experienced affect about specific places, objects and issues covered in the video; and promoting the desirability of the pro-social action (La Ferrara, 2016; Howell, 2014; Nicholson-Cole, 2005; Pooley and o'Connor, 2000).

Previous studies reveal that environmental films can increase multiple PEBs, concern, attitudes, and beliefs, in the short-run (Balmford et al., 2004; Reusswig, 2004; Leiserowitz, 2004; Hart and Leiserowitz, 2009; Nolan, 2010; Jacobsen, 2011; Howell, 2011; Bahk, 2010; Greitemeyer, 2013; Howell, 2014; van der Linden, 2015; Janpol and Dilts, 2016; Arendt and Matthes, 2016). Most studies measure a range of PEBs and behavioural intentions using surveys, either before and after the film (within-subjects design), or after watching the film (between-subjects design). Sakellari (2015) and Howell (2014) provide recent reviews of the impact of climate-change cinema on PEBs, and DellaVigna and La Ferrara (2015) reviews quasi-experimental studies on how media impacts other social and economic behaviours.

Studies that focus on the impact of media exposure, i.e., watching an environmental documentary film, find positive short-term effects. For instance, Leiserowitz (2004) found that subjects who saw the 'Day after Tomorrow,' were more likely to state that they would donate money to or volunteer with a global warming group, apart from expressing greater risk perception, concern and worry about global warming. Nolan (2010), studied the impact of 'An Inconvenient Truth' and reported positive short-run effects on stated behavioural intentions to reduce personal emissions. Howell (2011) found 'The Age of Stupid' increased stated concern about climate change, motivation to act, and viewers' sense of agency (although these effects did not persist 10–14 weeks afterwards; also see Howell (2014).

Janpol and Dilts (2016) and Arendt and Matthes (2016) are the closest to our study because they use a between-subjects experimental design to look at media impacts on contributions towards the environment. Both studies assign individuals to watch either nature or non-nature documentary films, after which each person could choose to donate to an environmental or non-environmental cause. Janpol and Dilts (2016) found that a higher proportion of subjects exposed to the nature documentary made a pro-environmental contribution, and Arendt and Matthes (2016) found a positive effect on donations, only for a sub-group who expressed greater connectedness to nature. In associated work, Jacobsen (2011) used a quasi-experimental approach and found 'An Inconvenient Truth' caused an increase in the purchase of voluntary carbon offsets.

Few related studies look at the impact of message content of climate change films and find mixed short-run effects. For instance, Greitemeyer (2013) found that watching a climate change sceptic film decreased environmental concern, whereas watching a climate change affirming film did not affect subject's concern. Similarly, van der Linden (2015) found that subjects were less likely to sign a global warming reduction petition, and were willing to volunteer less time and money after watching a climate conspiracy video.

We contribute to this body of literature in several ways. First, we extend the empirical evidence on how media affects PEBs to persuasive and brief online charity videos, within the realm of biodiversity conservation. Second, we quantify the separate impacts of media exposure to audiovisual information and additional audiovisual message content on donations, and two different stated behavioural intentions: namely to pay a fee and donate time. Also, we examine if behaviour varies across three different conservation videos, namely a charismatic species, a non-charismatic species and habitat, each with and without the anthropogenic cause of threat (therefore six videos in total), as a robustness check. Third, we consider how videos cause short-run behavioural changes using a spillovers framework, where we conceptualise that audiovisual media interventions targeting donations (direct effect), may unintentionally impact subsequent stated behavioural intentions (spillover effects). Thus, while previous work finds that audiovisual media affect multiple PEBs, we explicitly incorporate the sequential nature of pro-environmental decision making, into our analysis, as discussed below.

2.2 Pro-environmental behavioural spillovers

Previous experimental studies have quantified pro-environmental and pro-social behavioural spillovers, by exogenously varying price incentives, nudges, and information provision (e.g., in Alpízar et al. (2017b,a); d'Adda et al. (2017); Thomas et al. (2016); Lanzini and Thøgersen

(2014); Poortinga et al. (2013); Baca-Motes et al. (2012); Thøgersen and Ölander (2003). Studies using experiments (and longitudinal surveys), with sequential decision tasks show mixed results, demonstrating negative, positive or no spillover effects. We refer the reader to Nash et al. (2017); Truelove et al. (2014) and Dolan and Galizzi (2015), for recent reviews from environmental psychology and economics.

Studies examining spillover effects of audiovisual information are closer to this article. These studies primarily focus on how specific 'incidental' emotions caused by the emotion-arousing video clips, which are unrelated to the subsequent decision task, impact behaviour (Hanley et al., 2017; Andrade and Ariely, 2009; Harlé and Sanfey, 2007; Lerner et al., 2004). For instance, Harlé and Sanfey (2007) found lower acceptance rates of unfair offers, when subjects were exposed to movie clips eliciting sadness. Andrade and Ariely (2009) exposed subjects to films that cause either happy or angry affective states, followed by a series of sequentially designed Ultimatum and Dictator games. They found that subjects exposed to film clips eliciting anger were more likely to reject unfair offers and make fairer offers in both games, highlighting the potential importance of behavioural consistency. On the other hand, Hanley et al. (2017) found no impact on willingness to pay to improve coastal water quality and fish populations, when subjects were exposed to film clips arousing, happy, sad or neutral emotion states. We extend this body of work, by considering if environmental film clips intentionally designed to increase donations, cause PEB spillovers.

We also attempt to shed light on whether behavioural similarity affects both the direction and existence of PEB spillovers. Previous research suggests that a higher perceived degree of similarity between different behaviours can influence spillover effects (Thøgersen, 2004), but few studies systematically examine this (Truelove et al., 2014; Dolan and Galizzi, 2015). For instance, a positive spillover is more likely if individuals are prone to co-perform similar behaviours (Gatersleben et al., 2002), or if they act to prevent cognitive dissonance, or have preferences for behavioural consistency (Bem, 1972; Thøgersen, 2004). More specifically, Thøgersen (2004) noted that if individuals perceive that two behaviours are linked to a common goal, individuals might experience cognitive dissonance when performing one, and not the other. In addition, an individual's self-identity can be strengthened when she undertakes consistent choices in a specific domain, which may lead to behavioural consistency within that domain (Van der Werff et al., 2013; Whitmarsh and O'Neill, 2010). In one of the few studies on the topic, Margetts and Kashima (2017) found that positive spillover effects were more pronounced for behaviours that required similar money resources (between green shopping and willingness to pay a green fee) than for the behaviour that demanded dissimilar resources (between green shopping that required money and willingness to donate time to a charity).

On the other hand, there may be a negative spillover between similar behaviours, if subjects have a weak pro-environmental or pro-social identity (Whitmarsh and O'Neill, 2010; Truelove et al., 2014). Fishbach et al. (2006) propose that behaviours within a domain may be perceived as substitutes, so that the successful performance of the first behaviour might be regarded as having done enough to move towards the goal, reducing the need to perform the second goal-related behaviour. Another mechanism facilitating negative spillovers is the 'self-licensing' or 'moral licensing' effect, where an individual's inclination to engage in moral behaviours decreases after undertaking the previous sustainable behaviour (Clot et al., 2016; Mazar and Zhong, 2010; Sachdeva et al., 2009). There is experimental evidence of negative spillover effects within the same behavioural domain and across behaviours with great similarity. Within electricity conservation, Noblet and McCoy (2017) found individuals who engaged in past sustainable energy behaviours are less likely to support proposed energy efficiency/renewable energy policy investments. Brañas-Garza et al. (2013) found donations in the previous period negatively affected present decisions in a sequence of dictator games that tested pro-social behavioural spillovers. These findings lend empirical support for the simultaneous existence positive and negative spillovers (Thøgersen and Ölander, 2003; Effron and Monin, 2010).

We contribute to this work, by mapping the spillover effects from videos across different classes of pro-environmental behaviours of varying degrees of similarity. We focus on whether positive spillovers occur within the same behavioural domain of charitable donations, compared to the willingness to pay a green fee. The latter can be perceived as stating policy support for mandatory tax payment and is arguably dissimilar to giving money and time, which are two types of voluntary contributions (albeit measured in different resource units). In support of this, Duncan (1999) theoretically predicts that volunteering time and money can be perfect substitutes for contributors to the public good. Carpenter and Myers (2010) also provide experimental evidence that donations of money and time are correlated in a sample of fire-fighters (also see Bauer et al. (2013) for similar evidence from cross-country surveys). Other studies point out that volunteering time and money is perceived differently from the willingness to pay a green tax due to the compulsory 'push' element of regulatory coercion associated with taxes, which in turn can have behavioural implications (Drews and Van den Bergh, 2016; Steg et al., 2006).

In related work, Clot et al. (2016) found that inducing environmentally-orientated students to imagine a compulsory commitment to a virtuous act (called the 'regulatory condition') resulted in a licensing effect. More precisely, individuals donated less money to an environmental cause, compared to those subjects who imagined a voluntary commitment to an environmental program (non-regulatory condition) and a control condition (no commitment to any virtuous act was imagined). They also find that environmental-orientated students donated significantly

more than business-orientated students in the non-regulatory condition. We extend this work, by considering if there are spillover effects from money donations (voluntary contribution) to the willingness to pay a fee (coercive tax regulation) to the willingness to donate time (voluntary contribution). By doing so, we attempt to recreate a sequence of three separate environmentally-relevant decisions, to trace whether individuals reverse or enforce previous environmental and moral behaviour, across different behavioural domains. We also pay careful attention to whether pro-social subjects show positive spillover effects from watching videos and donating money, to giving time. We describe our experimental design and procedures in more detail in the following section.

3 Experimental design

3.1 Experimental design and hypotheses

We follow Truelove et al. (2014) to define a behavioural spillover as the effect of an intervention on subsequent behaviours not targeted by that intervention. Panel A in Table 1, describes the three behaviours, which are the outcome variables in our study. Behaviour one is charitable donations of money (Donations) and is the target of the intervention. Behaviour two is the stated Willingness to Pay a green tax (WTP), and behaviour three is the stated Willingness to Donate time to an environmental campaign (WTD time). In line with Dolan and Galizzi (2015), we conceptualise that the behaviours take place sequentially, i.e., behaviour one is followed by behaviour two, and then behaviour three. Table 1, Panel B summarises the between-subjects 'add-on' experimental design.

[Table 1]

Subjects are randomly assigned to a No Video condition, or to watch one of the different videos, without or with the anthropogenic cause of endangerment (called Control Videos and Cause Videos conditions respectively). In the No Video group, we directly elicit the WTP a green fee and then the WTD time from subjects. In the Control Video group, the baseline videos contain conservation-relevant information (for example the ecological role and conservation status of each species, described in detail in the next subsection). In the Cause Video group, we add audiovisual information on the anthropogenic cause of threat to each baseline video. After subjects watch the video, we elicit charitable donations, using an incentive-compatible modified dictator game, followed by the stated WTP a green fee and then the WTD time, as described in the following subsections. This design allows us to compare potential differences in donations,

WTP a green fee and WTD time between subjects in different treatment groups, to yield direct and spillover treatment effects of media interventions.

We formulate three hypotheses based on the literature reviewed in the previous section. First, we consider the direct treatment effect of media content describing the anthropogenic cause of endangerment, on donations. We build on the insight that additional textual information on the human-made causes of bio-diversity depletion increases the stated WTP to undo the harm caused (Bulte et al., 2005; Brown et al., 2002; Kahneman et al., 1993). For instance, Bulte et al. (2005) find that Dutch respondents are willing to state a higher WTP to protect seals when they appear to be threatened by human-made factors, such as oil and gas drillers, or by the greenhouse effect. Assuming audiovisual messages on the human-made causes of species depletion has a similar impact on donations:

Hypothesis I: Exposure to media content about the anthropogenic cause of endangerment, has a positive direct effect on contributions, i.e., Δ DonCause = DonCause Video – DonControl Video > 0.

Now we consider two of types of spillover effects on the WTP fee and WTD time. First, we explore the spillover effect of media exposure to videos aiming to increase donations and donating (between subjects with No Video, Control Video, and Cause Video groups). Second, we look at the spillover effect of media content on the anthropogenic cause of threat, conditional on having been assigned to one of the Videos and facing a donation task (between subjects in Control Video and Cause Video groups). While the former measures the unintended effect of exposure to a charity video (and facing a costly donation decision), the latter measures unintended consequences of a specific type of campaign message, controlling for the baseline audiovisual conservation information. Given the mixed results in the previous literature (e.g., in Janpol and Dilts (2016); Arendt and Matthes (2016); Howell (2014); Greitemeyer (2013), we formulate and test a null hypothesis of no spillover effect from media exposure and content on WTP:

Hypothesis II: There is no spillover effect from biodiversity conservation videos on WTP a green fee or WTD time. More specifically, there is:

Hypothesis II-A: Media exposure has no spillover effect: ΔWTPVideo — D = WTPVideo — D – WTPControl = 0 and Δ WTDVideo — D, WTP = WTDVideo — D, WTP – WTD-Control — WTP = 0.

Hypothesis II-B: Media content on the anthropogenic cause of endangerment has no spillover effect: Δ WTPCause — D = WTPCauseVideo — D – WTPVideo = 0 and Δ WTD-Cause — D, WTP = WTDCauseVideo — D, WTP – WTDVideo — WTP = 0.

However, as discussed previously, positive spillovers may be more likely if there is a higher similarity between two behaviours if subjects have preferences for consistency or hold a stronger pro-social identity (Thøgersen, 2004; Truelove et al., 2014; Margetts and Kashima, 2017). In our experimental set-up, there is arguably more similarity between money donations and WTD time as they are both pro-social actions. Subjects who donated to charities in the past are demonstrably more pro-social than those who have not, by already selecting into altruistic environments in the real world. Notably, previous work has shown that pro-sociality measured in the lab predicts behaviour in the field (Benz and Meier, 2008) and that pro-social preferences are stable over long periods of time (Carlsson et al., 2014; Volk et al., 2012). Thus, it is possible that past donors may perceive the greater similarity between charitable donations and WTD time, leading to the higher likelihood of positive behavioural spillovers on WTD time, for these pro-social subjects. We test the following hypothesis:

Hypothesis III: Media exposure and content have a positive spillover effect on WTD time amongst pro-social subjects, i.e., subjects who report donating to charity in the past.

3.2 Experimental procedure

All sessions were run at the London School of Economics Behavioural Research Lab (LSE BRL) during November to December 2016. The experiment was hosted on the Qualtrics platform. We followed a double-blind experimental procedure, where subjects were randomly assigned to a computer terminal upon arrival, after which the computer program randomly assigned each subject to one treatment group. Participation was open all individuals registered at the LSE BRL to obtain a heterogeneous subject pool and an adequate sample size for all treatments. In total, 259 subjects participated, and each treatment group had an average of 37 subjects. Each subject was paid a £5 show-up fee that they could collect at the end of the experiment. Apart from this, all subjects had an equal chance to earn a maximum of £25 from the charitable giving task, but only one subject was randomly selected in each session to receive this payout. Such lottery methods to determine payment have been used in other studies such as Clot et al. (2016). Moreover, in a recent paper, Charness et al. (2016) review a series of experimental games (including dictator games) and find that paying one or paying all subjects in a session

results in qualitatively similar behaviour.

3.3 Video interventions

Existing videos had not been designed to provide conservation-relevant information in a controlled manner suitable for this experiment's objectives. Thus, we constructed three standardised Control Videos, featuring a non-charismatic species (Bats), a charismatic species (Lions) and a composite habitat composed of the two species (Bats and Lions in the Savanna). Each video had a sequence of fifteen photographs for each species/habitat, with a standardised voice-over, first introducing the species/habitat, the ecological role of each species, it's conservation status, and a line that habitat loss due to land conversion, is a cause of endangerment.[2]

The Cause videos are identical to the Control Videos, barring one additional photo and a line of voiceover stating that another important cause of species decline is hunting and poaching. This is useful for numerous reasons. Firstly, understanding how responses to information about human-made drivers of endangerment are critical to generate greater awareness about the nature of the Anthropocene and associated environmental problems (Dirzo et al., 2014; Waters et al., 2016). Secondly, hunting is an unambiguous anthropogenic cause of biodiversity loss and can invoke moral assessments of right and wrong (Fischer et al., 2013). The issue of hunting is also underrepresented in the environmental and conservation behaviour literature (St John et al., 2011). Importantly, hunting and illegal wildlife trade is a consistent cause of species decline for both species considered (IUCN, 2016). Following the procedure outlined in (Gross and Levenson, 1995), subjects were exposed to a blank screen for 20 seconds, followed by the conservation appeal, lasting for an average length of 150 seconds.[3]

3.4 Donations

After subjects were exposed to the video, they were directed to a donation page, which carried one photo of the species/habitat featured in the , and instructions for the donation task. We adopt a modified dictator game used in other charitable giving experiments (e.g. in Eckel and Grossman (1996). An endowment of £25 was given to each subject. Subjects could choose to allocate any part of this endowment) to the African Wildlife Foundation, a conservation charity (in £1 increments). We chose an endowment of £25 because it is a frequently suggested donation amount by conservation charities and of sizeable economic magnitude (five times the show-up

[2]See Appendix in Shreedhar and Mourato (2018) for supplementary materials.

[3]After this, we also elicit stated affect from the video clip, which is analysed in greater detail in Shreedhar and Mourato (2018).

fee). This incentive-compatible design increases to cost of being pro-social to all subjects facing the donation task, but holds the cost itself fixed across subjects across treatment groups. We adopt several design features to make the decision setting more realistic: for instance, donations go to conserve the same public good, i.e., vulnerable African species and their habitats. Also, the instructions informed the subjects that they would be sent a payment receipt if they so desired, upon writing down their lab identification code and postal address.

3.5 Willingness to Pay (WTP) a green fee

Subjects stated their WTP a green fee after watching one of the videos and making their donation decision. Conversely, subjects in the No Video condition, were directly exposed to the question on the WTP a green fee. The proposed tax was an additional fee per disposable cup of hot beverage on the LSE campus and could lie between 0 to 100 pence per cup. Any revenue raised would be earmarked for environmental sustainability projects on the LSE campus. We emphasized consequentiality to reduce hypothetical bias, by stating that their responses would be used to inform LSE's sustainability policy (Bulte et al., 2005). We also used an entreaty to promote truth-telling through the following message: 'Please provide your honest answer' and 'While answering, please consider how many hot drinks you buy at LSE in disposal cups and how much that extra charge will affect you' (Loomis, 2014). Subjects could select any amount between 0 to 100 pence in one penny increments using a slider task (default was set to 0 pence). To control for potential sources of individual heterogeneity, we asked two control questions, after subjects stated their WTP. The first question asked how often they bought hot beverages on the LSE campus, on a Likert scale of 1 (Never) to 7 (Always). The second question asked how often subjects used reusable beverage cups, on a Likert scale of 1 (Never) to 5 (Always).

3.6 Individual attributes

Next, subjects answered questions about whether they had donated previously to charity, to obtain a measure of how pro-social they were.[4] Subjects also answered three self-assessment questions measuring PEBs, on how often they bought eco-friendly products, organic/local/seasonally grown food and how often they recycled. The responses were measured using Likert scales from 0 (Never) to 4 (Always). Each subject's answer to these three questions was averaged to form a single PEB score, in order to capture to what extent subjects engage in previous behaviours. We collected socio-demographic characteristics, such as age, gender, whether they were full-time

[4]Another option would be to as subjects whether they consider themselves pro-social, to get a self-assessment measure of their identity. We did not want to prime the subjects to be pro-social by asking them before the video and were concerned measures elicited after watching the video would be biased. Thus, we prefer to use a survey measure of revealed behaviour, by directly asking subjects if they had donated to charity previously.

students, and their affiliation to the LSE.

3.7 Willingness to Donate (WTD) time

Lastly, we measured the WTD time to an environmental campaign, which is the second non-target behaviour in our experimental set-up. After subjects answered questions on individual attributes, the experiment ended with a question on whether and how much time subjects would be willing to volunteer to organize events to raise awareness of environmental issues on campus in the following semester. They had to indicate their willingness to donate time by choosing a number between 0 to 7 hours using a slider task (where the default was set to zero).[5]

3.8 Sample

Of the total sample, 63.71% was female and had an average age of 24 years. Eighty point three one percent (80.31%) were full-time students, and 73% were affiliated to the LSE (in Appendix, A.1). There was balance across individual attributes by treatment group, and shows balance on most attributes, barring age (one group elicited slightly older people). As we follow a double-blind random assignment, this is likely due to chance (Table A.2 in Appendix).

4 Results

After describing our estimation strategy, we report our main results in three subsections, corresponding to each hypothesis, i.e., direct effect on donations, spillover effects on WTP and WTD, and heterogeneous spillover effects by pro-social subjects, i.e., past donors.

4.1 Estimation strategy for direct and spillover effects

We used the linear two-part Cragg-Hurdle model to estimate impacts on bounded outcomes (Cragg, 1971), due to the nature of our outcome variables and experimental set-up. For in-

[5] A possible concern is that the WTD time elicited here captures the stated intention to donate time to an *unspecified environmental campaign* on the LSE campus next semester. As the treatment is perfectly random, any difference in the stated intention across groups should capture the spillover effects. But the effects should be interpreted with caution if subjects are unclear what they are donating their time to, or what they are 'buying' with their time. For instance, the measure may be possibly affected by hypothetical bias, which could service to inflate the WTD time measure and the size of the spillover effect.

stance, when we estimated the treatment effects on charitable donations, the first part of the Cragg-Hurdle model deals with the decision of whether to donate (i.e., the first hurdle is the decision to give a non-zero amount) and was estimated using a probit regression model. The second part deals with how much to donate (i.e., the unbounded outcome), which is estimated by using a truncated linear regression model.[6] We applied similar reasoning to determine the treatment effects on WTP a green fee and WTD time.

This estimation strategy yielded several advantages over standard statistical tests. First, it allowed us to consider the distinct causal effects of each treatment variable on the probability of donating a non-zero amount (Probability) as separate from the decision of how much to give (Amount). While previous experimental evidence from dictator game experiments does find distinct treatment effects on donation probability and amount (Engel, 2011), how media exposure and content impact the two-part decision is an open empirical question. Second, it allowed us to control for potential session-fixed effects, by adding session dummies. In addition, we added another covariate for the number of subjects per session, to control for any variation in the expected payout from the donations game, which may in turn impact donations and spillover effects. We also used robust standard errors-clustered at the subject-level. Third, it allowed us to control for individual heterogeneity as an additional robustness check, by using individual-level covariates (such as age and gender). In the following subsections, we restrict our attention to discussing the impact of media exposure and content in the text, and present results for the pooled Cragg-Hurdle regression models (with dummies to control for each video type, i.e., Bats, Lions, Savanna).

4.2 Direct effect on donations: Media content on anthropogenic cause of endangerment

Average contributions for the pooled sample were about £8.72 or 34.88% of the endowment (the median and mode = £5).[7]. While it is possible that higher offers in our experiment were due to media exposure, we do not have another subject group which did not watch any film, so it is difficult to conclude this was the case. In total, 13.45% of the sample chose to zero-donations. From Figure 1, we see average donations are higher for subjects exposed to Bats and Savanna Cause Videos, and Lions groups (around 39-40% of endowment), providing suggestive evidence that media content positively impacts donations.

[6]The Cragg-Hurdle model treats the first hurdle i.e., donations of zero currency units, as an observed value of behavioural and policy interest rather than censored or selected variable values; it is preferable to alternatives like the Heckman selection model (Wooldridge, 2010). The estimation strategy is explained in the Appendix of Shreedhar and Mourato (2018).

[7]This figure is close to but marginally higher, than offers in charitable giving experiments, such as 30% in Eckel and Grossman (1996), but higher than offers made in anonymous dictator games of around 20% in Camerer (2003).

[Figures 1]

Table 2 presents results of the Cragg-Hurdle model on donations, with session and video controls. The explanatory variables of interest are a treatment dummy for Cause Videos, with the omitted category being the Control Video group. From model (1), there was no impact on the probability of donating a non-zero amount. But in Model (2), media content on the anthropogenic cause of endangerment increased the amount given, conditional on having decided to donate (significant at 5%). This result implies that additional media content from Cause videos elicits higher donations by around £2.05, relative to the control videos. Given the lower threshold for contributions on many charity's websites are £5, the effect size is of relatively sizeable magnitude, especially when scaled across a large population. Thus, we find confirmatory evidence for the hypothesis of the positive effect of media content on donations, in line with insights from previous studies (e.g., in Bulte et al. (2005); Kahneman et al. (1993)).[8]

[Table 2]

4.3 Spillover effects on WTP a green fee and WTD time: Media exposure and media content

Figure 2 presents the average WTP green tax by treatment group, and the average WTP a green fee for the pooled sample is 22.72 pence (median = 20 pence). Figure 3 presents WTD time to a campaign. We found that the average for the pooled sample is around 2.34 hours (median = 2 hours). In Table 3, models (1, Probability) and (2, Amount), provide the results of the effect of media exposure to either the Control or Cause Video on WTP, with session and video controls. Model (1) shows that when subjects are exposed to any video, they were more likely to state a positive WTP, relate to the no video control group (significant at 1%). In addition, model (2) demonstrates that there is a weak positive effect on WTP amount, conditional on having decided to state a positive WTP (significant at 10%). This finding is in line with previous literature, such as Janpol and Dilts (2016) and Howell (2011), who also found that exposure to environmental films can increase stated the intention to engage in future PEBs and elicit more support for green policies. However, we found that spillover effects are more robust on the probability of choosing to pay a fee, rather than the amount.

[8] When we add individual controls in Table A.3, the significance on the Cause variable falls, although none of the individual covariates are significant (barring full-time student status, which is positive and significant at 5%). The Lions videos increase the probability of donating in all specifications (weakly significant at 10%).

[Figures 2 and 3] [Table 3]

On the other hand, Models (3) of the Probability, and (4) of the Amount, indicate that on average, there is no spillover effect on WTD time, for the pooled sample. This result suggests that the extent to which the impact of the charity videos can carry over to impact subsequent PEBs may be limited.[9] Our results are robust to the inclusion of (i) session controls in the main models (ii) the addition of individual controls (iii) behavioural lags, including donation and WTP, and (iv) replicating analysis with separate discrete choice Probit, models, and Tobit and OLS regression models. The robustness estimates provide qualitatively similar results, but are omitted for brevity, and are available on request.

In summary, although we did not observe a negative spillover effect on WTD time, we did not see positive spillover effects either. More generally, these results reveal only a modest impact of media on pro-environmental behaviour, unlike studies which document changes in a far more extensive range of PEBs after exposure to environmental films (e.g., in Howell (2011) and Leiserowitz (2004)). There are several potential reasons for this, although it is difficult to conclude why this is the case. Firstly, unlike many previous studies that use cross-sectional or before-and-after surveys and a self-selected sample, our experimental design followed sequential behaviours and allowed us to map how past decisions impact future choices. Given this, our findings suggest that after subjects undertake the money donations task and state their WTP a green fee, there is no spillover effect of videos on WTD time. Relatedly, real monetary stakes may have dampened subsequent stated behavioural intentions, by increasing the salience of money to crowd out moral motives (Bolderdijk et al., 2013) or by reducing hypothetical bias (Lönnqvist et al., 2011; Harrison, 2006). Secondly, our experimental design incorporated brief conservation videos rather than full-length documentary films that can arguably have a weaker effect on behaviour.

4.4 Heterogeneous spillover effects

We explored subgroup variation in a regression framework used in previous work such as Heckman et al. (1997, 2002), Djebbari and Smith (2008) and Ferraro and Miranda (2013). More specifically, we considered the interactions terms between the treatment variables (i.e., media exposure effects by dummy variables for No Video, Control and Cause Videos, or media content by a dummy for Control and Cause Videos) and the donor dummy, which switches on if

[9] From Table A.4, when we add individual controls to model (7), we find that media content on anthropogenic cause of endangerment increases the probability of stating a positive WTD time (significant at 5%). We also find that a higher PEB score is associated with a positive probability of stating a positive WTP (significant at 1-5%), and positive with amount and probability of stating WTD (significant at 1%).

subjects donated to charities in the past. We ran independent regressions for the donor subgroup covariate, following Heckman et al. (2002), continued using the Cragg-Hurdle model as before, with session and video controls, and clustered robust standard errors at the subject-level.

In total, 74.51% had donated to charities in the past and were considered 'pro-social' subjects for this study. We tested if these pro-social subjects were more likely to show a positive spillover effect on WTD time, by first considering the direct effects on donations, presented in Table 2, models (3) and (4). We found that the coefficient on the interaction term between Past Donor and Cause Video increased in magnitude, and is significant at 5%. This result indicates that pro-social subjects are especially sensitive to messages on the anthropogenic cause of endangerment, relative to non-donors, controlling for other covariates (this result is robust to the addition of individual controls). Secondly, we found that - controlling for other covariates - pro-social subjects donated lower amounts relative to those who did not donate in the lab. One explanation for this is that subjects state lower donation amounts in the lab because they engage in more pro-social activities in the real world. Another possibility is that pro-social subjects become 'reluctant sharers' in the lab, i.e., they demonstrate lower levels of pro-social behaviour when they cannot remove themselves from the sharing opportunity in the donation task (Lazear et al., 2012).

[Table 4]

Next, we considered spillover effects on WTP a green fee and WTD time, in Table 4. As per our hypothesis, we found that the interaction term between the Cause Video and Past Donor dummy had a positive and significant effect on the amount donated (conditional on deciding to donate), in models (4) and (8). This finding lends empirical support to the idea that positive spillovers from media exposure to Cause Videos and media content on the anthropogenic cause of endangerment are more likely, between similar behaviours, when subjects are more pro-social. It is in line with studies which highlight that heterogeneity across individuals impacts measured spillover effects (e.g., in Clot et al. (2016), as well as impacts of the media (e.g., in Arendt and Matthes (2016)). This finding is also in line with literature which highlights that self-identity plays a vital role in influencing behavioural change (e.g., in Van der Werff et al. (2013); Whitmarsh and O'Neill (2010). However, we did not find a similarly positive and significant effect on the interaction term between Control Video and Past Donor. This suggests that videos with narratives that draw attention to the negative impact of humans on the environment may have a spillover effect of larger magnitude, amongst this sample. These results are also robust to the addition of individual controls, and to restricting observations to the sub-sample of donors.

5 Discussion and conclusion

Online and digital audiovisual media have a crucial role in increasing awareness and support for conservation, and more broadly, in fostering environmental education. Thus, understanding the direct and spillover effects of media exposure and content represents a valuable research enterprise. Interestingly, relatively few studies have examined how media affects PEBs, using a spillovers framework. Most studies on how audiovisual media impacts behaviour demonstrates that there can be positive (albeit) short-run effects on multiple PEBs, and behavioural intentions. Others have shown that specific types of message content also can impact intentions negatively (e.g., climate conspiracy videos), or have no impact. The bulk of past research moreover focuses on measuring multiple PEBs in a self-selected sample and primarily focus on climate change films, especially documentaries.

We contribute to the literature on how media impacts environmental behaviour by using the conceptual framework of behavioural spillovers. More specifically, we map the sequential nature of decision making to examine how media exposure and content can have distinct spillover effects in the short-run. We drew from the literature on PEB spillovers, which have not yet, to our knowledge, examined spillover effects of audiovisual media on biodiversity conservation. Thus, we have attempted to bring together these two lines of research, to map out the direct and spillover effects of media exposure and content of brief biodiversity conservation videos.

We provide initial evidence that people can behave consistently, generating positive spillovers, when exposed to media about biodiversity conservation. Moreover, unintended positive effects persist from exposure to media content on the anthropogenic cause of endangerment, when behaviours are more similar, and subjects are already pro-social. These results are broadly consistent with previous research on pro-social and pro-environmental behavioural spillovers, as well as on the impacts of audio-visual media. However, they document more modest impacts of brief videos on multiple PEBs than previous studies.

We found that media exposure caused positive spillover effects on the WTP a green fee, by increasing the probability of subjects donating a positive amount, but there are limited effects on the WTD time. We also found that media content on the anthropogenic cause of endangerment engenders positive spillover effects on the amount of time subjects are willing to donate (conditional on having decided to give) for pro-social subjects. This result provides initial empirical support, which greater similarity between subsequent behaviours, such as monetary donations and WTD time, can engender positive spillovers for pro-social individuals. In addition, it highlights that audiovisual information effects are heterogeneous.

These findings hold some potential policy implications. Firstly, exposure to audiovisual media can have positive or no spillover effects on subsequent PEBs, suggesting conservation organisations can follow up donation requests, with smaller requests on behavioural intentions. Secondly, we iterate that special care must be paid to design of media content, and the narratives presented in videos as noted in Paper 1 for the additional reason that they can have spillover effects. Information on the anthropogenic cause of endangerment is a promising avenue to consider to raise PEBs and behavioural intentions. Lastly, follow-up requests that are more similar to previous behaviours (e.g., money donations and WTD time) may yield positive spillover effects amongst donors.

That said, our findings must be seen with caution for a couple of reasons. Our methodological approach of using a lab experiment yields the advantage of having greater control over media exposure and content, and in the mapping of different behaviours sequentially. However, there are concerns regarding external validity, if the findings from within the lab do not translate qualitatively in the field context. We attempt to engage with this issue, by explicitly examining how pro-social subjects behave in the lab, given the existing evidence on the stability of social preferences in the lab and the field. We find that pro-social subjects are likely to donate lower amounts (conditional on deciding to give and controlling for other covariates), which may be an artefact of the lab environment. But they are also more responsive to audiovisual messages on the anthropogenic cause of endangerment and show heterogeneous impacts regarding spillover effects on WTD time. We also cannot entirely rule out the potential effect of experimenter demand on behaviour. Future work can address these concerns, by using a field experiment, to test how robust these findings are in a larger and more representative sample. We also hope that subsequent research may shed further light into underlying mechanisms and processes associated with the enduring spillover effects on a broader range of behaviours, to leverage the widespread use of digital and online media, for conservation and environmental protection.

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6 Tables and Figures

Table 1: Conceptual framework and experimental design

Panel A: Description of variables			
	Behaviour 1	Behaviour 2	Behaviour 3
Outcomes:	Donations (Don)	Willingness to Pay Tax (WTP)	Willingness to Donate Time (WTD)
Intervention focus	Target	Non-target	Non-target
Elicitation order	First	Second	Third
Range	£0-25	0-100 pence	0-7 hours
Unit	Money	Money	Time
Measure	Revealed behaviour	Stated intention	Stated intention
Type	Voluntary contribution	Coercive regulation	Voluntary contribution
Panel B: Experimental design			
Outcomes:	Donations (Don)	Willingness to Pay Tax (WTP)	Willingness to Donate Time (WTD)
Interventions:			
Control	-	WTP No Video	WTD No Video
Intervention 1, Video	Don Control Video	WTP Control Video-D	WTD Control Video-D,WTP
Intervention 2, Cause Video	Don Cause Video	WTP Cause Video-D	WTD Cause Video-D,WTP

Figure 1: Charitable donations

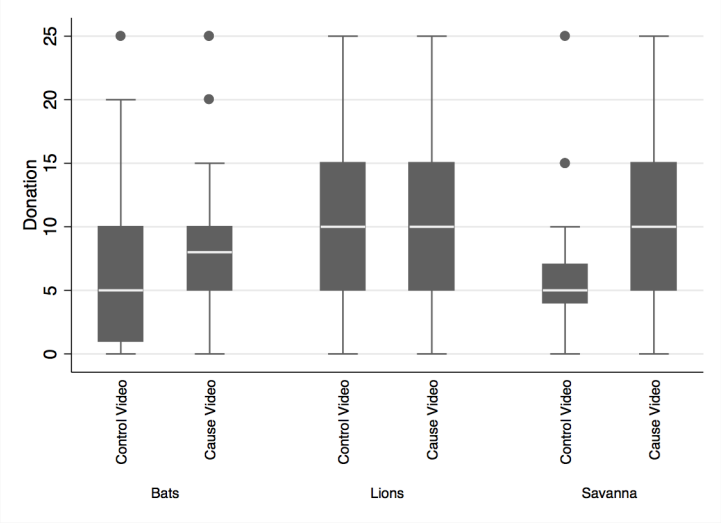


Table 2: Direct effect on donations: Media content on anthropogenic cause of endangerment

Sample:	All		Sub-group analysis	
Hurdle type:	Probability	Amount	Probability	Amount
Hurdle models:	(1)	(2)	(3)	(4)
Media Content = 1, Cause Video	0.234	3.073**	0.0255	-2.325
	-0.221	-1.487	-0.574	-2.974
Past Donor = 1, Yes			-0.413	-5.929**
			-0.406	-2.572
Cause Video X Past donor			0.247	7.363**
			-0.641	-3.366
Constant	7.189***	2.114	7.806***	8.391*
	-0.29	-4.007	-0.549	-4.867
Observations	223	223	223	223
Session controls	Yes	Yes	Yes	Yes
Video controls	Yes	Yes	Yes	Yes

Notes: Robust standard errors clustered at subject-level in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Linear Cragg-Hurdle model with donations is truncated at 0: the hurdle is modelled as a probit regression model, and the amount donated as a truncated linear regression. Session controls include subjects per session and session dummies. Video controls includes dummies for video type (i.e., Bats, Lions and Savanna videos).

Figure 2: Willingness to pay (WTP) a green fee

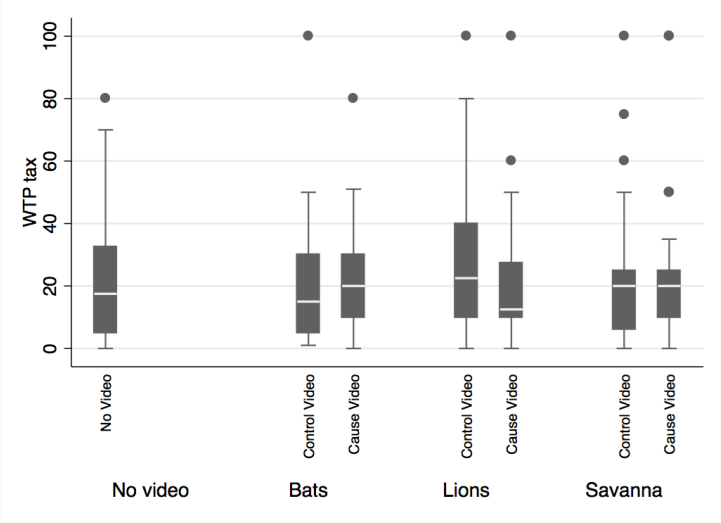
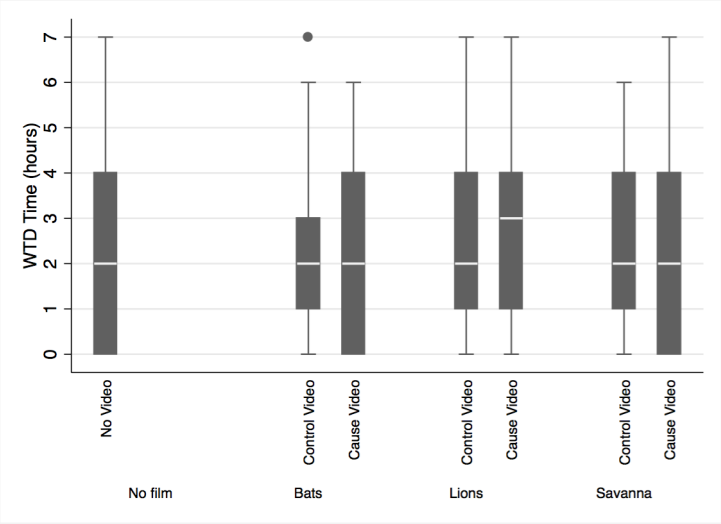


Figure 3: Willingness to Donate (WTD) time



7 Appendix

Table 3: Spillover effects on WTP a green fee and WTD time: Treatment effect of media exposure and media content

Treatment effect:	Media exposure				Media content on Cause			
Outcome variable:	WTP		WTD		WTP		WTD	
Hurdle type:	Probability	Amount	Probability	Amount	Probability	Amount	Probability	Amount
Hurdle model:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Media = 1, Control Video	4.744***	96.46*	0.687	1.085				
	-0.601	-54.25	-0.681	-1.005				
Media = 2, Cause Video	4.836***	94.86*	0.454	1.51	0.0926	-1.72	-0.233	0.434
	-0.622	-54.28	-0.69	-1.032	-0.258	-13.05	-0.193	-0.325
Constant	-4.944	-538.7*	-1.801	-14.25**	6.274***	-60.56	0.346	1.427***
	-5.294	-307.1	-3.971	-6.157	-0.457	-79.61	-1.12	-0.494
Observations	259	259	259	259	223	223	223	223
Session controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Video controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Robust standard errors clustered at subject-level in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Linear Cragg-Hurdle model with donations is truncated at 0: the hurdle is modeled as a probit regression model, and the amount donated as a truncated linear regression. In Models (1)-(4), No Video is the omitted category, and in Models (5)-(8), Control Video is the omitted category. Session controls include subjects per session and session dummies. Video controls include dummies for video type (i.e., bats, lions and savanna videos).

Table 4: Heterogeneous spillover effects: Pro-social subjects

Treatment effect:	Media exposure				Media content on Cause			
Outcome variable:	WTP		WTD		WTP		WTD	
Hurdle type:	Probability	Amount	Probability	Amount	Probability	Amount	Probability	Amount
Hurdle models:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Media = 1, Control Video	5.475***	96.45*	0.691	1.184				
	-0.769	-52.5	-0.795	-1.094				
Media = 2, Cause Video	5.071***	75.43	0.0805	-0.242	-0.404	-22.73	-0.61	-1.460**
	-0.684	-51.71	-0.799	-1.187	-0.523	-26.11	-0.43	-0.714
Past Donor = 1, Yes	0.611	22.63	-0.123	-0.932	-0.0198	14.54	-0.147	-0.939*
	-0.562	-26.15	-0.485	-0.827	-0.514	-19.86	-0.354	-0.534
Control Video X Past Donor	-0.631	-9.082	-0.0243	0.0151				
	-0.762	-31.22	-0.601	-0.984				
Cause Video X Past Donor	0.156	15.46	0.48	2.429**	0.788	26.52	0.504	2.472***
	-0.698	-33.21	-0.585	-1.005	-0.642	-31.76	-0.493	-0.83
Constant	-6.2	-526.7*	-1.665	-14.05**	5.984***	-75.29	0.463	2.071***
	-4.866	-288.2	-3.946	-5.776	-0.785	-77.18	-1.157	-0.658
Observations	259	259	259	259	223	223	223	223
Session controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Video controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Robust standard errors clustered at subject-level in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Linear Cragg-Hurdle model with donations is truncated at 0: the hurdle is modelled as a probit regression model, and the amount donated as a truncated linear regression. In Models (1) to (4), No Video is the omitted category, and in Models (5) to (8), Control Video is the omitted category. Session controls include subjects per session and session fixed effects. Video controls include dummies for video type (i.e., bats, lions and savanna videos).

Table A.1: Description of variables

Variables	Description
Donations	Charitable donation decision from £0 to £25
Willingness to pay fee	WTP fee, 0-100 pence
Willingness to donate time	WTD time, 0-7 hours
Donor	Previously made donations to charity (No (0), Yes (1))
Pro-environmental behaviour (PEB)	Average PEB score (Minimum (0) to Maximum (4))
Age	Continuous, in years
Gender	Categorical, Male (0), Female (1)
Student	Categorical, Yes (1), No (0)
Subjects/session	Number of subjects per session (Maximum of 20)

Notes: Values in table Mean with standard deviation in brackets. P-values for Gender (% females), student status (% Full-time students), LSE, and Past donors are from the Pearson's chi-squared test. P-values for Age is from one-way Anova, and from PEB score, Hot beverages and Re-useable cps form Kruskal-Wallis equality-of-populations rank test. The null hypothesis in all tests, is that there is no difference across groups. As subjects were randomly assigned to different treatment groups in the lab, there imbalance on age and ht beverages is due to chance.

Table A.2: Summary statistics by treatment groups

Variables	All	No Video	Bats- Control Video	Bats- Cause Video	Lions- Control Video	Lions- Cause Video	Savanna- Control Video	Savanna- Cause Video	p-value
Panel A: Individual attributes									
% Female	63.707	61.111	62.857	65.714	68.421	55	68.421	64.865	0.896
Age (years)	24.405	24.472	27.429	22.514	24.316	24.3	23.842	24.054	0.016
	(7.73)	(8.28)	(8.72)	(5.09)	(7.78)	(8.18)	(6.14)	(8.88)	
% Full time students	80.309	77.778	71.429	91.429	68.421	87.5	78.947	86.486	0.114
% LSE	72.973	75	68.571	74.286	63.158	85	73.684	70.27	0.495
% Past donors	74.517	69.444	91.429	74.286	65.789	67.5	78.947	75.676	0.189
PEB score	1.775	1.917	1.848	1.714	1.728	1.667	1.877	1.685	0.496
	(0.74)	(0.81)	(0.62)	(0.76)	(0.77)	(0.78)	(0.73)	(0.72)	
Hot beverage drinkers	4.56	3.806	4.771	4.114	5.263	4.625	4.658	4.622	0.05
	(1.95)	(1.97)	(2.12)	(2.14)	(1.75)	(1.64)	(1.96)	(1.86)	
Re-useable cups	0.429	0.444	0.343	0.314	0.474	0.575	0.316	0.514	0.133
	(0.50)	(0.50)	(0.48)	(0.47)	(0.51)	(0.50)	(0.47)	(0.51)	
Sample size	259	36	35	35	38	40	38	37	
Panel B: Outcome variables									
Donations	8.722		6.771	9.057	10.079	9.875	6.395	10	
	(7.08)		(6.80)	(6.86)	(7.00)	(7.53)	(6.12)	(7.47)	
WTP	22.718	23	20.857	24.114	25.684	21.85	22.421	21.081	
	(21.47)	(21.10)	(20.52)	(18.23)	(24.08)	(20.70)	(22.67)	(23.48)	
WTD	2.34	2.306	2.229	2.143	2.368	2.75	2.316	2.216	
	(2.00)	(2.03)	(1.88)	(1.97)	(2.22)	(2.17)	(1.69)	(2.10)	

Notes: Values in table Mean with standard deviation in brackets. P-values for Gender (% females), student status (% Full-time students), LSE, and Past donors are from the Pearson's chi-squared test. P-values for Age is from one-way Anova, and from PEB score, Hot beverages and Re-useable cps form Kruskal-Wallis equality-of-populations rank test. The null hypothesis in all tests, is that there is no difference across groups. As subjects were randomly assigned to different treatment groups in the lab, there imbalance on age and ht beverages is due to chance.

Table A.3: Direct effect: Media content on donations (with individual controls)

	All		Sub-group analysis	
Hurdle type:	Probability	Amount	Probability	Amount
Hurdle models:	(1)	(2)	(3)	(4)
Cause = 1, Cause Video	0.249	2.282	0.19	-2.837
	(0.22)	(1.49)	(0.57)	(3.03)
Past Donor = 1, Yes			-0.407	-5.812**
			(0.41)	(2.56)
Cause Video X Past Donor			0.0725	6.991**
			(0.64)	(3.32)
Video = 1, Lions	0.516*	2.301	0.474*	1.541
	(0.27)	(1.77)	(0.27)	(1.77)
Video = 2, Savanna	0.0246	-0.63	0.00817	-0.737
	(0.25)	(1.72)	(0.25)	(1.62)
Age	-0.0169	-0.0082	-0.0169	0.017
	(0.02)	(0.12)	(0.02)	(0.11)
Gender = 1, Female	-0.0738	-1.119	-0.0775	-0.809
	(0.26)	(1.77)	(0.25)	(1.79)
Full-time student = 1, Yes	0.0127	5.538**	-0.00975	5.735**
	(0.34)	(2.45)	(0.34)	(2.42)
PEB	0.244	0.963	0.277	0.991
	(0.19)	(1.04)	(0.20)	(0.96)
Constant	7.259***	-0.712	8.595***	4.411
	(0.83)	(7.01)	(0.93)	(7.02)
Observations	223	223	223	223
Session controls	Yes	Yes	Yes	Yes
Video controls	Yes	Yes	Yes	Yes
Individual controls	Yes	Yes	Yes	Yes

Notes: Robust standard errors clustered at subject-level in parentheses, *** p¡0.01, ** p¡0.05, * p¡0.1. Linear Cragg-hurdle model with donations is truncated at 0: the hurdle is modelled as a probit regression model, and the amount donated as a truncated linear regression. Session controls include subjects per session and session dummies. Video controls includes dummies for video type (i.e., bats, lions and savanna videos). Individual controls include age, dummies for gender and full-time student status, and PEB score.

Table A.4: Indirect effect: Media content on WTP green fee and WTD time (with individual controls)

Treatment effect:	Media exposure				Media content on Cause			
Outcome variable:	WTP		WTD		WTP		WTD	
Hurdle type:	Probability	Amount	Probability	Amount	Probability	Amount	Probability	Amount
Hurdle model:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Media = 1, Control Video	4.065***	93.62*	0.421	0.773				
	(0.67)	(49.94)	(0.71)	(0.85)				
Media= 2, Cause Video	4.344***	93.78*	0.246	1.403	0.29	-2.015	0.661**	-0.162
	(0.67)	(49.85)	(0.73)	(0.90)	(0.31)	(12.05)	(0.31)	(0.20)
Past donor = 1, Yes			0.001	-0.135			0.009	0.0155
			(0.23)	(0.34)			(0.39)	(0.25)
PEB	0.703***	3.804	0.280**	0.619***	0.577**	2.777	0.770***	0.398***
	(0.21)	(8.27)	(0.13)	(0.19)	(0.24)	(9.35)	(0.21)	(0.15)
Age	-0.00766	-1.707*	-0.02	-0.0323	-0.0258	-1.491	-0.0329	-0.0142
	(0.03)	(0.99)	(0.02)	(0.02)	(0.03)	(1.11)	(0.02)	(0.02)
Gender = 1, Female	0.148	3.637	0.384*	0.472	0.371	-0.403	0.256	0.314
	(0.28)	(12.06)	(0.20)	(0.35)	(0.30)	(13.19)	(0.40)	(0.23)
Full-time student = 1, Yes	0.106	-14.11	-0.277	-1.262***	-0.196	-2.878	-1.386**	-0.147
	(0.43)	(20.02)	(0.32)	(0.47)	(0.58)	(21.34)	(0.54)	(0.36)
LSE = 1, Yes	0.31	-15.61	0.307	-0.289	0.149	-22.18	-0.117	0.144
	(0.32)	(14.44)	(0.27)	(0.39)	(0.36)	(16.67)	(0.43)	(0.30)
Hot beverages	-0.0767	0.717			-0.11	0.464		
	(0.07)	(3.00)			(0.10)	(3.64)		
Reusable cups	-0.0068	5.109			-0.0301	17.85		
	(0.31)	(11.56)			(0.33)	(13.26)		
Video = 1, Bats	0.959**	-1.5	0.156	-0.319				
	(0.40)	(14.77)	(0.25)	(0.39)				
Video = 2, Lions	0.456	5.314	0.146	0.105	-0.5	5.943	0.405	0.0198
	(0.33)	(14.02)	(0.25)	(0.37)	(0.42)	(14.44)	(0.43)	(0.25)
Video = 3, Savanna					-1.012**	1.208	0.291	-0.132
					(0.41)	(15.53)	(0.39)	(0.25)
Constant	-2.134	-460.4	-0.0336	-8.04	6.997***	-19.56	1.885	0.128
	(5.66)	(295.60)	(4.05)	(5.33)	(1.65)	(89.54)	(1.62)	(1.35)
Observations	259	259	259	259	223	223	223	223
Session, Video & Individual controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Robust standard errors clustered at subject-level in parentheses, *** p¡0.01, ** p¡0.05, * p¡0.1. Linear Cragg-hurdle model with donations is truncated at 0: the hurdle is modelled as a probit regression model, and the amount donated as a truncated linear regression. In Models (1)-(4), No Video and Savanna-Control Video are omitted categories, and in Models (5)-(8), Control Video and Bats-Control Videos are omitted categories.

Table A.5: Heterogeneous spillover effects: Pro-social subjects as past donors (with individual controls)

Treatment effect:	Media exposure				Media content on Cause			
Outcome variable:	WTP		WTD		WTP		WTD	
Hurdle type:	Probability	Amount	Probability	Amount	Probability	Amount	Probability	Amount
Hurdle model:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Media = 1, Control Video	4.810***	98.37**	0.43	0.971				
	(0.95)	(49.88)	(0.82)	(0.93)				
Media = 2, Cause Video	4.421***	83.68*	0.0519	-0.138	-0.38	-17.64	-0.383	-1.165*
	(0.76)	(49.26)	(0.82)	(1.01)	(0.59)	(24.84)	(0.46)	(0.67)
Past donor = 1, Yes	0.371	25.49	-0.163	-0.858	-0.327	15.59	-0.159	-1.089**
	(0.66)	(24.49)	(0.50)	(0.77)	(0.59)	(19.81)	(0.37)	(0.48)
Control Video X Past Donor	-0.631	-11.75	0.0277	-0.183				
	(0.88)	(29.59)	(0.62)	(0.90)				
Cause video X Past Donor	0.486	6.618	0.308	2.090**	1.121	20.98	0.3	2.386***
	(0.79)	(30.72)	(0.61)	(0.95)	(0.71)	(30.12)	(0.52)	(0.80)
PEB	0.727***	4.104	0.270**	0.624***	0.634***	5.256	0.391**	0.774***
	(0.20)	(8.13)	(0.14)	(0.19)	(0.24)	(10.30)	(0.15)	(0.21)
Age	-0.0125	-1.462	-0.0218	-0.0226	-0.0253	-1.201	-0.0145	-0.0235
	(0.02)	(0.92)	(0.02)	(0.02)	(0.03)	(1.06)	(0.02)	(0.02)
Gender = 1, Female	0.131	1.016	0.396*	0.33	0.336	-5.428	0.323	0.131
	(0.29)	(11.83)	(0.20)	(0.35)	(0.32)	(13.90)	(0.22)	(0.40)
Full-time student = 1, Yes	0.221	-20.77	-0.155	-1.330***	-0.0168	-13.42	-0.1	-1.363***
	(0.46)	(18.03)	(0.30)	(0.42)	(0.54)	(21.35)	(0.34)	(0.49)
Video = 1, Bats	0.977**	-1.741	0.173	-0.24				
	(0.41)	(14.54)	(0.25)	(0.37)				
Video = 2, Lions	0.437	8.869	0.161	0.0958	-0.578	12.45	0.00907	0.304
	(0.33)	(13.69)	(0.25)	(0.35)	(0.42)	(15.22)	(0.25)	(0.40)
Video = 3, Savanna					-1.052**	2.327	-0.152	0.222
					(0.42)	(15.94)	(0.25)	(0.38)
Constant	-2.292	-460.7*	0.0711	-8.069	6.096***	-32.72	0.293	2.502*
	(5.58)	(271.90)	(4.06)	(5.18)	(1.49)	(82.58)	(1.36)	(1.38)
Observations	259	259	259	259	223	223	223	223
Session, Video and Individual controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Robust standard errors clustered at subject-level in parentheses, *** p¡0.01, ** p¡0.05, * p¡0.1. Linear Cragg-hurdle model with donations is truncated at 0: the hurdle is modelled as a probit regression model, and the amount donated as a truncated linear regression. In Models (1)-(4), No Video is the omitted category, and in Models (5)-(8), Control Video is the omitted category. Session controls include subjects per session and session fixed effects. Video controls includes dummies for video type (i.e., bats, lions and savanna videos). In Models (1)-(4), No Video and Savanna-Control Video are omitted categories, and in Models (5)-(8), Control Video and Bats-Control Videos are omitted categories.