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The Virtuous Loop Between Happiness and Pro-Environmental Behaviors

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Abstract

Creating a sustainable society necessitates policies that foster human well-being and encourage individuals to engage in pro-environmental behaviors (PEBs) aimed at reducing their environmental footprint. However, the compatibility of these goals remains uncertain. While pro-environmental behavior often correlates positively with individuals' well-being, the causal relationship between such actions and hedonic well-being (HWB) remains unclear. Similarly, the influence of subjective well-being (SWB) on PEB warrants further investigation. Based on a field experiment, supplemented by online surveys, in which French university students (n=393) could participate in a paid or unpaid volunteer waste collection, or donate to an environmental association, according to random allocation to different treatment groups, we find evidence of a virtuous loop between pro-environmental actions and SWB. Happiness is a determinant of voluntary waste collection participation, but not for paid waste collection or monetary donation. Additionally, participation in waste collection, whether paid or unpaid, significantly increases overall HWB. These results suggest that policies targeting human well-being are likely to encourage voluntary PEB and benefit from a leverage effect, as PEB, in turn, increases human well-being.

Keywords: Pro-environmental behaviors, Subjective well-being, Field experiment, Waste collection, Donation

JEL: Q50, I31, C93

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1 Introduction

Human activities are at the origin of the current climate crisis that we are facing (Pörtner et al. 2022). In this context adopting PEBs is crucial for ensuring the long-term viability of our planet. Most citizens, researchers, and politicians agree on the need for a transition to an environmentally sustainable society (EU 2021, Eurostat 2023). But there is persistent discrepancy between individuals' environmental attitudes and their actual behavior (ElHaffar et al. 2020). While attitudes have become increasingly environmentally friendly, behavioral shifts are occurring at a slower rate. One potential explanation for this discrepancy is that engaging in PEB may be perceived as detrimental to well-being, as such actions can entail significant costs in terms of time, energy, and finances, and may also be perceived as unpleasant to undertake (Tobler et al. 2012, Liu & Madni 2024).

However, most of the research indicates a positive correlation between SWB and PEB (Venhoeven et al. 2013, Zawadzki et al. 2020, Kasser 2017).¹ According to Welsch (2024), there exists a divergence between the perception of costs and the utility experienced from engaging in PEB, attributed to failures in affective forecasting. In other words, the decision utility, the ex-ante expectation of experienced utility (Kahneman et al. 1997) is not in line with the experienced utility, the ex-post satisfaction from a PEB. Another potential explanation for the positive effect of PEB on SWB is reverse causality: Are happier individuals more inclined to adopt PEB, or does engaging in PEB lead to greater happiness? Addressing these inquiries is crucial for understanding the type of policies that could foster a sustainable society by enhancing human well-being and encouraging individuals to participate in PEB.

In the current state of the literature, there is a dearth of evidence regarding the causal order of this relationship (Binder & Blankenberg 2016, 2017, Schmitt et al. 2018, Van der Linden 2018, Zawadzki et al. 2020, Welsch 2024).² Another limitation of the literature relates to the measurement of PEB, which is most often self-reported or assessed through a declaration of intention to engage in pro-environmental actions (Li et al. 2019). Furthermore, although the impact of monetary incentives

¹Nevertheless, certain studies have found no significant correlation or even a negative correlation between PEB and SWB (Suárez-Varela et al. 2016, Binder et al. 2020).

²A notable exception is the experiment on PEBs and SWB conducted by Prinzing (2023).

on prosocial behavior has been thoroughly examined (Frey & Oberholzer-Gee 1997, Gneezy & Rustichini 2000, Frey & Jegen 2001, Gneezy et al. 2011, Rommel et al. 2015) evidence is scarce regarding the effect of such incentives on the relationship between PEB and SWB.

This study aims to assess PEB through observable actions, disentangle the relationship between PEB and SWB, and to examine the impact of monetary incentives on this relationship. We addressed these relations in a field experiment (N=393) conducted in France, where we measured the participants' PEB by tracking their engagement and active participation in waste collection activities and their monetary donations to the environmental organization Alsace Nature. Additionally, Participants were asked to complete two online questionnaires: one administered before and another after the waste collection activities. These questionnaires aimed to assess participants' SWB at different steps of the decision-making process. Furthermore, participants were randomly assigned to one of four treatment groups: A first group (N=100) was invited to volunteer for a waste collection, organized in partnership with the Alsace Nature Association. A second group (N=99) was invited to volunteer for a waste collection and/or donate to the association. A third group (N=100) was invited to volunteer for a waste collection in exchange for a payment. The fourth group (N=97) only had the option to donate to the association.

Our field experiment setup enables us to unravel and identify the causal link between PEB and SWB. We find evidence of a virtuous loop: happier individuals are more inclined to voluntarily engage in PEB (i.e. waste collection), and this decision to engage, as well as participation in such activities, further enhances participants' HWB.

The remainder of our paper is structured as follows. First, we review the literature on the relationship between PEB and SWB and the role of monetary incentives in this relationship. Second, we describe our experimental design and then we present the results. We conclude by discussing our findings in light of the existing literature, as well as addressing the limitations of our work and avenues for future research.

2 Literature review

2.1 The Relationship between PEBs and SWB

The concept of SWB, referring to the subjective evaluation of one's life, is grounded in two more or less distinct sources of information: how well one's feel most of the time, the hedonic level of affect, and to what extent life has brought what one's want from it, referred as cognitive component (Veenhoven 2000).³ Schimmack et al. (2008) has shown that affective well-being and cognitive well-being are correlated because individuals rely on how they feel when they evaluate their lives. However, they also show that cognitive well-being and affective well-being are distinct constructs. For instance, factors like knowing that one's relatives are healthy and happy may influence the cognitive evaluation of life but not necessarily affect how one feels. Conversely, an individual may feel positive emotions while participating in an activity despite being dissatisfied with their current life situation.

To capture the effect of these dimensions on PEB, we chose to analyze two different measures of SWB. We assessed momentary feelings using a revised version of the Positive Affect negative Affect Schedule (PANAS)(Watson et al. 1988). Moreover, the cognitive evaluation consists of asking respondents to rate their satisfaction with their current life on a scale from 0 (not at all satisfied) to 10 (completely satisfied).⁴

Our work builds upon related literature, where there is growing evidence that acting in pro-environmental ways is positively correlated with SWB (Kasser 2017, Zawadzki et al. 2020, Veenhoven et al. 2013). Engaging in PEBs is likely to enhance SWB because people can feel good about doing "the right things", it may have altruistic dimensions, improve one's self-image, one's reputation (i.e., social acceptance), increase the feeling of pride, help avoid guilt, promote value-consistency, and strengthen social connections with individuals who share similar values. Moreover, Kasser (2017) suggests that self-determination theory offers insight into the favorable impact of

³This concept is nowadays recognized in psychology, economics and sociology (Dolan et al. 2008).

⁴This measure have been shown reliable and correlates with factors such as personality, health, marital status, age, institutional conditions, environmental conditions and economic circumstances (Van der Linden 2018).

pro-ecological actions on SWB. According to self-determination theory, if pro-ecological behaviors fulfill intrinsic psychological needs such as competence, autonomy, and relatedness, they are likely to enhance SWB.

A variety of PEBs are empirically associated with higher SWB across samples from Belgium (Verhofsstadt et al. 2016), Germany (Binder & Blankenberg 2016), United-Kingdom (Binder & Blankenberg 2017, Van der Linden 2018), Canada and the United-States (Schmitt et al. 2018), Mexico (Corral-Verdugo et al. 2011), China (Xiao & Li 2011), and nationally representative surveys in 100 countries (Mavisakalyan et al. 2024). Moreover, some studies highlight that PEB's intention is positively associated with quality of life (Ramkissoon 2016, Ramkissoon & Mavondo 2017) and subjective resource evaluation (e.g., economic, time, social networks, emotional support) (Zannakis et al. 2019). However, there are notable exceptions. Binder et al. (2020) discovered that increased levels of PEBs were linked to decreased LS among Spanish students. They noted that this negative association was mitigated by the total amount of disposable income. Furthermore, Suárez-Varela et al. (2016) found that water-saving habits did not show a significant relationship with SWB within a representative sample of households from Spain.

Some studies indicate that specific types of PEBs and different definitions of SWB may enhance or diminish the positive association between them. In a metaanalysis, Zawadzki et al. (2020) provide evidence of a positive and significant relationship between PEBs and SWB. This relationship is stronger for behaviors that reflect meaning and for those in which people consciously engage, rather than automatically, such as sustainable purchasing decisions. Moreover, PEBs are particularly highly correlated with warm glow, defined as a momentary, positive state experienced by individuals after performing a behavior meaningful to them. Venhoeven et al. (2013) provide theoretical arguments on the impacts of PEBs on hedonic (i.e., feeling pleasure) and eudaimonic (i.e., feeling meaningful) well-being. They mention that a gap exists between pro-environmental outcomes and their positive effects on the environment. For instance, it is difficult to perceive the direct benefit for the environment of taking the train instead of the plane, while in the short run, there are personal benefits - it is faster and cheaper. Moreover, they argue that the more a goal is perceived to be unattainable, the more likely it is to negatively affect HWB. Thus, reframing a goal into smaller,

attainable goals is likely to enhance HWB.

A study by [Binder et al. \(2020\)](#) reveals that individuals' definition of the "good life" influence how one's perceive and engage in environmentally friendly actions, with stoics experiencing increased LS when engaging in such behaviors, while those with a tranquility-based view find higher well-being in environmentally unfriendly actions. Furthermore, [Schmitt et al. \(2018\)](#) show that behaviors such as PEBs implying social interaction, and that involve direct costs in terms of money, time, and effort, positively predict LS. Besides, [Van der Linden \(2018\)](#) finds that individuals who anticipated that engaging in PEB would make them "feel good" were more likely to report diverse PEBs four weeks later. However, the expected positive emotional response from these PEB actions predominantly influenced the involvement in low-cost actions (e.g., switching off lights) and not more engaging green behaviors (e.g., buying green energy). In a broader sense, this finding implies that individuals are, to some extent, intrinsically motivated to act pro-environmentally due to their anticipation of experiencing a satisfying "warm glow" from participating in morally desirable behaviors.

One major limitation of studies in this field is their correlational nature, which prevents them from definitively determining the causal order of the relationship between PEBs and SWB. It remains plausible that individuals with higher SWB are more inclined to engage in PEBs. One exception is the experiment by [Prinzing \(2023\)](#) on pro-environmental behavior and subjective well-being. He conducts two studies to explore this relationship. In the first study, individuals living in the United States participated in an experience sampling study over 10 days, during which they reported their activities in the past hour and rated their current mood multiple times a day. He finds a positive and significant association between PEB and SWB within individuals and across different individuals. While this study is correlational, it has several design features that help support causal inferences. The conclusions from the first study are bolstered by the second study, which used a randomized controlled experiment to further test the causal relationship. In the second study, participants were randomly assigned to three treatment groups: PEB (i.e., participants were told to do three good things for the planet all in one day), Fun (i.e., participants were told to do three good things for themselves all in one day), or Control tasks (i.e., participants were told to keep track of their activities without altering their routine). The results show that engaging in PEB or Fun activities

leads to significant improvements in positive affect, reductions in negative affect, and increases in perceived personal meaning compared to the Control group. However, no significant difference is found between PEB and Fun activities.

Within the literature, it's acknowledged that various emotions can influence human behavior ([Triandis 1979](#)). For instance, [Russell et al. \(2017\)](#) demonstrate that emotions are a determinant of food waste behavior in a UK sample. They find that experiencing negative emotions is associated with both intentions to reduce food waste and higher levels of actual food waste behavior. Others have found that negative emotions can have a positive impact on PEB adoption ([Bamberg et al. 2007](#), [Grob 1995](#)). In contrast, [Bissing-Olson et al. \(2016\)](#) estimate that pride in relation to a behavior positively predicts subsequent engagement in PEB for people who perceived more positive pro-environmental descriptive norms. However, little is known about the influence of a more cognitive evaluation of one's life on the adoption of PEB.

Moreover, PEBs can be seen as a form of prosocial behavior since it contributes to the well-being of both present and future generations. An extensive literature shows the positive link between prosocial behavior and SWB. [Lyubomirsky et al. \(2005\)](#) provide compelling evidence that individuals who experience happiness are not only more prone to fostering positive relationships, achieving higher income, and enjoying better health but also exhibit greater engagement in prosocial behavior, displaying traits of altruism, generosity, and charity aimed at assisting others. [Meier & Stutzer \(2004\)](#) use panel data from Germany and provide causal evidence that people who volunteer frequently are more likely to report greater LS than non-volunteers. Moreover, [Aknin et al. \(2013\)](#) conducted an experiment on a Canadian university campus, demonstrating that recollecting a previous prosocial spending encounter results in elevated happiness levels. Additionally, they found that a higher level of happiness increases the likelihood of engaging in prosocial spending (i.e. gift for someone else or donation to charity). [Thoits & Hewitt \(2001\)](#) also show that people who have greater SWB invest more time in volunteer service.

2.2 The Role of Monetary Incentives on the Relationship between PEBs and SWB

Even though the impact of monetary incentives on prosocial behavior has been studied (Frey & Oberholzer-Gee 1997, Frey & Jegen 2001, Rommel et al. 2015), little is known about its potential effect on the relationship between PEBs and SWB. The standard economic principal-agent theory commonly assumes that introducing external monetary incentives to encourage individuals' pro-environmental actions will raise their marginal monetary benefits for engaging in such behaviors. This phenomenon is also called the relative price effect of external intervention (Frey & Jegen 2001). In this framework, the consideration that monetary incentives may impact the intrinsic motivation to act is not considered. In a review of empirical evidence on motivation crowd-out, Frey & Jegen (2001) show that a crowding out effect may occur when monetary incentives crowd out the intrinsic motivation to undertake an activity. Thus, this notion is closely linked to the type of motivations that undermine an action.

Deci & Ryan (1985) developed the cognitive evaluation theory. They argue that motivation to act ranges from extrinsic to intrinsic motivation. The former refers to doing something because of monetary incentives. The latter refers to the motivation to participate in an activity for the activity and not for the rewards associated with this activity. Frey & Jegen (2001) highlight that both the relative price effect and the crowding-out effect are at stake when a monetary incentive is introduced. The ultimate impact on individuals' actions can result in either crowding-in or crowding-out effects, depending on the magnitude of these two influences. They mentioned two psychological processes that may explain the crowd-out effect of an external intervention on intrinsic motivation. The first process is impaired self-determination; it occurs when the external rewards alter basic human needs for autonomy. In other words, because individuals are coerced or monetarily incentivized to engage in an action, their autonomy in their decision-making process is undermined. The second process is called impaired self-esteem. It happens when the intrinsic motivation of an individual to act is not recognized because someone offers a reward to do so.

In their theory of prosocial behavior, Bénabou & Tirole (2006) incorporate reputational motivation

alongside intrinsic and extrinsic motivations as factors influencing agents' adoption of prosocial and antisocial behaviors. They hypothesize that the use of extrinsic incentives, such as monetary rewards, changes the meaning attached to prosocial behavior, which in turn affects the reputational incentive to engage in it. These psychological processes are likely to affect individuals' SWB. Moreover, in his examination of Deci and Ryan's cognitive evaluation theory, [Lindenberg \(2001\)](#) argues that the theory is incomplete. He asserts that the theory only accounts for two fundamental "needs": the need for competence and the need for self-determination, while overlooking the conceptualization of the goals influencing human action. Consequently, [Lindenberg \(2001\)](#) developed the theory of framing, positing that three overarching goals may impact human behavior: the hedonic goal to seek pleasure, the gain goal to enhance one's resources, and the normative goal to conform to societal expectations. He suggests that the strength of these goals depends on individuals' prioritization of values (e.g., self-enhancement values versus self-transcendence values) and various situational factors (e.g., hedonic symbols, normative symbols, perception of others' behavior). Introducing a monetary incentive for PEBs can shift the decision-making framework and thus alter the relative strength of overarching goals, transforming what might have initially been a moral decision (i.e., what is the appropriate course of action?) into a decision driven by gain-related considerations (i.e., what are the personal benefits?) ([Steg et al. 2016](#)). This adjustment does not negate the roles of normative and hedonic goals but is rather likely to relegate them to the background of the decision-making process. He argues that the impact of this effect will depend on the relative strength of the goal for the individual and the size of the monetary incentive.

All in all, introducing a monetary incentive to act environmentally friendly is likely to trigger extrinsic motivation and put forward gain goals. [Kasser \(2017\)](#) cites numerous studies indicating that prioritizing extrinsic, materialistic goals—such as those centered around money, image, and status—over intrinsic aspirations, such as personal growth, close relationships, and community connection, is associated with lower levels of personal well-being. Therefore, fulfilling intrinsic aspirations tends to result in greater satisfaction of psychological needs compared to pursuing extrinsic goals. As a consequence, it is plausible to expect that the provision of monetary incentives for engaging in pro-environmental actions may weaken the association between PEBs and SWB.

3 Research Design

3.1 Experiment

The study is based on a field experiment supplemented by two online surveys, conducted before and after a waste collection activity organized by the French environmental and nature conservation association: Alsace Nature. The primary goals of our field experiment were threefold: (1) to explore whether SWB influenced participation in waste collection and/or donation, (2) to investigate how people experienced the participation in waste collection and/or donation, (3) to investigate the effect of monetary incentives on the relationship between waste collection participation and SWB.

The experimental sessions were held in two waves of registrations, on September 25 and October 9, 2023. For the two waves, an email was sent to a part of the database of the Laboratory of Experimental Economics of Strasbourg (LEES), primarily consisting of students from the University of Strasbourg. The email invited them to anonymously participate in a paid experiment without disclosing the subject. Recipients of the email were different for the two waves and were randomly drawn from the LEES database.

The invitation mentioned a base compensation of €20. Participation required being available in Strasbourg for a predetermined two-hour slot. The invitation also emphasized the need to complete a 20-minute online questionnaire five days prior to the scheduled slot, as well as a final 5-minute questionnaire on the evening of the slot.

The first online questionnaire allowed us to collect various information about participants' characteristics and introduced the decision-making scenarios they would face, according to different treatments. We first measured the participants' LS. Then, we assessed their HWB. After measuring SWB characteristics, we collected different information about their attitudes, behaviors, and perceptions of environmental issues. We then presented to all participants, regardless of their treatment groups, the activities of Alsace Nature, particularly focusing on the waste collection activity and its benefits. This was done with the help of a 2-minute and 30-second video available at this [link](#).

The aim of this video was to inform the participants about the association to which they might potentially donate and to describe the waste collection activity in which they could participate.⁵ Following this presentation, we asked participants to make a decision.

- *Activity*: We asked participants if they wished to participate in a waste collection during a predetermined two-hour slot. Their participation was not mandatory and did not affect their €20 compensation for participating in the study.
- *Remunerated Activity*: This treatment was identical to the Activity Treatment, with an additional compensation of €20 if the participant took part in the waste collection.
- *Activity & Donation*: This treatment was the same as the Activity Treatment, with the added option of donating €5 to Alsace Nature from the €20 received for participating in the study.
- *Donation*: We informed participants that their presence was not required during the predetermined two-hour slot. They only had to respond to the second online questionnaire to receive their compensation. However, they had the option of donating €5 to Alsace Nature from the €20 received for participating in the study.

Once the decision was made, we measured HWB again. Finally, we collected various socio-demographic information.

Two waste collections took place on Saturday, October 7, 2023. The first gathered volunteer participants from the *Activity* treatment, meeting at the Strasbourg central station at 10 am. The second gathered volunteer participants from the *Activity & Donation* treatment, meeting at the Winston Churchill tram stop at 2 pm. Finally, the third waste collection occurred on Saturday, October 21, 2023, for participants of the *Remunerated Activity* treatment, with a meeting point at the Strasbourg central station at 10 am. Fortunately, the weather was similar on both collection days, with clear skies and temperatures ranging from 10° to 15°C in the morning and 15° to 20°C in the afternoon. This similarity allows ruling out weather as an explanatory factor for the differences in dropout rates between treatments. Additionally, all experimental sessions were scheduled on

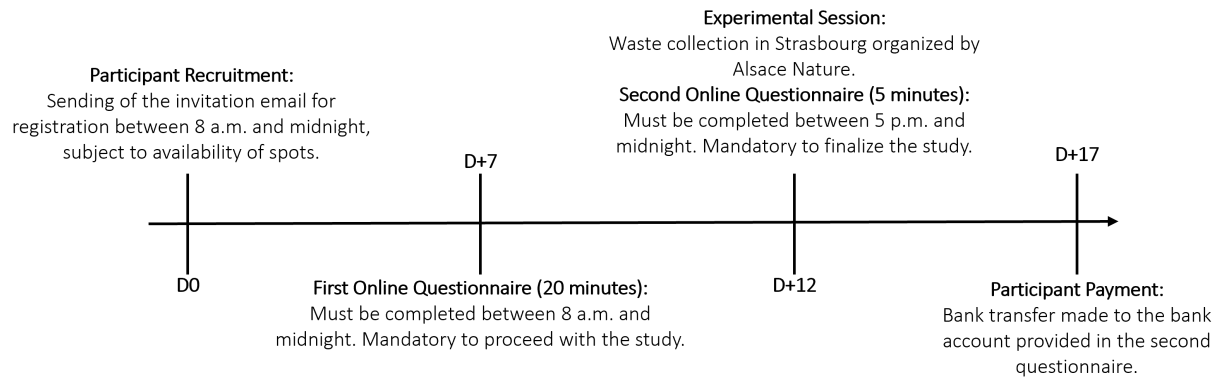
⁵At that stage, participants did not know that they would have such possibilities.

Saturdays to eliminate the day of the week as a possible explanatory factor for differences between treatments. Waste collection slots were different for each treatment to prevent participants from different treatments from communicating with each other, as this could have altered the responses to the final questionnaire. Moreover, for the activity’s relevance and logistical reasons, itineraries had to be different, with a maximum duration of 2 hours, and meeting points had to be easily accessible in Strasbourg to avoid dropouts related to the activity’s location.

Lastly, a second and final online questionnaire allowed us to gather information from all participants, regardless of their choices, since they had to complete it to receive their payment. Similar to the first questionnaire, we measured the participants’ LS and HWB. We finally requested their bank information in order to process the payment of the participation fee, with an additional amount for those who participated in the waste collection in the *Remunerated Activity* treatment, and accounting for any donations made.

The details of all questions asked during the two online questionnaires are presented in Table 7 in Appendix A and the timeline of the experiment’s steps is summarized in Figure 1.

Figure 1: The Timeline of the Experiment’s Steps



3.2 Variables

We consider two types of SWB at different stages of the experiment: the LS and the HWB. LS is measured twice, at the beginning of the study (*LS Beginning*) and at the end of the study (*LS End*). LS is measured in response to the question, “On a scale from 0 (not at all satisfied) to 10 (completely

satisfied), indicate your satisfaction with the life you are currently leading.” This single-item scale question is the most commonly recognized measure of SWB found in international datasets (e.g., OECD, Gallup World Poll) and national longitudinal datasets (e.g., England, Switzerland, France, The Netherlands, Austria, and Germany).

HWB is measured three times: at the beginning of the study (*HWB Beginning*), just after individuals make a decision related to PEB (*HWB Post-decision*), and at the end of the study (*HWB End*). We measure HWB (i.e., experienced utility) with momentary feelings derived from the Positive Affect Negative Affect Schedule (PANAS) (Watson et al. 1988). Our short version of the PANAS consists of 10-item scales, encompassing five positive emotions and five negative emotions.⁶ Overall emotional balance is estimated as the mean difference between positive affect (PA) score and negative affect (NA) score.⁷ We also detail the evolution analysis by separating positive and negative emotions as well as by considering each emotion separately.

Because the study of the effect of LS on PEB can suffer from confounding variables, we control for different variables identified in the literature such as the *Gender*, the *Age*, the *Health status*, the *Income* and the *Environmental concern* (Blankenberg & Alhusen 2019, Li et al. 2019).

Lastly, we consider different decisions, namely *Engagement* and *Action*. *Engagement* corresponds to participants who registered for the waste collection event for the upcoming Saturday (available for the *Activity*, *Remunerated Activity*, and *Activity & Donation* treatments), and/or participants who donated €5 to the association (available for the *Donation* and *Activity & Donation* treatments).⁸

⁶For our study’s purposes, we replaced certain emotions originally present in the PANAS due to either the direct translation into French eliciting overly strong emotions (e.g., alert, scared, afraid, hostile), having no equivalent translation in French (e.g., excited, strong), or because, following discussions with members of Alsace Nature, we considered certain emotions to be more relevant to the waste collection activity (e.g., serene, discouraged, happy, worried).

⁷This approach is grounded in the seminal work of Watson et al. (1988), who developed the PANAS and demonstrated that positive affect and negative affect are two distinct constructs. Their research supports the practice of calculating and using the mean difference between these scores to gauge overall emotional states. Moreover, Seib-Pfeifer et al. (2017) confirmed that the PANAS can effectively differentiate between positive emotions, allowing meaningful interpretations of the mean difference between these scores. Additionally, the method of mean differences is widely utilized across various fields, including psychology, medicine, social sciences, and marketing, to compare data and understand the impact of interventions or conditions on different groups.

⁸The engagement to donate corresponds to the action of donating. In our experimental design, the choice to donate (engagement) is made during the first questionnaire and is applied (action) at the end of the second questionnaire without the possibility of modifying it.

Action corresponds to participants who actually attended the waste collection event.⁹

4 Results

4.1 Descriptive Statistics

The study was completed by 393 of the initial 483 registrants. 45 did not start the first questionnaire, 22 started it but were finally not eligible (i.e., declared not to be available the next Saturday), 12 did not finish the first questionnaire, and 11 did not start the second questionnaire. The distribution of attrition behavior across treatment is available in Table 8 of the Appendix B. We do not find significant differences between treatments. We displayed in Table 9 of the Appendix B the average characteristics of subjects who completed the study and drop-off registrants. Due to the low number of observations for the latter, we cannot conclude any significant differences and therefore assume attrition is not an issue in our study. In total, 130 people participated in the waste collections, gathering 73 bags of 100 liters of trash, 16 bottles of 1.5L filled with cigarette butts, and 23 bags of glass. Table 1 summarizes the mean values of the different variables across treatment.

The average age is 21.8 years, and we observe a significant difference in age¹⁰ between *Remunerated Activity* and *Activity* ($p < 0.001$), between *Remunerated Activity* and *Donation* ($p = 0.068$), and between *Remunerated Activity* and *Activity & Donation* ($p < 0.001$). Overall, 60.8% of the participants are female, 51.7% of the participants declared having less than €500 as available income to live on per month, and there are no significant differences between treatments. Also, there are no significant differences in the average *Health Status* and *Environmental Concerns*.¹¹

Table 1: Mean Values of Variables Across Treatments

	<i>Activity</i>	<i>Remunerated Activity</i>	<i>Activity & Donation</i>	<i>Donation</i>
Subjective well-being				

Continued on next page

⁹All participants who attended the waste collection event were engaged.

¹⁰According to a Wilcoxon-Mann-Whitney test.

¹¹According to Fisher's Exact Test for Two Proportions.

Table 1 – continued from previous page

	<i>Activity</i>	<i>Remunerated Activity</i>	<i>Activity & Donation</i>	<i>Donation</i>
LS Beginning	6.6	6.6	6.6	6.7
LS End	6.8	6.7	6.9	7.1
HWB Beginning	2.8	3.1	4.6	4.2
HWB Post-decision	4.8	5.7	4.1	5.6
HWB End	4.3	4.5	5.3	5.0
Other characteristics				
% Female	63.0	56.0	63.6	60.6
Age	21.0	22.5	21.3	21.9
Health status	2.4	2.3	2.3	2.4
% Income < €500	51.0	53.0	56.6	45.7
Environmental concerns	0.07	0.01	-0.04	-0.05
Decision				
% Engagement	50.0	68.0	52.5	43.6
Donation	-	-	26.3	43.6
Waste Collection	50.0	68.0	44.4	-
% Action	44.0	50.0	47.5	43.6
Donation	-	-	26.3	43.6
Waste Collection	44.0	50.0	36.4	-
Nb subjects	100	100	99	94

Note: We provided participants with an “Other” option for the gender question. Only four participants (one in each treatment group) chose this option. We have grouped them with the “Male” category for the remainder of the analysis. We have split the income variables into three groups: “Income < €500,” “Income > €500,” and “NA.” Twenty-six participants preferred not to disclose their income. *Health status* is measured in response to “On a scale from 0 (Poor) to 4 (Excellent), how do you rate your overall health?.” *Environmental concerns* are measured as the average of three normalized scales: the Scale of Environmental Concern (Schultz 2001), the General Ecological Behavior Scale (Kaiser 2020), and the Environmental Action Scale (Alisat & Riemer 2015). Normalization is performed as standardization, using the standard deviation of the entire sample regardless of the treatment group.

For the remainder of this paper, we exclude the *Activity & Donation* treatment from the analysis. This decision is based on the effects that can be driven by substitutability or complementarity between different PEBs (Brown & Lankford 1992). We believe that such effects deserve their own study.

4.2 Do Happier Individuals Adopt More PEB ?

4.2.1 Overall Effects of SWB on Engagement, and Action

We first analyse the effect of SWB on PEB decision-making using logistic regression where the dependent variables are binary choices corresponding either to the *Engagement* or the *Action* towards adopting PEB.

Explanatory variables considered in the models are the LS and HWB measured at the beginning of the experiment (*LS Beginning* and *HWB Beginning*). Both measures are simultaneously inserted into the models since we reject multicollinearity issue. The Pearson correlation coefficient is equal to 0.58 between *LS Beginning* and *HWB Beginning*. The regressions are performed independently for each treatment group. For simplicity we only report in Table 2 the coefficient associated with the SWB variables.

Table 2: Logistic Regression Models for *Engagement* and *Action* According to SWB Variables

	<i>Activity</i>	<i>Remunerated Activity</i>	<i>Donation</i>
Engagement			
LS Beginning	0.20(0.22)	-0.08(0.17)	0.15(0.19)
HWB Beginning	0.03(0.05)	-0.02(0.04)	-0.05(0.05)
Action			
LS Beginning	0.37(0.23)	0.02(0.16)	
HWB Beginning	-0.01(0.04)	-0.03(0.04)	
Nb subjects	100	100	94

Note: Significance: *= 10%; **= 5%; ***= 1% [under Holm-Bonferroni correction](#). Standard errors are in parentheses. All regressions included a constant and a set of control variables: *Environmental concerns*, *Gender*, *Health status*, *Income*, and *Age*.

According to the results displayed in Table 2, neither LS before the decision (*LS Beginning*) nor HWB before the decision (*HWB Beginning*) significantly predict engagement or action, regardless of the treatment group. However, a more detailed analysis of the influence of various emotions on decision-making reveals a different perspective.

4.2.2 The Role of Emotions in Decision-Making

Table 3 presents the coefficients derived from logistic regression where the dependent variables are binary choices corresponding either to the *Engagement* or the *Action* towards adopting PEB. The explanatory variables are the participants' answer for the ten different emotions which constitute the measure of HWB before the decision-making (*HWB Beginning*). After measuring the Pearson correlation coefficients among the different emotions (reported in Table 10 in Appendix B), we not exclude the possibility of multicollinearity effects and use all emotions simultaneously as explanatory variables either detailed or aggregated by positive or negative emotions.

Table 3: Logistic Regression Models for *Engagement* and *Action* According to HWB Emotions

	<i>Activity</i>	<i>Remunerated Activity</i>	<i>Donation</i>
Engagement			
Positives	0.05(0.05)	0.01(0.07)	-0.08(0.06)
Determined	0.09(0.25)	-0.03(0.33)	0.07(0.30)
Happy	1.32**(0.44)	0.03(0.26)	-0.10(0.34)
Inspired	-0.27(0.25)	0.05(0.30)	0.08(0.27)
Proud	-0.00(0.28)	0.28(0.29)	0.00(0.28)
Serene	-0.47(0.36)	-0.50(0.32)	0.27(0.32)
Negatives	-0.07(0.05)	0.01(0.06)	-0.05(0.06)
Discourage	-0.21(0.26)	0.12(0.28)	0.29(0.28)
Guilty	-0.15(0.24)	0.02(0.24)	0.48(0.27)
Nervous	0.01(0.23)	0.13(0.25)	-0.34(0.26)
Sad	0.20(0.25)	-0.08(0.29)	-0.56(0.32)
Worried	0.14(0.24)	0.35(0.27)	-0.28(0.31)
Action			
Positives	0.07(0.05)	0.06(0.06)	
Determined	0.05(0.25)	-0.08(0.31)	
Happy	1.19**(0.44)	0.22(0.26)	
Inspired	-0.50(0.26)	0.01(0.29)	
Proud	-0.05(0.28)	0.63(0.30)	
Serene	0.07(0.36)	-0.69(0.32)	

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Table 3 – continued from previous page

	<i>Activity</i>	<i>Remunerated Activity</i>	<i>Donation</i>
Negatives	-0.02(0.05)	0.04(0.06)	
Discourage	0.08(0.267)	0.08(0.26)	
Guilty	-0.12(0.25)	-0.17(0.25)	
Nervous	0.18(0.24)	0.09(0.25)	
Sad	0.31(0.25)	0.35(0.29)	
Worried	-0.13(0.24)	-0.53(0.27)	
Nb subjects	100	100	94

Note: Significance: *= 10%; **= 5%; ***= 1% under Holm-Bonferroni correction. Standard errors are in parentheses. All models include a constant.

We observe that only the feeling of happiness significantly explain engagement and action, but exclusively in scenarios involving unpaid waste collection (*Activity* treatment). In contrast when waste collection is remunerated (*Remunerated Activity* treatment) or when PEB corresponds to a donation (*Donation* treatment), neither engagement nor action is significantly influenced by any of the measured emotions.

4.3 Does Adoption of PEB Make Individuals Happier?

We focus now on the effects of adopting PEB, either by participating in the waste collection activity or donating to the association, on the HWB of participants.¹²

4.3.1 Evolution of HWB according to Decision-Making

We perform a within analysis using a two-sided t-tests where we test the evolution of HWB from the beginning to after the engagement (i.e., *HWB Post-decision* - *HWB Beginning*) or after the actions (i.e., *HWB End* - *HWB Beginning*) for subjects who did the action or not on the different treatments. The null hypothesis of the different tests is the average evolution of emotion equal to zero. The different tests have been performed on the average global HWB measure (sum of positive

¹²We do not find a significant evolution of LS between the beginning and the end of the experiment, whether PEB is adopted or not. This result was expected since LS is a stable measure over time and mostly sensitive to changing life circumstances (Veenhoven 2000, Frey & Stutzer 2002).

emotions scores minus sum of negative emotions scores), on the average evolution of each emotion, and on the average evolution of aggregated positive or negative emotions. Table 4 displays the average evolution according to the PEB decision-making for the different treatment. We provide additional supporting information in Table 11 of the Appendix B where we test, using a two-sample t-test, the difference in evolution between participants who did the action and those who did not for each treatment. The null hypothesis of the different tests is the evolution of emotions is equal between participants who did the action or not. This allows us to control that the evolution is not dependent on factors other than PEB decision-making, which would produce significant increases or decreases regardless of the individuals' decisions.

Table 4: T-Test - Average HWB Evolution According to PEB Decision-Making for Each Treatment

	<i>Activity</i>		<i>Remunerated Activity</i>		<i>Donation</i>	
	<i>Action=0</i>	<i>Action=1</i>	<i>Action=0</i>	<i>Action=1</i>	<i>Action=0</i>	<i>Action=1</i>
<i>HWB Post-decision - HWB Beginning</i>						
Overall	-1.23(0.82)	6.09***(1.00)	-0.16(0.77)	5.46***(0.89)	-0.37(1.23)	3.66***(0.95)
Positives	-1.43**(0.55)	1.93***(0.61)	-1.00*(0.49)	2.52***(0.79)	-1.38**(0.55)	1.17**(0.51)
Determined	-0.59**(0.18)	0.11(0.18)	-0.32(0.16)	0.22(0.12)	-0.49**(0.15)	-0.05(0.15)
Happy	-0.27(0.15)	0.27*(0.12)	-0.26(0.12)	0.40*(0.14)	-0.34(0.14)	0.12(0.11)
Inspired	0.18(0.17)	0.45**(0.17)	0.00(0.16)	0.38**(0.12)	-0.19(0.17)	0.34(0.18)
Proud	-0.70*** (0.16)	0.57**(0.19)	-0.34(0.17)	0.50**(0.15)	-0.60*** (0.16)	0.37(0.17)
Serene	-0.05(0.19)	0.52**(0.15)	-0.08(0.17)	1.02*** (0.14)	0.25(0.17)	0.39(0.17)
Negatives	-0.20(0.55)	-4.15*** (0.59)	-0.84(0.51)	-2.94*** (0.53)	-1.00*(0.43)	-2.49*** (0.56)
Discourage	-0.14(0.17)	-0.80*** (0.16)	-0.20(0.14)	-0.70*** (0.16)	-0.30(0.14)	-0.76*** (0.18)
Guilty	1.05*** (0.18)	-0.39** (0.14)	0.20(0.18)	-0.46** (0.14)	0.62** (0.17)	-0.41(0.21)
Nervous	-0.48*(0.18)	-0.93** (0.23)	-0.32*(0.15)	-0.68*** (0.17)	-0.75*** (0.15)	-0.59*** (0.14)
Sad	-0.13(0.16)	-0.95*** (0.16)	-0.08(0.17)	-0.54** (0.16)	-0.09(0.13)	-0.39** (0.14)
Worried	-0.50** (0.17)	-1.09*** (0.18)	-0.44** (0.16)	-0.56** (0.16)	-0.47** (0.16)	-0.34(0.20)
<i>HWB End - HWB Beginning</i>						
Overall	0.39(0.62)	2.84*** (0.87)	-0.84(0.11)	3.78*** (0.73)	0.72(0.68)	1.00(0.75)
Positives	0.02(0.40)	0.84(0.52)	-0.58(0.31)	1.56*** (0.39)	0.09(0.40)	0.36(0.49)
Determined	-0.21(0.13)	-0.07(0.20)	-0.40*** (0.10)	-0.04(0.16)	-0.19(0.11)	-0.29(0.15)

Continued on next page

Table 4 – continued from previous page

	<i>Activity</i>		<i>Remunerated Activity</i>		<i>Donation</i>	
	<i>Action=0</i>	<i>Action=1</i>	<i>Action=0</i>	<i>Action=1</i>	<i>Action=0</i>	<i>Action=1</i>
Happy	0.09(0.11)	0.11(0.11)	0.06(0.13)	0.26(0.12)	0.06(0.11)	0.02(0.14)
Inspired	0.00(0.12)	0.36*(0.14)	-0.08(0.10)	0.42**(0.14)	0.00(0.12)	0.27(0.15)
Proud	0.04(0.12)	0.34(0.21)	-0.12(0.15)	0.16(0.13)	0.15(0.15)	0.12(0.14)
Serene	0.11(0.13)	0.09(0.13)	-0.04(0.12)	0.76***(0.12)	0.08(0.14)	0.24(0.15)
Negatives	-0.37(0.49)	-2.00***(0.64)	0.26(0.49)	-2.22***(0.45)	-0.62(0.46)	-0.63(0.47)
Discourage	-0.09(0.14)	-0.30(0.16)	-0.08(0.15)	-0.40(0.16)	-0.09(0.12)	-0.24(0.16)
Guilty	0.00(0.18)	-0.07(0.15)	0.24(0.15)	-0.28(0.14)	-0.00(0.11)	-0.24(0.17)
Nervous	-0.14(0.17)	-0.57*(0.20)	0.08(0.15)	-0.76***(0.16)	-0.34(0.18)	-0.10(0.15)
Sad	0.13(0.15)	-0.39(0.21)	0.34(0.15)	-0.22(0.15)	-0.11(0.15)	0.02(0.14)
Worried	-0.27(0.18)	-0.68**(0.21)	-0.32(0.15)	-0.56***(0.15)	-0.08(0.14)	-0.07(0.17)
Nb subjects	56	44	50	50	53	41

Note: Significance: *= 10%;**= 5%;*** = 1% of a two-sided t-test under Holm-Bonferroni correction. When considering detailed emotions, we assume 10 different multiple hypotheses tested to perform the Holm-Bonferroni correction, corresponding to the 10 emotions for a sample consisting of subjects of a treatment either doing the action or not. Standard errors are in parentheses.

We observe an increase in HWB among participants engaging in PEB immediately after the decision, regardless of the treatment. In contrast, no significant differences are found for non-participants.

For the *Donation* treatment, the average increase in HWB among donators disappears five days after the donation.

For the *Activity* and *Remunerated Activity* treatments, we observe a general increase in positive emotions and a decrease in negative emotions post-decision among participants to the waste collection, whether remunerated or not. These results still hold just after the activity (i.e., five days after the engagement), except for the increase of positive emotions for the *Activity* treatment.

These findings further confirm that PEB increases HWB, particularly after the decision to engage.

4.3.2 Comparison of HWB evolution between the *Activity* and the *Remunerated Activity* treatments

We now shift our focus to analyzing the difference in emotional changes between participants who choose to engage in waste collection and those who do not, comparing the treatment where participation is remunerated with the treatment where it is unpaid.

We perform two-sample t-tests where we compare the evolution of emotions between participants in the *Activity* and *Remunerated Activity* treatments, depending on whether they participated in the waste collection or not. The null hypothesis is that the evolution of emotions is equal regardless of whether the activity is remunerated or not. Table 5 reports the average differences between the two samples (i.e., *Remunerated Activity* - *Activity*).

We do not find overall significant differences in the evolution of HWB regardless of whether the activity is remunerated or unpaid, or whether participants choose to take part in it. However, we do observe differences in specific emotions. More specifically, participants who choose to participate in waste collection tend to feel more serene after the activity when it is remunerated, compared to when the waste collection is unpaid. Also, as noted in previous analyses based on Table 4, participants who decide not to participate in waste collection feel significantly more guilty after the decision. This effect is particularly pronounced when the activity is unpaid. In other words, refusing to adopt a PEB has fewer consequences on guilt when this behavior is monetarily rewarded.

Table 5: T-test - Average HWB Evolution According to PEB Decision-Making and Comparing When the Activity Is Remunerated or Not

	<i>Action=0</i>	<i>Action=1</i>	<i>Action=0</i>	<i>Action=1</i>
	<i>HWB Post-decision - HWB Beginning</i>		<i>HWB End - HWB Beginning</i>	
Overall	1.07(1.14)	-0.63(1.34)	-1.23(0.94)	0.94(1.13)
Positives	0.43(0.74)	0.59(0.75)	-0.60(0.52)	0.72(0.64)
Determined	0.27(0.24)	0.11(0.21)	-0.19(0.17)	0.03(0.25)
Happy	0.01(0.19)	0.13(0.19)	-0.03(0.17)	0.15(0.17)
Inspired	-0.18(0.23)	-0.07(0.21)	-0.08(0.16)	0.06(0.2)

Continued on next page

Table 5 – continued from previous page

	<i>Action=0</i>	<i>Action=1</i>	<i>Action=0</i>	<i>Action=1</i>
Proud	0.36(0.24)	-0.07(0.24)	-0.16(0.16)	-0.18(0.24)
Serene	-0.03(0.26)	0.5(0.21)	-0.15(0.18)	0.67**(0.18)
Negatives	-0.64(0.76)	1.22(0.79)	0.63(0.70)	-0.22(-0.77)
Discourage	-0.06(0.22)	0.1(0.23)	0.01(0.2)	-0.1(0.23)
Guilty	-0.85**(0.25)	-0.07(0.2)	0.24(0.24)	-0.21(0.21)
Nervous	0.16(0.24)	0.25(0.28)	0.22(0.23)	-0.19(0.25)
Sad	0.04(0.23)	0.41(0.23)	0.22(0.21)	0.17(0.25)
Worried	0.06(0.23)	0.53(0.24)	-0.05(0.23)	0.12(0.25)
Nb subjects	56/50	44/50	56/50	44/50

Note: Significance: *= 10%; ** = 5%; *** = 1% of a two-sample two-sided t-test under Holm-Bonferroni correction. When considering detailed emotions, we assume 10 different multiple hypotheses tested to perform the Holm-Bonferroni correction, corresponding to the 10 emotions considered for each treatment. Standard errors are in parentheses. The number of subjects corresponds to the two sample sizes, with the first value corresponding to the number of subjects in the *Activity* treatment and the second value corresponding to the number of subjects in the *Remunerated Activity* treatment.

4.3.3 Comparison of HWB evolution between the *Activity* and *Donation* treatments

Last, we focus the analysis on the type of PEB considered (waste collection or donation) and the evolution of HWB after the engagement.¹³

We perform two-sample t-tests where we compare the evolution of emotions between participants in the *Activity* and *Donation* treatments, depending on whether they make a PEB or not. The null hypothesis is that the evolution of emotions is equal regardless of the type of PEB. Table 6 reports the average differences between the two samples (i.e., *Donation* - *Activity*).

Overall, the increase in HWB for participants adopting PEB is significantly smaller when the PEB consists of a donation compared to participating in a waste collection activity. Specifically, feelings of sadness and worry decrease more for those who choose to adopt a PEB by engaging in an activity comparing to those who choose to donate (see Table 4 for average evolution of emotions for each treatment according to PEB decision-making).

¹³We do not consider the evolution of HWB between the beginning and the end of the experiment since the donation decision-making was done during the first questionnaire.

Table 6: T-test - Average HWB Evolution According to PEB Decision-Making and Comparing When the PEB is a Waste Collection or a Donation

	<i>Action=0</i>	<i>Action=1</i>
<i>HWB Post-decision - HWB Beginning</i>		
Overall	0.86(1.14)	-2.43*(1.38)
Positives	0.05(0.77)	-0.76(0.80)
Determined	0.1(0.23)	-0.16(0.23)
Happy	-0.07(0.2)	-0.15(0.16)
Inspired	-0.37(0.24)	-0.11(0.25)
Proud	0.09(0.23)	-0.2(0.25)
Serene	0.3(0.26)	-0.13(0.23)
Negatives	-0.80(0.70)	1.67**(0.81)
Discourage	-0.16(0.22)	0.04(0.24)
Guilty	-0.43(0.25)	-0.03(0.25)
Nervous	-0.27(0.24)	0.35(0.27)
Sad	0.03(0.21)	0.56*(0.21)
Worried	0.03(0.23)	0.75*(0.27)
Nb subjects	56/53	44/41

Note: Significance: *= 10%; ** = 5%; *** = 1% of a two-sample two-sided t-test under Holm-Bonferroni correction. When considering detailed emotions, we assume 10 different multiple hypotheses tested to perform the Holm-Bonferroni correction, corresponding to the 10 emotions considered for each treatment. Standard errors are in parentheses. The number of subjects corresponds to the two sample sizes, with the first value corresponding to the number of subjects in the *Activity* treatment and the second value corresponding to the number of subjects in the *Donation* treatment.

5 Discussion and conclusion

This research explores the relationship between PEB and SWB in a field experiment setting. In the existing literature, there is extensive discussion on the positive correlation between SWB and PEB. Most of this research argues that PEBs enhance SWB by fulfilling intrinsic psychological needs (Kasser 2017), promoting value consistency (Zawadzki et al. 2020), improving one’s self-image (Binder & Blankenberg 2017), and reputation (Schmitt et al. 2018), and creating a feeling of warm glow (Venhoeven et al. 2013), or as a result of “decision errors” (Welsch 2024). These findings offer hope for gaining public support for the ecological transition, suggesting that lifestyle changes towards

eco-friendly behaviors are not a threat to individual well-being but, on the contrary, are likely to improve it. However, an important issue has been put aside to explain this positive correlation: the possibility of reverse causality. In other words, does adopting PEB increase happiness, or do happier people adopt more PEB? Most of the research emphasizes the need to develop an experimental design to address this limitation (Binder & Blankenberg 2016, 2017, Schmitt et al. 2018, Van der Linden 2018, Zawadzki et al. 2020, Welsch 2024). Our experimental design enables us to disentangle the relationship between PEB and SWB, and to examine the impact of monetary incentives on this relationship. In doing so, we contribute to the literature in four different ways.

First, through the implementation of a field experiment, we track PEBs by recording participation in waste collection and monetary donations. De Leeuw et al. (2015) highlights that self-reported measures of PEB may be biased because individuals are likely to overestimate the extent to which they perform socially desirable behaviors.¹⁴ Studies on PEBs most commonly employ self-reported measures of actual behavior (Li et al. 2019, Zawadzki et al. 2020). In this regard, we go further than the existing literature by ensuring to capture actual behaviors. Furthermore, few experiments incorporate measures of SWB (Burger et al. 2020, Aknin et al. 2022, Prinzing 2023). Following Burger et al. (2020), we measure momentary HWB at three points in time: before the participants are informed about the nature of the experiment, after participants choose to engage in waste collection, donate, or decide not to take any action, and after the waste collection has taken place. Additionally, we observe individuals' LS at the start and the end of the experiment. This design enables us to explore whether SWB influences PEBs and to examine changes in HWB from the experiment's start to the moments of PEB engagement and action. Moreover, we explore how these relationships fluctuate among three different treatments: *Activity*, *Remunerated activity*, and *Donation*.

Second, our main finding reveals evidence of a virtuous feedback loop between SWB and PEB among individuals who voluntarily participate in waste collection. On one hand, momentary happiness explain participation in the unpaid waste collection. On the other hand, PEBs (i.e. waste collection and donation) enhance positive emotions and decrease negative emotions. This result aligns with

¹⁴We confirm it since 48% of respondents who did not participate in waste collection when given the opportunity stated that they would in a hypothetical situation.

the existing literature on PEB and SWB (Venhoeven et al. 2013, Zawadzki et al. 2020, Kasser 2017). Interestingly, the rise in HWB is highest after the engagement. All in all, these results are consistent with the intuition of Van der Linden (2018) about the existence of a positive self-reinforcing “feedback” loop where PEBs increase HWB which in turn encourages PEBs. This suggests that the effect of PEB on SWB may be overestimated when studying the correlation between the two. We note that our experiment does not allow us to conclude whether the hedonic gains from engaging in PEB will directly result in the adoption of other PEBs. Future research could involve a repeated experiment or follow-up diary studies to investigate whether positive emotions can facilitate more long-term behavior change.

Third, our results highlight a significant difference in the relationship between donation and voluntary participation in a non remunerated waste collection and SWB. Firstly, happiness does not predict monetary donations, whereas it does predict voluntary participation in waste collection. Secondly, we observe that the increase in HWB for participants engaging in PEB is significantly less pronounced when the PEB involves a donation compared to voluntary waste collection. Indeed, participants involved in waste collection experience significantly lower levels of sadness and worry compared to those who make a donation. Following self-determination theory (Deci & Ryan 1985), individuals are more prone to fulfill their need for relatedness through participation in waste collection compared to donating, as they can experience a sense of connection with fellow participants and unite around the shared objective of making the city cleaner. Thus, we may infer that individuals who consciously choose to get involved in waste collection will pursue this activity as more meaningful than a monetary donation (Zawadzki et al. 2020).¹⁵ Additionally, waste collection is an achievable goal with direct perception of the benefits, while monetary donation does not imply direct tangible benefits (Venhoeven et al. 2013).

Fourth, we find that happiness explains participants’ decision to adopt PEB only when the waste collection is not remunerated. Indeed, SWB does not explain the participation in the paid activity. Based on Lindenberg (2001) theory of farming, we can argue that framing the experiment by

¹⁵Among the various activities proposed by the Alsace Nature association (e.g., inventory of fauna and flora, participation in ecological projects, geolocating natural habitat degradation and ensuring follow-up on cases, workshops on environmental issues, etc.), participants ranked waste collection as the activity with the most impact on nature preservation. 88% believe that waste collection has a significant impact on preserving the environment.

introducing monetary incentives increased the participation of individuals primarily motivated by gain-related considerations. Moreover, according to the literature on intrinsic motivation, we can infer that introducing a monetary incentive may have impaired self-determination (i.e. need for autonomy in decision-making) and undermined self-esteem (i.e. non-recognition of individual values), leading to a decrease of individual intrinsically motivated to participate to the paid waste collection. In support of this, we observe that the feeling of guilt is more pronounced among individuals who choose not to participate in the unpaid treatment group compared to those in the remunerated treatment group. However, we do not find a significant difference in the global increase of HWB or participants in waste collection, whether they are paid or not. This result challenges the idea that intrinsically motivated individuals will experience greater positive feelings (Kasser 2017). It implies that offering monetary incentives for an activity does not necessarily reduce the hedonic benefits of engaging in it.

The results are mainly based on students from France, and future research should investigate whether our findings hold in other countries and among different populations. Moreover, our study focuses on specific PEB. Participation in waste collection is a specific kind of PEB that does not necessarily translate into eco-friendly habits. Additionally, it is plausible that the self-selection of happy individuals in the waste collection is due to specific characteristics of the volunteering rather than to act eco-friendly. Existing research has shown a positive correlation between volunteering and SWB, suggesting that this relationship is partly driven by the altruistic nature of the activity and the social interactions it fosters (Thoits & Hewitt 2001, Meier & Stutzer 2004, Binder & Blankenberg 2016). Thus, future research may analyze whether SWB is a determinant of various other types of PEB, such as purchasing behavior, dietary habits, or energy use using an experimental setting. Lastly, for simplicity and to avoid a lack of power in our statistical analysis, we exogenously defined the possible donation amount to be €5. Results might vary if participants could decide the donation amount themselves or if a larger amount was used. We believe this could also be an interesting avenue for further research.

Our findings contribute to the ongoing debate about the relationship between PEB and SWB and have implications for policymakers seeking to promote sustainable behaviors. Our main result on

the virtuous loop between PEB and SWB supports the idea that more eco-friendly and sustainable behaviors do not lead to a substantive loss in SWB. On the contrary, it lends support to public policies promoting sustainable well-being, as it seems to encourage voluntary PEB and harness a leverage effect, since PEB, in turn, increases SWB. We do not necessarily advocate solely for public policies aimed at eliciting positive moods to encourage PEB, as these policies may be too inconsistent to achieve stable PEB in the population (Lindenberg & Steg 2007). However, the fact that individuals who report higher LS are more inclined to voluntarily engage in PEB lends support to behavioral policies that appeal to intrinsically valued motives to encourage participation in the ecological transition. Additionally, in line with Lindenberg & Steg (2007), we believe that public policies could also disseminate information aimed at promoting environmentally responsible norms, to encourage and reinforce PEB.

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Competing Interests

The authors have no competing interests to declare.

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A Experimental design

Table 7: Details of Online Questionnaires

Page	Question	Possible Answer
1st questionnaire		
1	Before proceeding, do you confirm that you are available in person in Strasbourg on Saturday, XX, from XX a.m. to XX p.m., as well as remotely in the evening from 5 p.m. to 23:59 p.m. to respond to a 5-minute online questionnaire?	Yes-No
2	On a scale from 0 (not at all satisfied) to 10 (completely satisfied), please indicate your satisfaction with the life you are currently leading:	0 (Not at all satisfied) - 10 (Completely satisfied)
3	Over the past four weeks, have you felt happy?	Never - Rarely - Sometimes - Most of the time - Always
4	Right now, do you feel: - Serene - Discouraged - Happy - Guilty - Inspired - Nervous - Proud - Sad - Determined - Worried	Not at all or very little - A little - Moderately - A lot - Extremely
5	Do you feel concerned about environmental issues?	Very little or not at all - A little - Moderately - A lot - Extremely
Continued on next page		

Table 7 – continued from previous page

Page	Question	Possible Answer
6	<p>Around the world, people are generally concerned about environmental issues due to their adverse effects on nature and the environment. However, they have different opinions regarding which consequences concern them the most. Please rate each of the following items on a scale from 0 (not important) to 6 (extremely important) in response to the statement below: I am concerned about environmental issues due to their consequences on ...</p> <ul style="list-style-type: none"> - ... plants. - ... marine life. - ... birds. - ... animals. - ... myself. - ... my lifestyle. - ... my health. - ... my future. - ... the inhabitants of my country. - ... humanity. - ... children. - ... future generations. 	0 (not important) - 6 (extremely important)
7	<p>Please indicate how often you perform the following actions:</p> <ul style="list-style-type: none"> - If offered a plastic bag when shopping, I take it. - I separate my recyclable waste such as paper, cardboard, plastic, and glass. - After a picnic, I leave the place as clean as it was initially. - To travel to a place within 10km of my home, I use my bike or public transportation. - When possible, I prefer traveling by train rather than by plane. - When I can, I carpool. - I turn off lights when a room is empty. - In winter, I keep the heating on to avoid wearing a sweater. - I turn off my electronic devices when not in use, rather than leaving them on standby. - I buy local and seasonal products. - I boycott companies that harm the environment. - I limit my meat consumption. - I confront people who have environmentally unfriendly behavior. - I seek ways to incorporate environmentally friendly practices into my lifestyle. - I question the environmental consequences of my daily choices. 	Never - Rarely - Sometimes - Most of the time - Always

Continued on next page

Table 7 – continued from previous page

Page	Question	Possible Answer
8	<p>During the past six months, to what extent have you engaged in the following environmental activities and actions?</p> <ul style="list-style-type: none"> - I informed myself about environmental issues (e.g., media, television, internet, blogs, etc.). - I participated in events related to environmental issues (e.g., conferences, seminars, workshops on environmental issues). - I discussed environmental issues with my loved ones (e.g., partner, family, friends, or children). - I actively engaged in an association or political party advocating for environmental protection. - I financially supported an environmental cause. - I took part in a demonstration related to environmental issues. - I chose to study/work on environmental issues. - I participated in nature conservation activities (e.g., tree planting, river restoration, waste collection, etc.). 	<p>Never - Once or twice - Once or twice a month - Once a week - More than once a week</p>
10	Would you like to participate more in activities/actions in favor of the environment?	Yes-No
11	Video	
12	<p>Would you be willing to participate in a waste collection activity? Do you think some of your relatives would like to participate in a waste collection activity?</p> <p>According to the video, how many kilograms per person per year of wild waste are thrown into nature?</p>	<p>Yes-No Yes-No 1kg-5kg-10kg-15kg</p>
13	<p><i>Activity</i> treatment: You have stated that you are available on Saturday, XX from XX am to XX pm in Strasbourg. During this time slot, we offer you the opportunity to participate in a waste collection activity organized in Strasbourg by the Alsace Nature association that you have just discovered in the video. The waste collection will start on Saturday, XX at XX am at the XX tram stop. Your participation is not mandatory. In any case, you will receive €20 for answering the questionnaires, provided you log in during the third stage between 5 pm and 23:59 pm (maximum 5 minutes) on Saturday, XX to provide your banking information and sign an electronic receipt. Do you wish to participate in the activity offered by the Alsace Nature association?</p> <p><i>Remunerated Activity</i> treatment: You have stated that you are available on Saturday, XX from XX am to XX pm in Strasbourg.</p>	Yes-No
Continued on next page		

Table 7 – continued from previous page

Page	Question	Possible Answer
	<p>During this time slot, we offer you the opportunity to participate in a waste collection activity organized in Strasbourg by the Alsace Nature association that you have just discovered in the video. The waste collection will start on Saturday, XX at XX am at the XX tram stop.</p> <p>Your participation is not mandatory. In any case, you will receive €20 for answering the questionnaires, provided you log in during the third stage between 5 pm and 23:59 pm (maximum 5 minutes) on Saturday, XX to provide your banking information and sign an electronic receipt.</p> <p>Additionally, if you participate in this activity, an amount of €20 will be added to your earnings of €20 for a total gain of €40.</p> <p>Do you wish to participate in the activity offered by the Alsace Nature association?</p> <p><i>Activity & Donation treatment:</i></p> <p>You have stated that you are available on Saturday, XX from XX am to XX pm in Strasbourg.</p> <p>During this time slot, we offer you the opportunity to participate in a waste collection activity organized in Strasbourg by the Alsace Nature association that you have just discovered in the video. The waste collection will start on Saturday, XX at XX am at the XX tram stop.</p> <p>Your participation is not mandatory. In any case, you will receive €20 for answering the questionnaires, provided you log in during the third stage between 5 pm and 23:59 pm (maximum 5 minutes) on Saturday, XX to provide your banking information and sign an electronic receipt.</p> <p>Do you wish to participate in the activity offered by the Alsace Nature association?</p> <p>We also offer you the opportunity to donate €5 to the Alsace Nature association, which was introduced to you earlier in the video. These €5 will be deducted directly from the €20 corresponding to your earnings for your participation in this study.</p> <p>Do you wish to donate €5 to the Alsace Nature association?</p> <p><i>Donation treatment:</i></p> <p>You have stated that you are available on Saturday, XX from XX am to XX pm in Strasbourg.</p> <p>We will not need you during this time slot after all. You will proceed directly to step 3 of the experiment.</p> <p>Therefore, you will receive €20 for answering the questionnaires, provided you log in during the third step between 5 pm and 23:59 pm (maximum 5 minutes) on Saturday, XX to enter your banking information.</p>	<p>Yes-No</p> <p>Yes-No</p> <p>Yes-No</p>
Continued on next page		

Table 7 – continued from previous page

Page	Question	Possible Answer
	However, we offer you the opportunity to donate €5 to the Alsace Nature association, which was introduced to you earlier in the video. These €5 will be deducted directly from the €20 corresponding to your earnings for your participation in this study. Do you wish to donate €5 to the Alsace Nature association?	Yes-No
14	You've just made a decision, how do you feel? <ul style="list-style-type: none"> - Serene - Discouraged - Happy - Guilty - Inspired - Nervous - Proud - Sad - Determined - Worried 	Not at all or very little - A little - Moderately - A lot - Extremely
15	What is your age? What is your gender? Are you in a relationship? What is the postal code of your primary residence? What is your nationality? What is your current situation? Are you a scholarship recipient? In what field do you work or study?	Integer value Female - Male - Other Yes-No Integer value Free text Employed - Unemployed (registered or not with Pôle emploi) - Retired or pre-retired - Unable to work due to a disability or long-term health problem - In education - Homemaker - Other situations Yes-No Arts - Other - Chemistry, biochemistry, life and earth sciences - Law, political sciences - Economics - French, literature, philosophy - History, geography - Language, linguistics - Physical, mathematics - Psychology - Health - Sociology
		Continued on next page

Table 7 – continued from previous page

Page	Question	Possible Answer
	<p>What is the highest level of education you have completed?</p> <p>How do you rate your overall health?</p> <p>How many paid hours do you work per week?</p> <p>What is your average monthly disposable income?</p> <p>Are you a member of one or more non-profit associations? What type(s) of association(s) are you a member of?</p>	<p>Certificate of completion of lower secondary education (Brevet) - High school diploma (BAC) - Associate's degree (BAC+2) - Bachelor's degree (BAC+3) - Master's degree (BAC+5) - Doctorate (BAC+8)</p> <p>Poor - Fair - Good - Very good - Excellent</p> <p>0 hours - 11-15 hours - 16-23 hours - 1-10 hours - 23-27 hours - 28-34 hours - 35-39 hours - More than 39 hours</p> <p>0 or deficit - Less than 500 - 500-850 - 850-1250 - 1250-1700 - 1700-2100 - 2100-2500 - 2500-3000</p> <p>- I prefer not to answer</p> <p>Yes-No</p> <p>Free text</p>
2nd questionnaire		
1	On a scale from 0 (not at all satisfied) to 10 (completely satisfied), please indicate your satisfaction with the life you are currently leading:	0 (Not at all satisfied) - 10 (Completely satisfied)
2	Over the past four weeks, have you felt happy?	Never - Rarely - Sometimes - Most of the time - Always
3	<p>After your activities of the day, you feel:</p> <ul style="list-style-type: none"> - Serene - Discouraged - Happy - Guilty - Inspired - Nervous - Proud - Sad - Determined - Worried 	<p>Not at all or very little</p> <p>- A little - Moderately - A lot - Extremely</p>
4	Do you feel concerned about environmental issues?	<p>Very little or not at all</p> <p>- A little - Moderately - A lot - Extremely</p>
Continued on next page		

Table 7 – continued from previous page

Page	Question	Possible Answer
5	Do you know anyone who has taken part in this experiment?	Yes-No
	Did you know the Alsace Nature association before this experiment?	Yes-No
	Would you like to be contacted by the Alsace Nature association for future events?	Yes-No
6	For <i>Activity</i> and <i>Remunerated Activity</i> treatments only We offer you the opportunity to donate €5 to the Alsace Nature association. These €5 will be deducted directly from the €20 corresponding to your earnings for your participation in this study. Do you wish to donate €5 to the Alsace Nature association?	Yes-No

B Results

Table 8: Attrition Behavior Across the Different Treatments

Treatment	Nb Registrants	Nb Subject	Nb Drop-off	% of Registrants	Do not start	Not eligible	Drop-off during Questionnaire 1	Do not start Questionnaire 2
<i>Activity</i>	120	100	20	17%	9	7	3	1
<i>Activity Remunerated</i>	120	100	20	17%	12	5	1	2
<i>Activity & Donation</i>	123	99	24	19%	13	2	4	5
<i>Donation</i>	120	94	26	27%	11	8	4	3
Total	483	393	90	19%	45	22	12	11

Table 9: Average Individual Characteristics of Subjects and Drop-off Registrants

	Subjects	Drop-Off Registrants
LS Beginning	6.6	6.5
HWB Beginning	3.7	4.4
% Female	60.8%	27.3%
Age	21.7	20.9
Health Status	2.3	2.5
% Income < 500	51.7%	63.6%
Environnemental Concern	-0.00	0.05
Nb	393	≤ 22

Note: The drop-off registrants sample size is lower or equal to 22 depending on when participants left the study. For subjective well-being measure, we have 22 participants’ answers; for environmental concern, we gathered 15 answers; and for other characteristics, only 11 participants reached this stage. For the socio-demographic survey, we provided participants with an “Other” option for the gender question. We have grouped them with the “Male” category for the remainder of the analysis. We have split the income variables into three groups: “Income < €500,” “Income > €500,” and “NA.” *Health status* is measured in response to “On a scale from 0 (Poor) to 4 (Excellent), how do you rate your overall health?.” *Environmental concerns* are measured as the average of three normalized scales: the Scale of Environmental Concern (Schultz 2001), the General Ecological Behavior Scale (Kaiser 2020), and the Environmental Action Scale (Alisat & Riemer 2015). Normalization is performed as standardization, using the standard deviation of the whole sample regardless of attrition behavior.

Table 10: Pearson Correlation Coefficients Among the Different Emotions Composing the *HWB Beginning*

	Determined	Happy	Inspired	Proud	Serene	Discourage	Guilty	Nervous	Sad	Worried
Determined	1.00									
Happy	0.34	1.00								
Inspired	0.56	0.33	1.00							
Proud	0.55	0.41	0.48	1.00						
Serene	0.36	0.54	0.31	0.37	1.00					
Discourage	-0.33	-0.34	-0.23	-0.25	-0.46	1.00				
Guilty	-0.14	-0.20	-0.12	-0.16	-0.31	0.37	1.00			
Nervous	-0.08	-0.22	-0.11	-0.03	-0.47	0.41	0.30	1.00		
Sad	-0.24	-0.39	-0.17	-0.22	-0.42	0.45	0.45	0.40	1.00	
Worried	-0.11	-0.27	-0.08	-0.15	-0.42	0.39	0.37	0.57	0.46	1.00

Table 11: Two-Sample T-Tests - Average HWB Evolution Between *Action=0* and *Action=1* for Each Treatment

	<i>Activity</i>	<i>Remunerated Activity</i>	<i>Donation</i>
<i>HWB Post-decision - HWB Beginning</i>			
Overall	7.32***(1.28)	5.62***(1.18)	4.04***(1.23)
Positives	3.36***(0.82)	3.52***(0.66)	2.55**(0.76)
Determined	0.7**(0.25)	0.54*(0.2)	0.44(0.21)
Happy	0.54**(0.2)	0.66**(0.19)	0.46(0.19)
Inspired	0.28(0.24)	0.38(0.2)	0.53(0.25)
Proud	1.26***(0.25)	0.84**(0.23)	0.97***(0.23)
Serene	0.58*(0.25)	1.1***(0.22)	0.14(0.25)
Negatives	-3.96***(0.81)	-2.10**(0.73)	-1.49*(0.70)
Discourage	-0.65**(0.24)	-0.5(0.22)	-0.45(0.23)
Guilty	-1.44***(0.24)	-0.66**(0.23)	-1.04**(0.27)
Nervous	-0.45(0.29)	-0.36(0.23)	0.17(0.21)
Sad	-0.83**(0.23)	-0.46(0.24)	-0.3(0.19)
Worried	-0.59*(0.25)	-0.12(0.23)	0.13(0.25)
<i>HWB End - HWB Beginning</i>			
Overall	2.44**(1.04)	4.62***(1.01)	0.28(1.02)
Positives	0.82(0.64)	2.14***(0.50)	0.27(0.63)
Determined	0.15(0.23)	0.36(0.19)	-0.1(0.19)
Happy	0.02(0.16)	0.2(0.18)	-0.03(0.18)
Inspired	0.36(0.19)	0.5**(0.17)	0.27(0.19)

Continued on next page

Table 11 – continued from previous page

	<i>Activity</i>	<i>Remunerated Activity</i>	<i>Donation</i>
Proud	0.31(0.23)	0.28(0.17)	-0.03(0.21)
Serene	-0.02(0.19)	0.8*** (0.18)	0.17(0.2)
Negatives	-1.62*(0.80)	-2.48*** (0.67)	-0.01(0.67)
Discourage	-0.21(0.21)	-0.32(0.22)	-0.15(0.20)
Guilty	-0.07(0.24)	-0.52*(0.21)	-0.24(0.20)
Nervous	-0.43(0.26)	-0.84** (0.22)	0.24(0.24)
Sad	-0.51(0.26)	-0.56*(0.21)	0.14(0.21)
Worried	-0.41(0.27)	-0.24(0.21)	0.00(0.21)
Nb subjects	44/56	50/50	41/53

Note: Significance: *= 10%; **= 5%; *** = 1% of a two-sample two-sided t-test under Holm-Bonferroni correction. When considering detailed emotions, we assume 10 different multiple hypotheses tested to perform the Holm-Bonferroni correction, corresponding to the 10 emotions considered for each treatment. Standard errors are in parentheses. The number of subjects corresponds to the two sample sizes, with the first value corresponding to the number of subjects doing the action.