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Social preferences and environmental externalities

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Working Paper 2025:6

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Social Preferences and Environmental Externalities

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May 2025

LUND UNIVERSITY

Social Preferences and Environmental Externalities*

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May 15, 2025

Abstract

Standard economic theory assumes that consumers ignore the externalities they create, such as emissions from burning fossil fuels and generating waste. In an incentivized study ($N = 3,718$), we find that most people forgo substantial gains to avoid imposing negative externalities on others. Using administrative data on household waste, we show a clear link between such prosociality and waste behavior: prosociality predicts lower residual waste generation and higher waste sorting. Prosociality also predicts survey-reported pro-environmental behaviors such as lowering indoor temperature, limiting air travel, and consuming eco-friendly products. These findings highlight the importance of considering social preferences in environmental policy.

JEL Classifications: D01, D62, Q53

Keywords: social preferences, prosociality, environmental behaviors, externalities

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1 Introduction

Many individual consumption behaviors, such as air travel, energy consumption, and waste generation, impose negative externalities on others. These externalities are central to the most pressing environmental issues, including climate change, air pollution, and waste accumulation. Standard economic theory assumes that individuals ignore such environmental externalities. However, recent theoretical work postulates that consumers exhibit other-regarding or "social" preferences, leading them to consider environmental externalities to some extent (Brekke et al., 2003, Nyborg et al., 2006, Bénabou and Tirole, 2010, Grafton et al., 2017, Herweg and Schmidt, 2022, Ambec and De Donder, 2022, Aghion et al., 2023, Eichner and Pethig, 2024, Kaufmann et al., 2024, Dewatripont and Tirole, 2024). This literature presents important policy conclusions often remarkably different from those derived from standard economic theory, suggesting that the optimal design of environmental policies crucially depends on the population's degree of prosociality.

A large body of evidence from incentivized experiments designed to carefully measure social preferences shows that many people do consider others in their decisions in abstract settings (e.g., Fehr and Schmidt 1999, Bolton and Ockenfels 2000, Fehr and Gächter 2002, Andreoni and Miller 2002, Charness and Rabin 2002, Gneezy 2005, Cappelen et al. 2007, Fisman et al. 2007, Carpenter 2010, Bartling et al. 2015, Abeler et al. 2019, Fehr and Charness 2023). However, this work does not link these measures of social preferences to real-world environmental behavior, leaving open the question of whether such prosociality translates into environmentally friendly consumption.

There are good reasons to question whether social preferences actually drive environmental behaviors. Insights from psychology and economics suggest that people often use excuses, such as uncertainty about how their actions affect others, to act selfishly (Haisley and Weber, 2010, Exley, 2016, Grossman and Van Der Weele, 2017). These excuses might be particularly relevant for environmentally friendly behaviors, where the impact on others is often unclear (Pace et al., 2023, Semken, 2024). Furthermore, many academics have questioned the role of social preferences in economic settings more broadly, due to factors like high stakes and experience (e.g., Levitt and List 2007, 2008, Stoop et al. 2012, Galizzi and Navarro-Martinez 2019).[1] Indeed, preferences for environmentally friendly products could be driven by other

[1]Hence, understanding whether such a relationship exists is important not only for environmental economics

factors such as status signaling or perceived differences in quality (e.g., Griskevicius et al. 2010, Barbu et al. 2022). Therefore, the extent to which prosocial concerns matter for environmentally friendly consumption remains an open and important question.

In our pre-registered study, we investigate the relationship between social preferences and environmental behavior using a general population sample in Sweden ($N = 3,718$). We collect incentivized measures of prosociality through an experiment where participants can expose others to negative externalities for personal gain. We then link these measures with administrative data on each participant's annual household waste production, including both residual household waste and sorted food waste. This approach allows us to study whether individuals who are more reluctant to impose negative externalities on others also produce less residual waste and sort more food waste, thereby mitigating the environmental externalities of their own consumption. Additionally, we complement this analysis with detailed self-reported data on each participant's environmentally friendly consumption across various domains, allowing us to understand how social preferences explain diverse environmental behaviors. Finally, by combining this data with a different dataset on the perceived environmental impact of these behaviors, we investigate whether social preferences matter differently for domains that are perceived to be more impactful.

In the incentivized social preferences experiment, we find that people are generally averse to imposing externalities on others for personal gain. In the "Externality Game," which builds on the dictator game, the participant and 20 others each start with an endowment of US$5.[2] The participant then decides whether to increase her payoff at the cost of imposing a small negative externality of $0.5 on all the other individuals. This game is played in seven iterations, with varying amounts of personal gain for the participant: $0.1, $2, $5, $10, $15, $25, and $50. The Externality Game reflects the type of social preference relevant to everyday environmental decisions, where consumers must choose whether to impose small negative externalities on many others for personal gain. See Galizzi and Wiesen (2018) and Wang and Navarro-Martinez (2023a, 2023b) for discussions on the importance of tailoring social preferences elicitation to the behaviors they aim to explain.[3]

but also for understanding whether social preferences observed in experiments influence important real-world behaviors (e.g., Fisman et al. 2015, Galizzi and Wiesen 2018, Almås et al. 2020, Epper et al. 2022, Fehr et al. 2024, Gill et al. 2023).

[2]For ease of interpretation, we present payments in US$, where SEK10 = US$1.

[3]For other papers that studied dictator games with multiple recipients, see Charness and Rabin (2002), Engelmann and Strobel (2004), Fisman et al. (2007), and Engel (2011).

Our findings reveal that most participants choose not to impose externalities on others for their own gain: 90% refuse to do so for \$0.1, 79% for \$5, and 47% even for \$50. We conclude that many people are willing to forgo substantial payments to avoid imposing externalities on others in this abstract setting. However, does such prosocial behavior translate to environmentally friendly consumption?

To study this question, we link our measures of social preferences with the annual waste generation of each participant's household, obtained from local authorities who record the weights of both residual and sorted food waste during collection. As pre-registered, we define our main social preference variable as the number of times that each participant refused to impose negative externalities on others. We find that our measure of social preferences is negatively related to the production of household residual waste (main outcome variable) and positively correlated with the amount of sorted food waste. In our pre-registered specification, the most prosocial individuals generate 0.15 standard deviations (SD) less residual waste ($p = 0.001$) and sort 0.12 SD more food waste ($p = 0.016$) compared to the least prosocial participants. These coefficients are substantial: a reduction of 0.15 SD in residual waste is similar in magnitude to the effect of reducing the number of adult household members from two to one. The results are robust and remain stable to a large battery of controls, including sociodemographics, time spent at home, and risk and time preferences..

To understand how social preferences matter for behavior in various environmental domains, we collect self-reported data on participants' environmentally friendly consumption across multiple areas. These include separate items for the frequency of flying and driving, along with four pre-registered indices for waste reduction, energy and water saving, transportation, and eco-consumption. We find that while prosociality is not a strong predictor of driving frequency, the most prosocial people fly significantly less than the least prosocial (0.19 SD, $p < 0.001$). Moreover, prosocial preferences matter mostly for the transportation (0.24 SD, $p < 0.001$) and eco-consumption (0.20 SD, $p < 0.001$) indices. Prosocial preferences also positively predict our waste reduction index (0.14 SD, $p = 0.008$), mirroring the coefficient obtained using administrative data, yet they do not significantly influence the energy and water saving index (-0.02 SD, $p = 0.685$). These results illustrate that while social preferences predict environmental behavior across the board, their influence varies substantially across different domains.

To explore why social preferences predict environmental behaviors differently across do-

mains, we consider the perceived environmental impact of each behavior. For example, even though reusing shopping bags benefits the environment, prosociality might not strongly explain this behavior if it is not perceived as particularly important for the environment. To investigate this question, we collect data on the perceived impact of various behaviors from an independent sample of Swedes. We find a clear link between the perceived importance of each behavior and the extent to which prosociality explains such behavior. For example, turning off the lights—viewed as the least environmentally important behavior—shows the lowest correlation with social preferences. Conversely, avoiding flying—perceived as highly significant for the environment—shows the strongest correlation with prosocial behavior. These results suggest that part of the reason why social preferences matter differently across domains stems from differing perceptions of the externalities associated with each behavior.

Overall, the evidence in this paper aligns with a model in which consumers take into account the environmental externalities they impose on others. In an abstract experimental setting, we find that many people are willing to forgo substantial personal gains to avoid causing negative externalities to others. Using administrative data, we find that individuals' prosociality negatively predicts individuals' residual waste and positively predicts sorted food waste. Using survey data, prosociality positively predicts a wide variety of environmentally friendly behaviors, particularly those deemed more impactful for the environment. These results support recent theoretical assumptions that consumers are prosocial and, as a result, are motivated by prosociality to mitigate the externalities they impose on others. Our findings highlight the importance of considering social preferences in environmental policy.

The first contribution of this paper is to the literature on social preferences. Much of this literature has focused on the measurement and precise characterization of such preferences in laboratory experiments (for overviews, see Carpenter 2010, Bowles and Polania-Reyes 2012, Fehr and Charness 2023). However, many academics have questioned the role that such social preferences play in field settings (e.g., Levitt and List 2007, 2008, Stoop et al. 2012). In response, a recent and rapidly growing literature studies the importance of experimentally elicited social preferences in shaping real-world behaviors. Initially, this literature focused on the "external validity" of social preferences, exploring the relationship between experimentally elicited preferences and closely related field measures, such as donation prompts encountered after leaving the laboratory (for a summary, see Galizzi and Navarro-Martinez 2019). More

recently, this literature has shifted towards "external importance," investigating the connection between preferences and particularly important field behaviors with a prosocial dimension. Evidence for external importance include, for example, Fisman et al. (2015), Almås et al. (2020), and Epper et al. (2022), who find that social preferences play an important role in explaining people's voting behavior. In the health domain, Galizzi and Wiesen (2018) review the literature linking measures of preferences, including social preferences, to health behaviors (for more recent work, see Thunström et al. 2021, Campos-Mercade et al. 2021, Müller and Rau 2021, Alfaro et al. 2022, and Schneider et al. 2023). Social preferences have also been connected to career choices (Carpenter and Myers, 2010, Dur and Zoutenbier, 2014, Fisman et al., 2015, Li et al., 2017, Friebel et al., 2019, Gill et al., 2023, Schneider et al., 2024a), socially responsible investments (Riedl and Smeets, 2017, Bauer et al., 2021), and honesty in field settings (Cohn and Maréchal, 2018, Dai et al., 2018).[4]

Surprisingly, the link between experimentally measured social preferences and consumption with environmental externalities remains unexplored, despite being one of the most obvious reasons why social preferences are relevant to economics. We address this gap by providing key initial evidence, adding a crucial dimension to understanding how prosociality influences real-world, everyday behavior more broadly.

Moreover, scholars have also questioned whether the nature of markets erodes prosocial concerns (e.g., Bowles 1998, Sandel 2012). In response, a growing body of literature has examined prosocial considerations in abstract market experiments in the laboratory (Dufwenberg et al. 2011, Bartling et al. 2015, 2024, Kirchler et al. 2016, Schneider et al. 2024b, Ziegler et al. 2024), with most studies finding a preference among consumers to avoid negative social impacts. We contribute to this literature by showing that prosociality predicts important market behaviors with negative externalities in the field, such as eco-consumption and flight frequency, underscoring the role of prosociality in market settings.

Finally, we also contribute to a literature studying the determinants of pro-environmental behavior. Numerous studies have documented a higher willingness to pay for environmentally friendly products (e.g., Loureiro et al. 2001, Roe et al. 2001, De Pelsmacker et al. 2005). However, it remains unclear whether these preferences reflect prosocial motives or other factors such

[4]There is also a literature measuring behavior in social dilemmas and correlating it with field behavior involving social dilemmas (see e.g. Gupta and Ogden 2009, Rustagi et al. 2010, Fehr and Leibbrandt 2011, Stoop et al. 2012, Noussair et al. 2015, Torres-Guevara and Schlüter 2016).

as status signaling (Griskevicius et al., 2010) and perceived or actual differences in quality (see Barbu et al. 2022 for a review of perceived differences between green and non-green products).[5] Similarly, other studies have correlated prosociality with pro-environmental behaviors using either unincentivized survey questions about prosociality or self-reported behaviors (e.g., Bruvoll et al. 2002, Kotchen and Moore 2007, Ziegler 2020, Brekke et al. 2010, Viscusi et al. 2011, Lange et al. 2017, Fischbacher et al. 2021). By combining incentivized measures of social preferences and administrative data on people's real-world behavior, we overcome key challenges in previous research involving potential experimenter demand effects (Rosenthal, 1976, Zizzo, 2010, De Quidt et al., 2018) and hypothetical biases (List and Gallet, 2001, Vossler et al., 2012, Bernheim et al., 2022, Campos-Mercade et al., 2024). Additionally, the collection of sorted food waste data, extensive survey data on other behaviors, as well as the perception of the impact of these behaviors, allows us to better understand the mechanisms linking social preferences and environmental behavior.

This paper is organized as follows. Section 2 describes the design of the surveys as well as the administrative data and defines the main variables of the study. Section 3 presents the main results. Section 4 concludes and discusses the implications of our results.

2 Design

2.1 Data collection and sample

On 15 November 2023, we sent survey invitations to 18,202 households residing in single-family detached homes across the Swedish municipalities of Varberg and Partille.[6] These municipalities offer an unusually suitable setting to test our hypotheses as they have a waste system where households' residual and food waste bins are weighted in connection with waste collection.

[5]There is also a literature studying whether information that highlights the negative externalities of certain environmental behaviors influences people to act more pro-environmentally (e.g., Allcott 2011, Allcott and Rogers 2014, Hainmueller et al. 2015, Imai et al. 2022, Pace et al. 2023, Semken 2024). This literature focuses on strategies to change behavior, rather than individual differences in the underlying motivations. We speak to this literature in that the effectiveness of such interventions will often rest on the degree to which people care about the externalities they generate.

[6]Both municipalities are broadly representative of the national population in terms of gender, mean age, and education. Our sample also includes substantial income heterogeneity, with 40% of respondents earning less than the national median (see Appendix Table A.3 for more details). Crucially, our results remain consistent even when controlling for income or other sociodemographic factors.

The focus on single-family homes allows us to obtain precise data on waste generation at the individual household level. The addresses and resident names for each household were obtained from the Swedish Tax Agency (Skatteverket). For each household, the invitation was addressed to one randomly selected adult resident.

The invitation letter included a link to the online survey along with a unique five-character ID that each respondent was to report back on the first page of the survey. This ID allowed us to match each response to its address, enabling us to link the survey data to both municipal and national records. The letter informed recipients that they would be paid \$5 for their participation, with the potential to earn additional money.[7] Participants were also informed that only one person per household could participate. The letter briefly described the study as a project that studies attitudes and behavior related to environmental perceptions without any further details. Crucial to our design in order to avoid experimenter demand effects, participants were unaware that the survey answers would be matched with waste data. Excluding 12 respondents whose ID could not be matched as well as 3 duplicates belonging to addresses that had already responded, we received a total of 3,718 complete survey responses, a response rate of 20.4%. The invitation letter and the full online survey are presented in Appendix Section C.

2.2 Social preferences survey

In the first section of the survey, we measured participants' willingness to impose externalities on others for their own benefit with a game that builds on the dictator game, the *Externality Game*. In the Externality Game, the respondent (the dictator) faces a tradeoff between her own payoff and the payoff of 20 other subjects (the recipients) that we recruited separately for a different study, thus avoiding strategic motives (Grech and Nax, 2020). Participants were told that they would play seven iterations of the game with different payoff structures.

In each game $j \in \{1, \ldots, 7\}$, the dictator, as well as each of the 20 recipients, initially hold an endowment of \$5. The dictator then chooses between either upholding the status quo, in which case each player retains the endowment of \$5, or increasing her own payoff while imposing a small negative externality on all recipients. In all games, this latter option reduces each recipient's payment by \$0.50, but the payoff for the dictator increases by an escalating

[7] The invitation also mentioned that payments would be made through "Swish," a payment service used by about 90% of the Swedish adult population. Our final survey question asked respondents for their mobile phone number, and over 95% of responses included a valid phone number.

amount: in games 1 through 7, the payoff increase is \$0.10, \$2, \$5, \$10, \$15, \$25, and \$50, respectively. We informed participants that we would randomly draw one of the seven games and implement the payments corresponding to their choice in that game for one out of 200 participants.

We denote respondent i's choice in game j as Prosociality$_{ij}$. This variable is 0 if respondent i chooses the option with negative externalities in game j and 1 otherwise. Our pre-registered main measure of prosociality is defined as the unweighted average of prosocial choices across all seven games:

$$\text{Prosociality}_i = \frac{1}{7}\sum_{j=1}^{7} \text{Prosociality}_{ij} \tag{1}$$

The seven games were followed by survey items that measured preferences and personality traits (see Appendix Table A.1 for a complete list). Most importantly, we elicited self-reported altruism as a secondary measure of prosociality, asking respondents to rate from 0 to 10 their willingness to "give to charity without expecting anything in return" (Falk et al., 2018). For easier comparison with the experimental measure of prosociality, we also code this variable linearly from 0 to 1.

2.3 Environmental survey

The second part of the survey measured environmental behaviors, along with various socio-demographic variables. We first asked participants how often they engage in 15 different environmental behaviors using items from established survey scales designed to comprehensively measure pro-environmental behaviors (Kaiser, 1998, Kaiser and Wilson, 2004, Whitmarsh and O'Neill, 2010). As pre-registered, we group these behaviors in four categories and then create an index for each of these four categories: (i) Waste reduction (buys packaging-free products; recycles; sorts food waste; reuses/repairs instead of throwing away; reuses shopping bags); (ii) Home energy and water conservation (turns off lights; takes shorter showers; reduces indoor temperature); (iii) Transportation (avoids driving; walks/bikes/takes public transportation; avoids flying); (iv) Eco-consumption (buys environmentally friendly products; eats organic/locally produced/seasonal food; avoids eating meat; buys second-hand products). To create the indices, we first standardize each of the 15 individual items by subtracting the mean and dividing by the standard deviation. Then we similarly standardize the sum of the resulting

variables. We treat these four indices as secondary outcome measures.[8]

In addition, in separate survey items, we elicited the frequency with which people fly and use the car. Specifically, we asked participants how often they personally use a car or van to travel and how many round-trip flights they took in 2022 for leisure. We included these items not only because they are important but also because they are easy to quantify. Standardized versions of these responses are also treated as secondary outcomes.

The final section of the survey elicited various socio-demographic characteristics (See Appendix section C).

2.4 Administrative data on waste collection

The municipalities in our study weigh each household's waste bins using scales mounted on the waste collection trucks. This process is part of a per-kilogram unit-based waste pricing system (Bucciol et al., 2015, Valente, 2023), which has been used for an extended period in these municipalities.[9] The household-specific data generated through this system provides precise information on the amount of waste produced by each household, which we then use for our analysis.

The raw administrative data provides detailed information on waste collected from each household during each waste collection event with a precision of 0.5 kilograms. The data covers the waste streams collected by the municipalities: "residual waste" (also referred to as general, unsorted, or combustible waste) and "sorted food waste". Packaging and newsprint waste, which households drop off at local recycling stations, are not included in the data. However, waste behavior can largely be inferred from residual waste alone: recycling effectively involves moving material from the residual-waste bin into other bins, and waste prevention typically involves reducing the amount deposited in the residual-waste bin. Thus, residual waste serves as our primary measure of pro-environmental behavior in the waste domain. Food waste is a secondary measure that helps us to pinpoint the mechanisms (through recycling) for any effect on residual waste. For each waste type, we calculate our measures of interest by summing the

[8] We further pre-registered that we would aggregate these four indices to create a general index of pro-environmental behavior. For exposition purposes throughout the paper, we mainly focus on the four indices as they provide more information on the domains in which prosociality matters more. However, Appendix Table A.5 shows similar results when we use the aggregated index.

[9] In practice, these costs are typically quite low—less than $8 per month on average in our sample—and likely have little influence on households' decision-making.

collected weights over the 52 weeks prior to our survey invitation.

Of the 3,718 survey responses, we are unable to match 24 observations as addresses do not appear in the waste data. Moreover, the waste sums of respondents that moved into their current address during 2023 will largely reflect the behavior of earlier residents. Thus, we exclude the 125 respondents who moved in during 2023.[10] Hence, we use the smaller sample of 3,569 observations whenever our analysis uses the municipal waste data and the full survey sample of 3,718 observations when we focus on survey responses.

2.5 Pre-registration and specification

We pre-registered our data analysis plan on OSF (https://osf.io/zw39x). A copy is provided in Appendix Section D. Our main analyses aim to estimate the relationship between the environmentally friendly behaviors of our participants and their prosociality. Following our pre-analysis plan, our main specification regresses y_i, an outcome variable that measures an environmental behavior (described in sections 2.3 and 2.4), on the main measure of prosociality (described in section 2.2):

$$y_i = \beta_0 + \beta_1 \text{Prosociality}_i + \beta_2 X_i + \epsilon_i \tag{2}$$

where X_i is a vector of socio-demographic controls (age, gender, marital status, income, occupation, education; see Appendix Table A.1 for definitions) along with a set of dummies for address location and household composition (number of adults and number of children aged 0-2 years, 3-6 years, 7-11 years, and 12-17 years). ϵ_i is an individual-specific error, robust to heteroscedasticity.

Whenever y_i represents waste weights from administrative data, X_i also includes a set of survey variables that capture time spent away from home, which does not directly reflect waste behavior but is likely to affect collected waste weights (see Appendix Table A.2 for definitions). We also control for the distance from each household address to the nearest recycling station for packaging and newsprint waste. All sets of control variables strictly adhere to the pre-registration plan.

Our pre-registered hypothesis is that individuals who are more prosocial engage in more

[10] The results are robust to retaining all households (see Appendix Table A.4).

pro-environmental behaviors. Hence, we expect prosociality to be negatively related to residual waste (main pre-registered test), negatively related to self-reported frequency of flying and driving, and positively related to the four pro-environmental indices.[11]

In addition to the analyses described above, we add two new analyses which were not outlined in the pre-analysis plan and should therefore be considered exploratory. First, since we were unaware that we would receive data on sorted food waste at the household level, we did not pre-register that variable. Since we ultimately received the data, we analyze sorted food waste as a secondary outcome variable.[12] Second, in Section 3.3, we conduct an analysis to investigate whether the explanatory power of prosociality on environmental behaviors varies with the perceived environmental impact of each behavior. We developed this analysis after observing that the relationship between prosociality and environmental behaviors differed substantially across behaviors.

3 Results

3.1 Behavior in the Externality Game

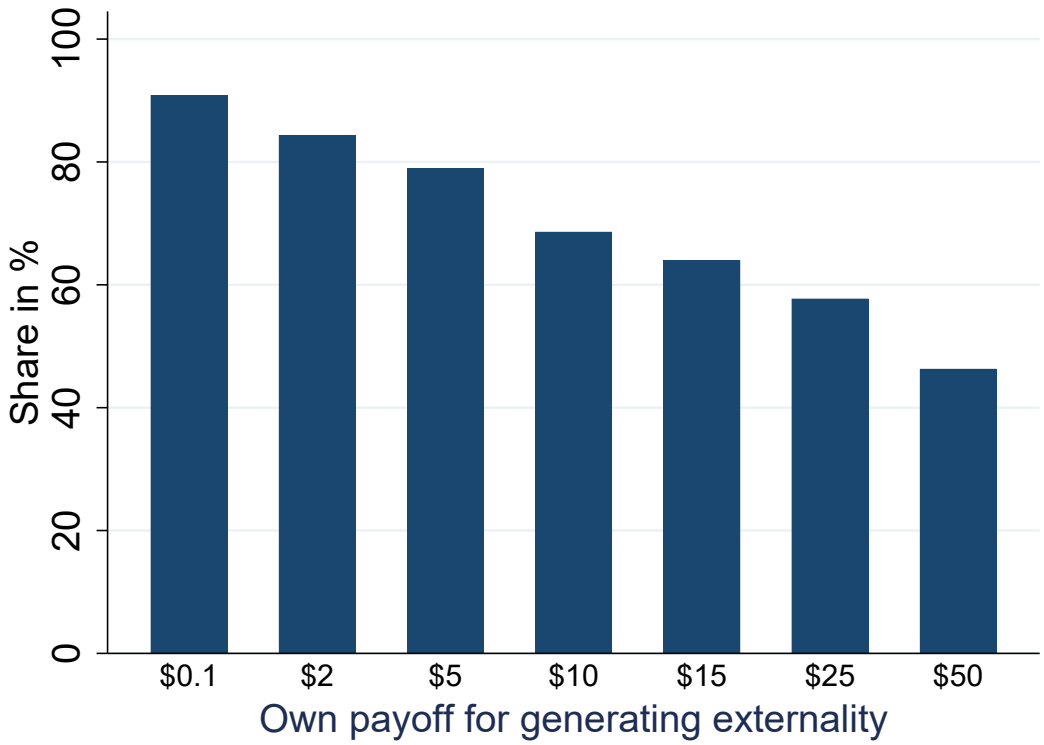
Most participants are highly averse to imposing externalities on others. Figure 1 displays the share of participants (the dictators) who did not impose externalities on the 20 other participants (the recipients) for each of the seven Externality Games that they played. When the participants only gain \$0.1 from imposing an externality of \$0.5 on each of the 20 recipients, 91% do not impose the externality. This share monotonically decreases when we incrementally increase the dictators' benefit from \$0.1 to \$50. But even with a very large benefit of \$50, 46% of the participants refrain from exposing others to the small externality.

On average, across all seven games, dictators choose not to impose an externality on others in 70% of their choices. Additionally, 41% of participants consistently avoid imposing externalities in any game, while 8% always impose externalities, even for minimal gains. The remaining

[11] Reflecting these directional hypotheses, we initially pre-registered our intention to use one-sided tests. However, throughout the paper we follow common practice by using a more conservative two-sided test of β_1.

[12] Before analyzing the data, we hypothesized that prosociality would be positively associated with sorted food waste. This expectation aligns with our initial reasoning: individuals who sort their food waste are likely engaged in recycling, which could explain why prosocial households generate less residual waste. However, an alternative hypothesis could be that prosociality is negatively associated with sorted food waste, as prosocial individuals might also strive to minimize overall food waste. Thus, while we primarily predicted a positive relationship between prosociality and sorted food waste, a different pattern would also be plausible.

Figure 1: Distribution of choices capturing prosociality



Note: This figure reports the share of participants that did not impose externalities on others in the seven Externality Games that they played. In each Externality Game, the participant (the dictator) and 20 other players (the recipients) start with an endowment of $5 each. The dictator can then choose an option that benefits her, but has a small negative externality on the 20 recipients. In each of the seven games, the payoff of each other player would be reduced by $0.5. The benefit for the dictator depends on the game; in Game 1 to 7, she would receive an additional $0.1, $2, $5, $10, $15, $25 or $50, respectively. The y-axis gives the share of participants that chose the prosocial option to not produce any externalties for each of the seven games.

51% impose externalities in some games but not in others, indicating substantial heterogeneity in prosociality. [13]

The fact that the average participant is very averse to imposing externalities on others for personal benefit suggests that people care about the externalities of their behavior. This finding is in line with a large body of research that studies social preferences in dictator games. However, these results do not imply that people consider the externalities that their environmental behavior has on others.

To test whether the prosociality captured in the experiment translates into behavior in the

[13]Since incentives to impose externalities on others gradually increased, from $0.1 to $50, most participants who switched did so only once. Only 7.3% switched multiple times, suggesting that most participants understood the choices they faced and followed a consistent decision pattern.

environmental domain, we study whether differences in the willingness to impose externalities across the seven Externality Games explain peoples different environmental behaviors. As pre-registered, we measure prosociality as the proportion of games in which each participant avoids imposing externalities on others (Appendix Figure A.1 shows the distribution of this measure).

3.2 Social preferences predict household waste

Figure 2 gives the coefficient estimates from regressions of various environmental behaviors on prosociality, controlling for demographics, household composition, and location (our pre-registered specification).[14] All coefficient estimates in the main text are expressed in standard deviations of the outcome variables.

In this section, we focus on our outcomes measured using administrative data: residual waste (main outcome variable) and sorted food waste. Figure 2 shows that increasing prosociality from a minimum of 0 to a maximum of 1 is associated with a reduction of residual household waste by 0.149 standard deviations ($t = -3.32$, $p = 0.001$) and a simultaneous increase of sorted food waste by 0.115 standard deviations ($t = 2.38$, $p = 0.017$).[15] The estimates are substantial, comparable in magnitude to the predicted effect of increasing household size from one to two adults (coefficient = 0.167 SD, $t = 2.41$, $p = 0.016$).[16]

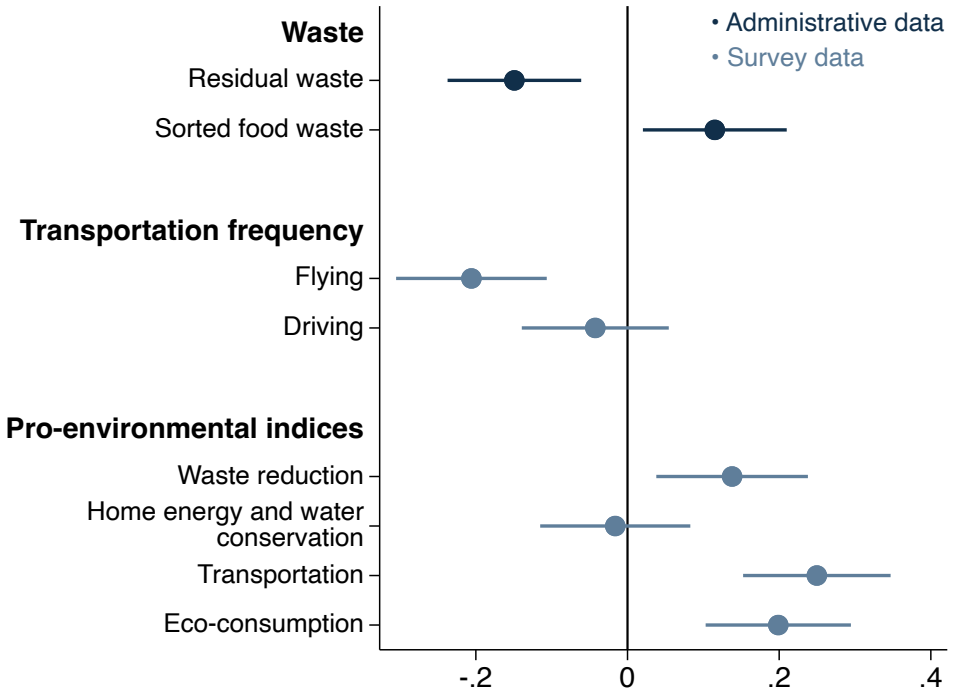
Table 1 shows that these results remain robust when including different sets of controls. Specification (5) presents the pre-registered specification, and the coefficient estimates correspond to those visualized in Figure 2. Specifications (1) to (4) establish robustness by sequentially adding sets of controls. The coefficient estimates only change when we include controls for household composition, comparing Specification (1) to Specification (2). This indicates that, as one would expect, the number of people in the household contributes to the variation in waste and serves as an important control. However, the estimates remain stable across all other specifications.

[14] Appendix Figures A.2 to A.5 provide the raw distributions of all environmental behaviors. Additionally, Appendix Figures A.9 and A.10 replicate the analysis in Figure 2 using prosociality measures from individual Externality Games, rather than aggregating behavior across all seven games. The results remain very similar. Finally, Appendix Figure A.11 performs the same analysis using the survey measure of prosociality. We find a relatively weak association of the survey measure of altruism with waste behaviors measured in administrative data, underscoring the limitations of relying on unincentivized survey items for preference measurement.

[15] This corresponds to a reduction of 23.78 kg in yearly residual household waste and an increase of 10.09 kg in yearly sorted food waste.

[16] Appendix Figure A.6 and A.7 show similar results when we consider monthly household and sorted food waste for each month from November 2022 to November 2023.

Figure 2: Prosociality predicts pro-environmental behaviors



Note: The figure shows coefficient estimates from a linear regression of the outcome variable (shown on the left) on prosociality, controlling for age, gender, marital status, income, occupation, education, number of adult household members, number of children aged 0-2, 3-6, 7-11 and 12-17 year in household, and a set of postcode fixed effects. For Residual and Sorted food waste, we also control for days away from home, frequency of work from home, frequency work from home other household members, number of other household members that work or study, the interaction between frequency work from home other household members and the number of other household members that work/study, days away in second residence and the distance to the nearest recycling station (preregistered specification). The coefficient estimates give the change in the outcome variables in standard deviations when moving from least prosocial (=0) to most prosocial (=1). The sample consists of 3,569 observations for Residual waste and Sorted food waste and 3,718 observations for all other outcome measure. The figure also shows standard errors bars corresponding to a two-sided significance test at the 5%-level.

In Specification (6), we additionally control for risk and time preferences, as measured using the experimentally validated survey questions in Falk et al. (2018), and find that the coefficients remain remarkably stable. In Specification (7), we control for measures of reciprocity, trust, and the tendency to follow norms. These factors may be related to prosociality and could potentially capture a similar construct, which raises the possibility of overcontrolling in these specifications. However, the results show that reciprocity, norm-following, and trust do not explain our findings, as the coefficients remain largely unchanged with the inclusion of these measures.

In conclusion, we find robust evidence that prosociality is associated with significantly less

Table 1: Prosociality predicts pro-environmental behaviors

	Model						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Residual waste	-0.35***	-0.17***	-0.12***	-0.14***	-0.15***	-0.15***	-0.15***
	(0.05)	(0.05)	(0.05)	(0.05)	(0.04)	(0.04)	(0.04)
Sorted food waste	-0.02	0.12**	0.12**	0.12**	0.12**	0.12**	0.11**
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
Flying	-0.24***	-0.27***	-0.21***	-0.21***	-0.17***	-0.15***	-0.15***
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
Driving	-0.09*	-0.07	-0.03	-0.04	-0.04	-0.05	-0.04
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
Index waste reduction	0.26***	0.23***	0.13**	0.14***	0.13**	0.14***	0.14***
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
Index energy and water saving	0.11**	0.06	-0.02	-0.02	-0.03	-0.01	-0.01
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
Index transportation	0.26***	0.28***	0.25***	0.25***	0.25***	0.25***	0.24***
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
Index eco-consumption	0.20***	0.24***	0.20***	0.20***	0.20***	0.22***	0.20***
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
Controls							
Household composition		yes	yes	yes	yes	yes	yes
Sociodemographics			yes	yes	yes	yes	yes
County fixed effects				yes	yes	yes	yes
Time at home					yes	yes	yes
Risk and time preferences						yes	yes
Reciprocity, Trust, Norm following							yes

Note: The sample consists of 3,569 observations for Residual waste and Sorted food waste and 3,718 observations for all other outcome measures. Sociodemographics includes the following controls: age, gender, marital status, income, occupation, education; Household composition includes the following controls: number of adult household members, number of children aged 0-2 year in household, number of children aged 3-6 years, number of children aged 7-11 years, number of children aged 12-17 years; County fixed effects includes a set of postcode dummies; Time at home includes the following controls: days away from home, frequency of work from home, frequency work from home other household members, number of other household members that work or study, the interaction between frequency work from home other household members and the number of other household members that work/study, days away in second residence and the distance to the nearest recycling station. Specification (5) is the pre-registered main specification for Residual waste and Sorted food waste, specification 4 is the pre-registered main specification for all other outcomes. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

residual waste. We also observe a positive relationship between prosociality and sorted food waste.[17] This positive relationship suggests a possible explanation for why prosocial individuals generate less residual waste: they engage more in recycling.

Next, we conduct exploratory analyses to further understand how prosociality relates to waste and its underlying mechanisms. We begin by examining the relationship between prosociality and *total waste*—the sum of residual waste and sorted food waste—as well as the *share of food waste* within total waste. Our estimates show that increasing prosociality from 0 to 1 reduces total waste by 0.072 standard deviations, although this reduction is not statistically significant (t = -1.70, p = 0.089; see also Appendix Table A.5). More importantly, prosociality increases the share of food waste by 0.139 standard deviations (t = 2.80, p = 0.005). Although not all waste streams are observable in the data, these findings suggest that higher prosociality may be associated with a tendency toward reduced overall waste generation, and a substantial increase in recycling efforts among prosocial individuals.

Our survey measures provide further evidence supporting this interpretation of the data. As part of the environmental survey, we ask participants about various actions related to total waste reduction (buying packaging-free products; reusing or repairing items instead of discarding them; reusing shopping bags) and waste sorting (recycling; sorting food waste). We preregistered that these items would be aggregated into a single index (*waste reduction*). Figure 2 shows that prosociality predicts this index, with the coefficient estimate closely aligning with our measures in the administrative data (coefficient = 0.138 SD, t = 2.71, p = 0.007). However, more importantly, we can create subindices based on the items related to reducing total waste and those related to sorting waste.[18] We find that prosociality shows a weak, non-significant association with reducing total waste (coefficient = 0.071 SD, t = 1.42, p = 0.156) but has a substantially greater predictive power for waste sorting (coefficient = 0.163 SD, t = 3.12, p = 0.002). Appendix Figure A.8 gives the association between prosociality and each individual item in the indices, further supporting our finding that prosociality exhibits more predictive power for waste sorting behaviors than for reducing total waste.

[17] While residual waste is generally considered harmful to the environment, the impact of sorted food waste is more nuanced. On one hand, sorted food waste could reflect unnecessary consumption. On the other hand, higher levels of sorted food waste often indicate greater household recycling efforts. Moreover, in most high-income countries, including Sweden, sorted food waste is environmentally beneficial, as it is predominantly converted into renewable biogas.

[18] We follow our standard approach for generating indices: first, we standardize all items, then sum them, and subsequently standardize the resulting value once more.

Finally, we can also combine the survey items on waste reduction with the administrative data on actual waste to validate the survey items. We regress the index waste reduction on residual waste and sorted food waste while controlling for the same variables as in Figure 2. We estimate that a one standard deviation increase in residual waste reduces the waste reduction index by 0.44 standard deviations (t = -21.64, $p < 0.001$), while a one standard deviation increase in sorted food waste increases the index by 0.753 standard deviations (t = 56.64, $p < 0.001$), with an R^2 of 0.68.[19] These results provide evidence that survey items related to environmental behaviors can be informative about actual environmental behavior. This validation is important for the next section, where we focus on the survey items concerning environmental behaviors.

3.3 Social preferences predict behaviors perceived to have high environmental impact

In the previous section, we established that prosociality predicts waste behaviors. In this section, we use the survey evidence to turn our focus to other environmental behaviors.

We start by examining transportation behaviors. In the survey, we collected data on how frequently participants fly and use their cars. Figure 2 shows that increasing prosociality from 0 to 1 is associated with a reduction in flying by 0.206 standard deviations (t = -4.06, $p < 0.001$) and a statistically insignificant reduction in driving by 0.043 standard deviations (t = -0.86, p = 0.390).[20] Additionally, Figure 2 presents results for the *Transportation* index, which combines three survey items: avoiding driving, walking/biking/taking public transportation, and avoiding flying. Prosociality is also statistically significantly linked to more environmentally friendly transportation choices when we consider this composite measure (coefficient = 0.250 SD, t = 5.03, $p < 0.001$).

Figure 2 also provides results for two other indices: *Home Energy and Water Conservation* (i.e., turning off lights; taking shorter showers; reducing indoor temperature) and *Eco-Consumption* (i.e., buying environmentally friendly products; eating organic/locally produced/seasonal food; avoiding meat; purchasing second-hand products). We find that while

[19] Without controls, we estimate that a one standard deviation increase in residual waste reduces the waste reduction index by 0.46 standard deviations (t = -26.28, $p < 0.001$), while a one standard deviation increase in sorted food waste increases the index by 0.73 standard deviations (t = 59.48, $p < 0.001$), with an R^2 of 0.57.

[20] This corresponds to a reduction of 0.29 yearly flights and a decrease of 0.38 weekly car rides.

prosociality is associated with more eco-friendly consumption (coefficient = 0.199 SD, t = 4.07, $p < 0.001$), it does not statistically significantly predict home energy and water conservation behaviors (coefficient = -0.016 SD, t = -0.32, p = 0.749). Table 1 shows that these results are robust across all sets of controls.

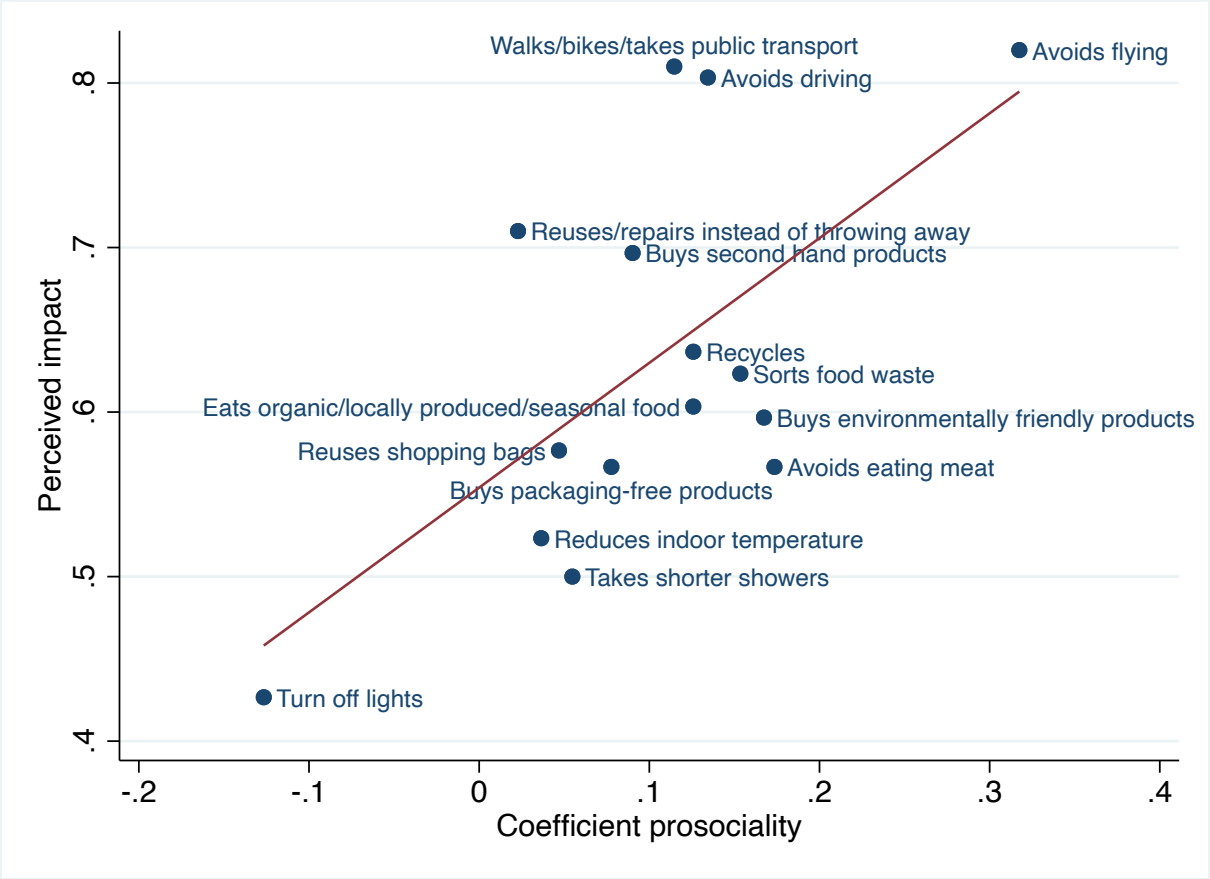
Thus, our analysis provides strong evidence that prosociality is associated with a range of environmental behaviors, particularly waste generation, flying, and eco-friendly consumption. However, it has little predictive power for home energy and water conservation. When we examine the correlation between prosociality and the 15 individual survey items that make up the indices, we observe similar heterogeneities. For instance, we find a strong association with avoiding flying (coefficient = 0.317 SD, t = 6.61, $p < 0.001$; see Appendix Figure A.8), but almost no correlation with reusing shopping bags (coefficient = 0.047 SD, t = 0.94, p = 0.346). Hence, we find that the correlation between prosociality and environmental behaviors varies widely across different types of behaviors.

What explains this heterogeneity? If prosocial individuals are motivated by the impact their behaviors have on the environment, we would expect the strongest correlations with behaviors that are perceived as having the greatest environmental impact. To explore this hypothesis, we collected data on the perceived impact of all 15 survey items from an independent sample of 50 Swedes, recruited via the survey platform Prolific.[21] Figure 3 plots the perceived impact of each survey item (y-axis) against the coefficient estimates from regressing each behavior on prosociality (x-axis). The figure reveals a positive relationship: the correlation between prosociality and environmental behaviors increases with the perceived environmental impact of the behavior.

To test the relationship between perceived impact and the size of the correlation with prosociality, we pool data from all 15 environmental behaviors and regress environmental behavior on prosociality, perceived impact, and their interaction. We estimate that the interaction between perceived impact and prosociality has a coefficient of 0.293 (95% CI using bootstrap: [0.040, 0.513]), indicating that the association between prosociality and environmental behaviors indeed increases with the perceived environmental impact of the behavior.

[21] We asked participants to rate, on a scale from 1 to 7, how influential they believe each of the 15 behaviors is in contributing to environmental protection. We then rescaled this variable to range from 0 to 1.

Figure 3: Relationship between coefficient estimates and impact perceptions



Note: Coefficient prosociality measured with a sample of 3,718 Swedes. Perceived impact measured with an independent sample of 50 Swedes recruited on Prolific. The coefficient of the interaction between perceived impact and prosociality is 0.2925 (95-CI using bootstrap: [0.0400, 0.5132])

4 Conclusion

Standard economic theory often assumes that individuals ignore the environmental externalities of their actions. However, recent theoretical work builds on the assumption that, due to social preferences, people consider these externalities to some extent. This paper speaks to this literature by investigating the link between prosociality and environmental behavior. We study whether individuals who are more reluctant to harm others for personal gain are also more likely to engage in behaviors that reduce their environmental impact.

Using a large-scale, pre-registered study with a general population sample in Sweden, we find a large and significant relationship between social preferences and environmental behaviors. In the experimental setting, we observe that many participants are willing to forgo substantial personal gains to avoid imposing negative externalities on others. When linking these

preferences to real-world behavior, we find that more prosocial individuals generate less residual waste and sort more food waste. To understand how our findings generalize to other environmental behaviors, we complement our analysis with a survey on self-reported environmental behaviors. We find that the relationship between prosociality and self-reported waste reduction behavior mirrors the one we find using administrative data, hence providing some validity to our survey measures. The results show that prosociality matters for a wide range of environmental behaviors, especially those that are perceived to matter the most for the environment, such as reduced air-travel, taking public transport, and eco-shopping.

Our choice to focus on Swedish municipalities stems from the unique context that allows us to collect highly precise administrative data on environmental behavior relating to household waste. Although some media narratives may suggest that Swedes are especially prosocial, global data on prosociality shows that Swedes are not significantly more prosocial than populations in other Western countries, including Canada, Germany, Spain, the UK, and the US (Falk et al., 2018, WGI, 2022). Moreover, the attitudes of Swedes towards the environment and their self-reported behaviors are strikingly similar to those in many other European nations (Vuković, 2014, Telesiene and Gross, 2016). Together, these factors make our setting an ideal context for examining the interplay between prosociality and environmental behavior.

Our findings not only contribute to academic understanding but also have important implications for shaping effective policy. Models of environmental behavior can be enhanced by integrating prosocial motives—an assumption increasingly prevalent in this literature but previously lacking robust empirical support. These enriched models yield policy conclusions that can diverge markedly from those derived from standard economic theory, implying that the effectiveness of environmental policies may heavily depend on the level of prosociality within a population. Given that prior research indicates considerable variation in prosociality across different regions (Falk et al., 2018, WGI, 2022, Herrmann et al., 2008, Almås et al., 2020), our findings imply that environmental policy design could be improved by accounting for these regional differences. With this approach, governments could tailor policies to better align with the prosocial tendencies of their populations.

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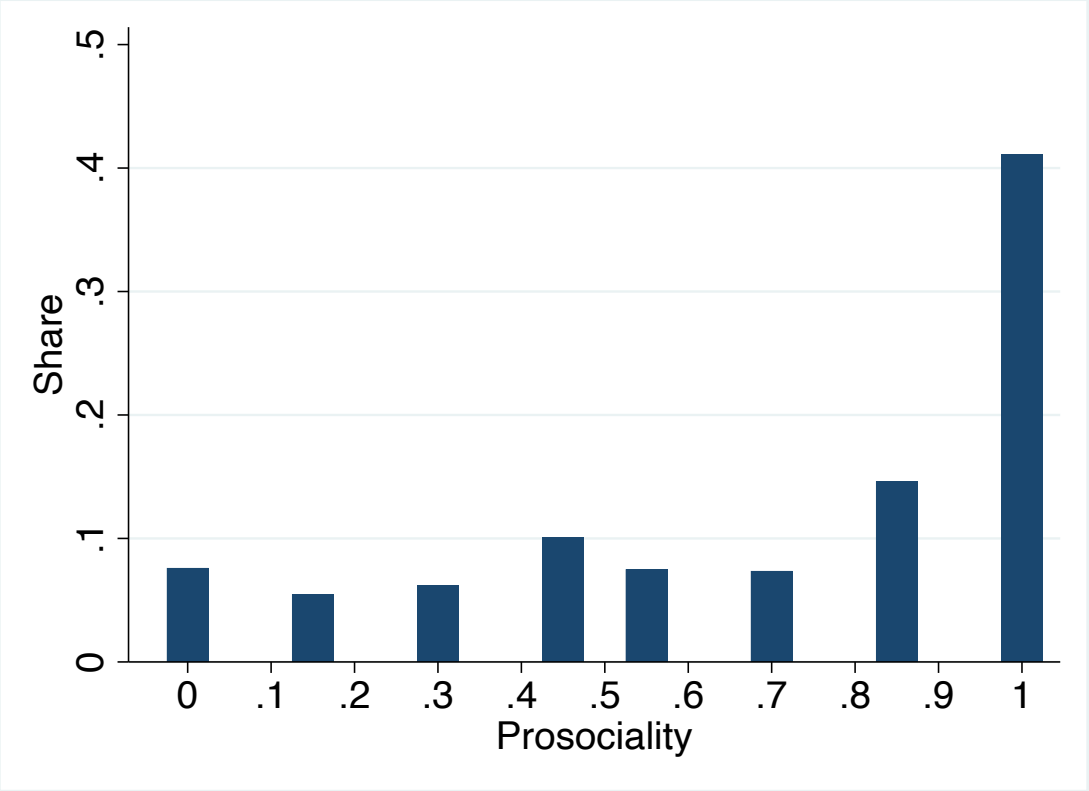
Appendix

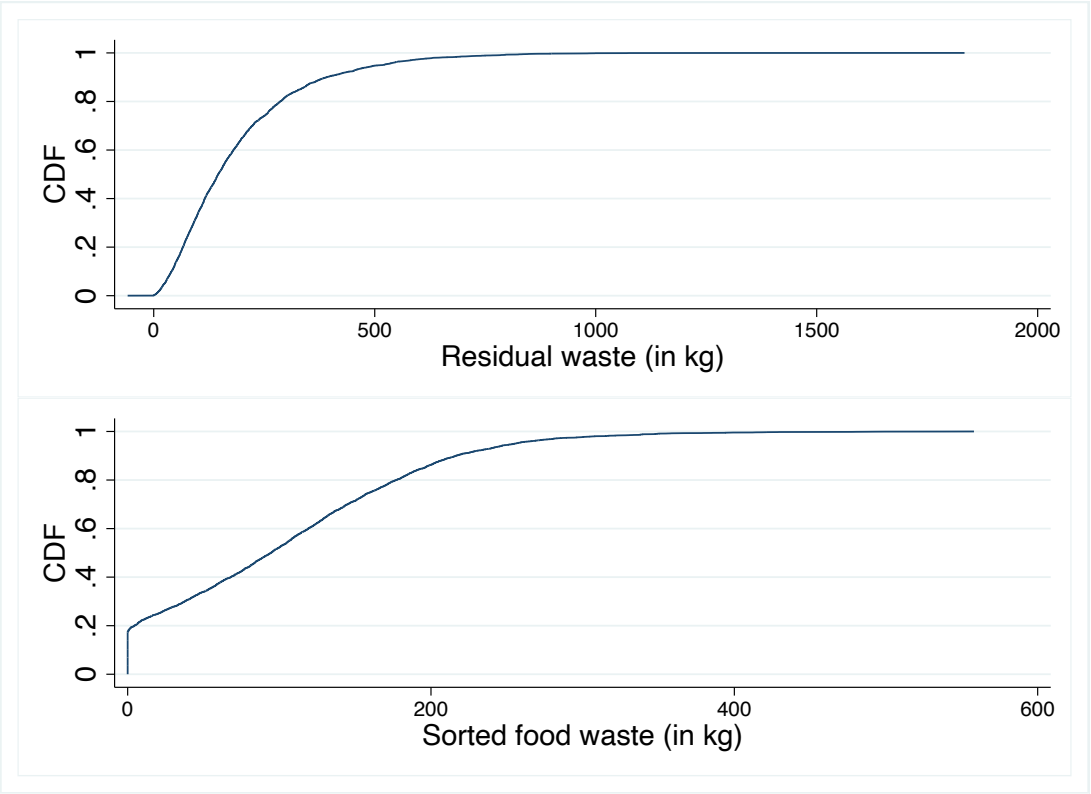
A Additional figures

Figure A.1: Distribution prosociality



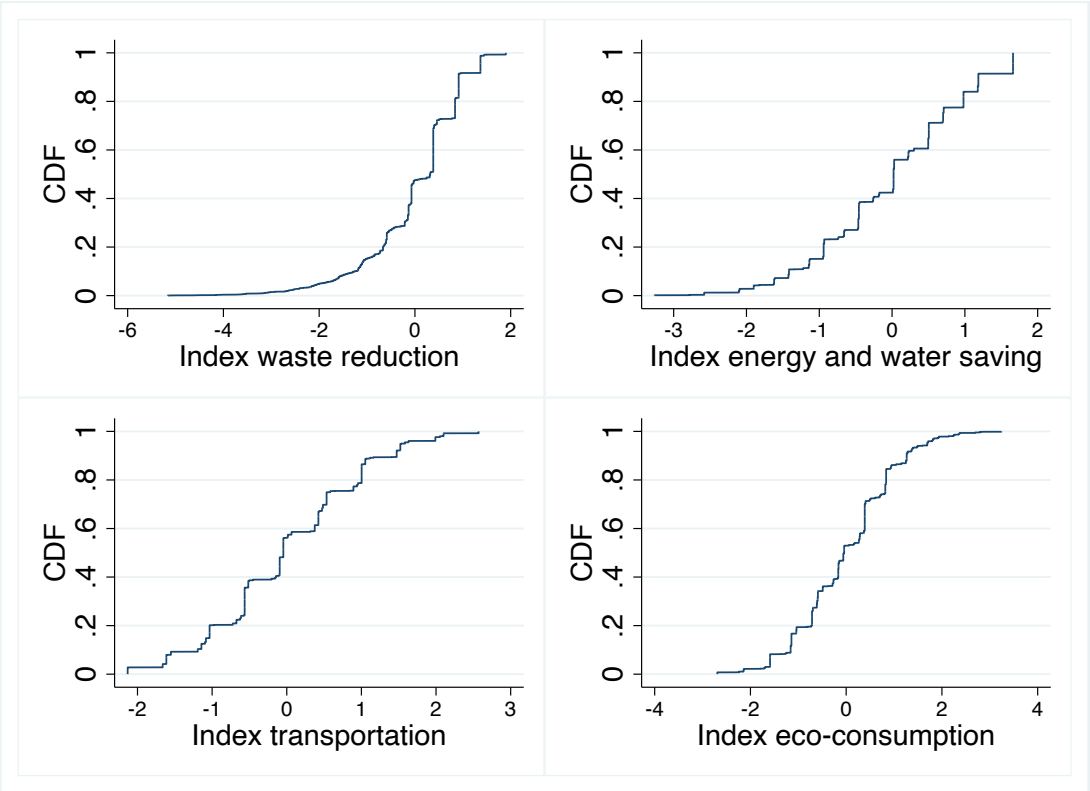
Note: This figure reports the distribution of prosociality. Prosociality is defined as the share a participant does not impose the externality on others among all seven games.

Figure A.2: Distribution household and food waste



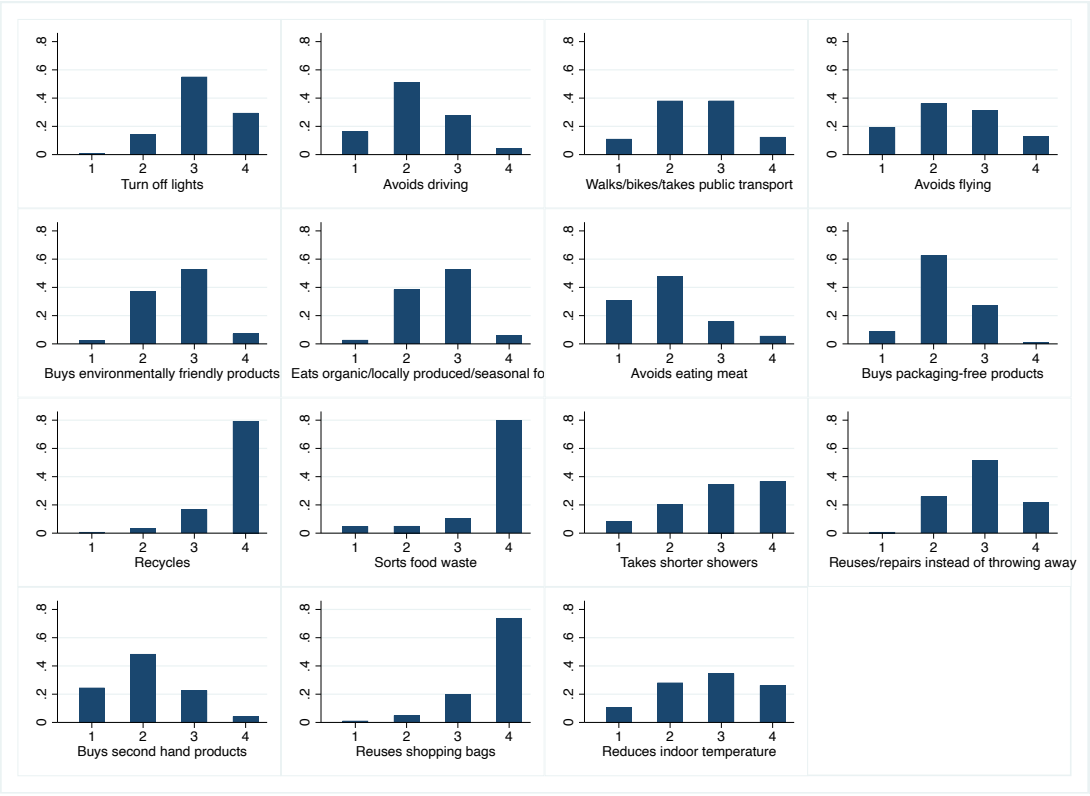
Note: This figure gives the cumulative distribution functions for household and sorted food waste.

Figure A.3: Distribution indices



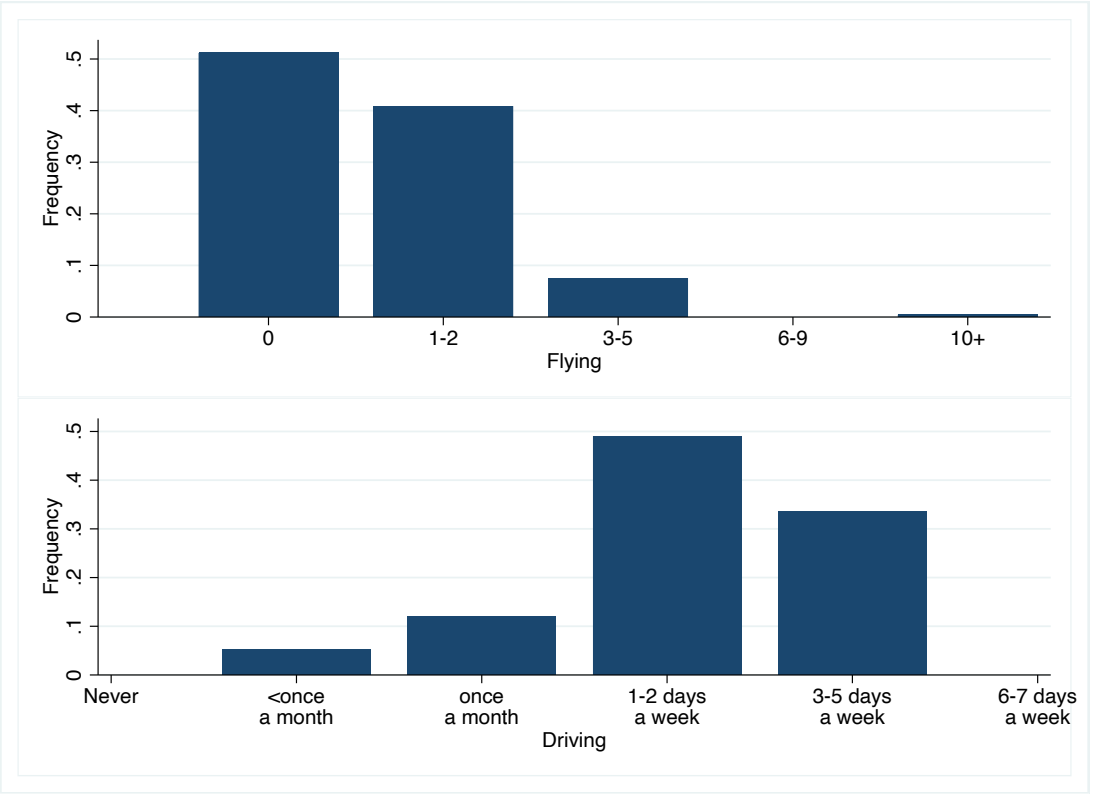
Note: This figure gives the cumulative distribution functions for waste reduction, energy and water saving, transporation and eco-consumption indices.

Figure A.4: Distribution 15 survey environmental behaviors



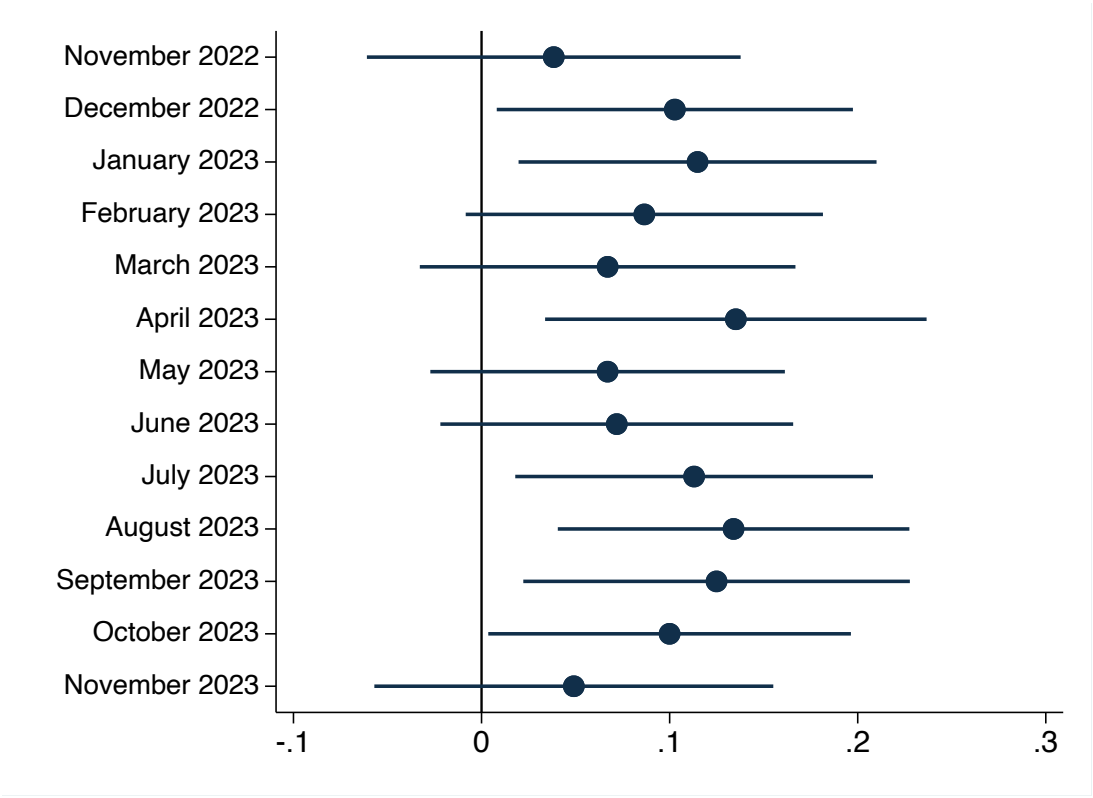
Note: This figure reports the distribution of the 15 individual survey items that make up the indices.

Figure A.5: Distribution frequency flying and driving



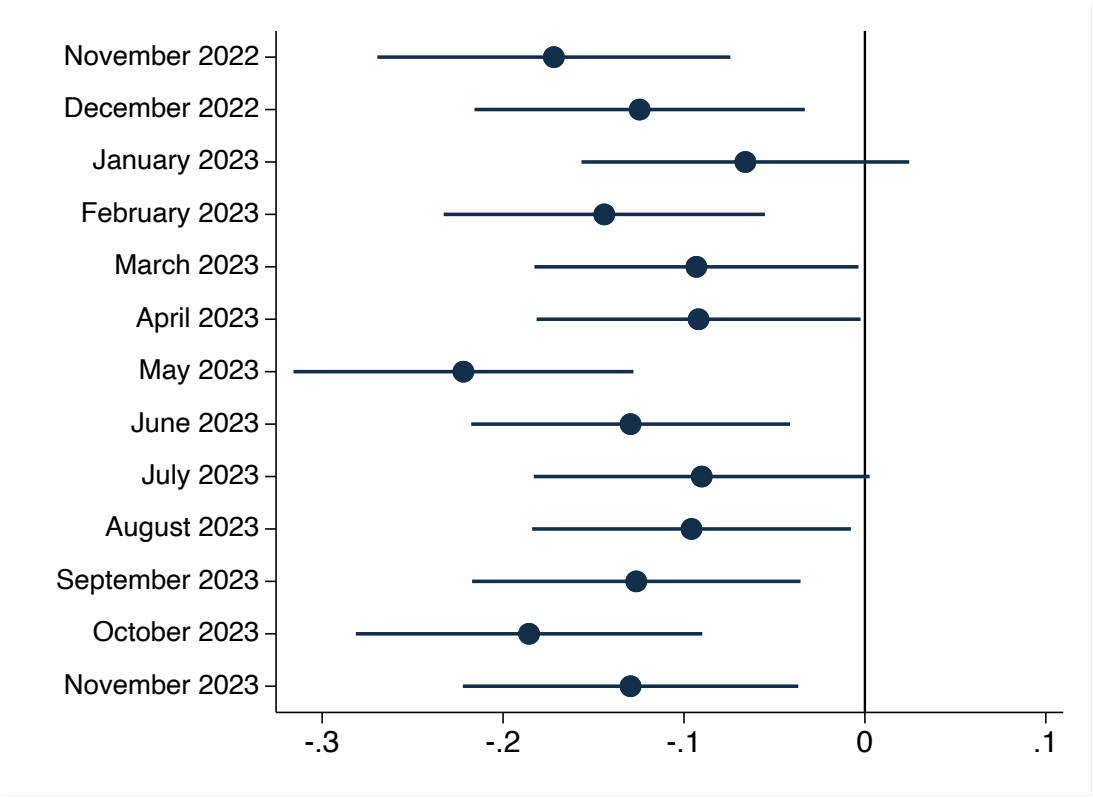
Note: This figure reports the distribution of the reported frequency of flying and driving.

Figure A.6: Prosociality predicts residual waste: monthly data



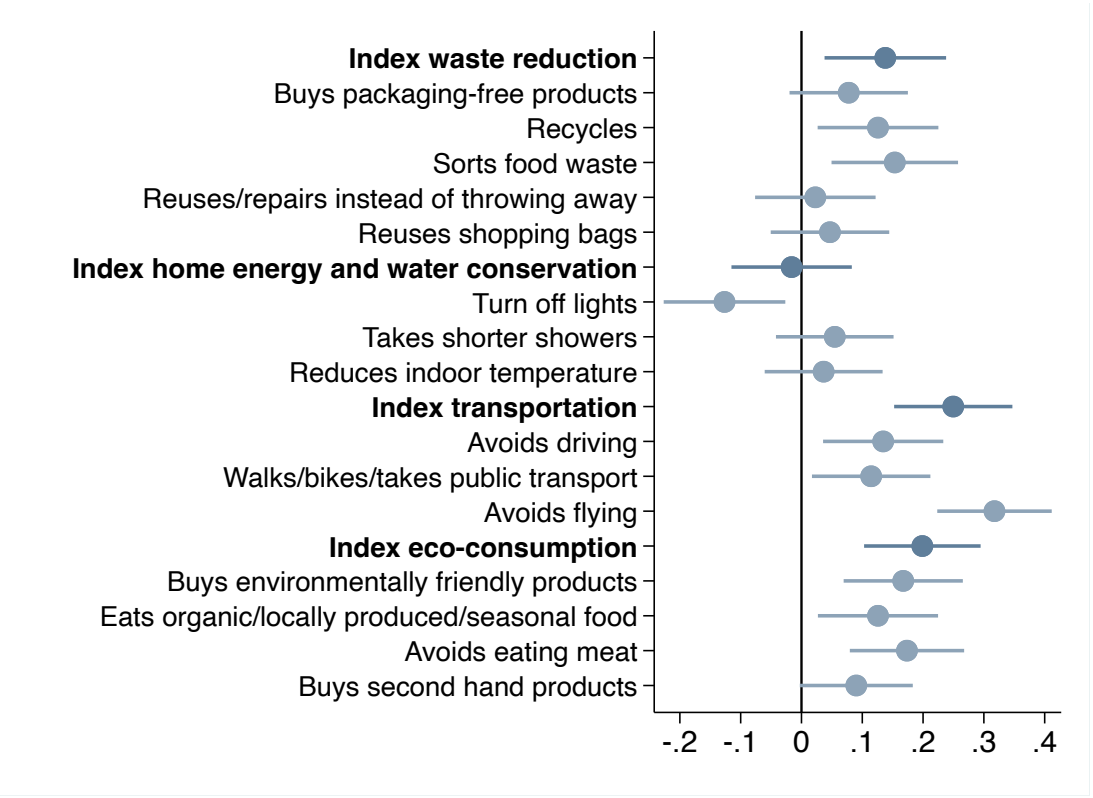
Note: The figure shows coefficient estimates from a linear regression of residual waste for different months (shown on y-axis) on prosociality, controlling for age, gender, marital status, income, occupation, education, number of adult household members, number of children aged 0-2 year in household, number of children aged 3-6 years, number of children aged 7-11 years, number of children aged 12-17 years, and a set of postcode fixed effects (preregistered specification). The coefficient estimates give the change in the outcome variables in standard deviations when moving from least prosocial (=0) to most prosocial (=1). The figure also shows standard errors bars corresponding to a two-sided significance test at the 5%-level. N = 3,569.

Figure A.7: Prosociality predicts sorted food waste: monthly data

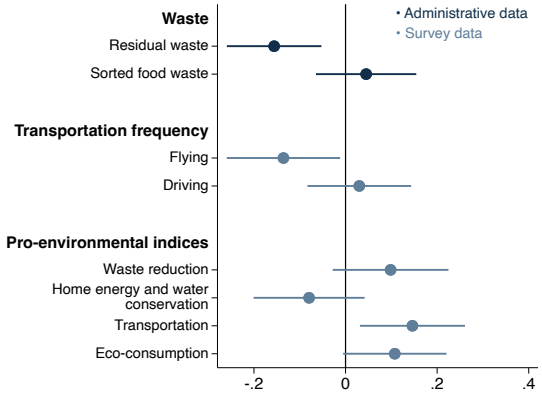


Note: The figure shows coefficient estimates from a linear regression of sorted food waste for different months (shown on y-axis) on prosociality, controlling for age, gender, marital status, income, occupation, education, number of adult household members, number of children aged 0-2 year in household, number of children aged 3-6 years, number of children aged 7-11 years, number of children aged 12-17 years, and a set of postcode fixed effects (preregistered specification). The coefficient estimates give the change in the outcome variables in standard deviations when moving from least prosocial (=0) to most prosocial (=1). The figure also shows standard errors bars corresponding to a two-sided significance test at the 5%-level. N = 3,569.

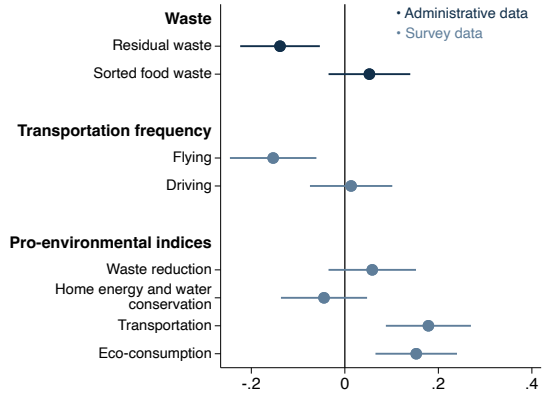
Figure A.8: Prosociality predicts pro-environmental behaviors - Items



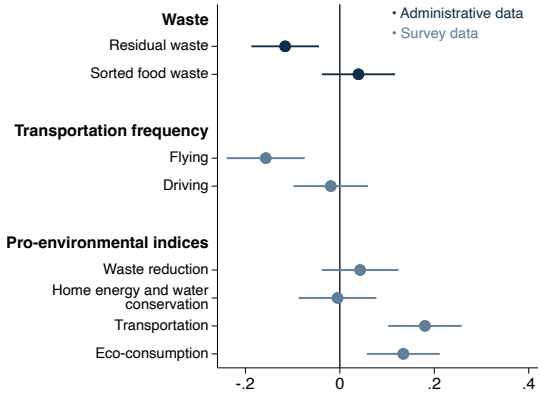
Note: The figure shows coefficient estimates from a linear regression of the outcome variable (shown on the left) on prosociality, controlling for age, gender, marital status, income, occupation, education, number of adult household members, number of children aged 0-2 year in household, number of children aged 3-6 years, number of children aged 7-11 years, number of children aged 12-17 years, and a set of postcode fixed effects (preregistered specification). The coefficient estimates give the change in the outcome variables in standard deviations when moving from least prosocial (=0) to most prosocial (=1). The figure also shows standard errors bars corresponding to a two-sided significance test at the 5%-level. N = 3,718.



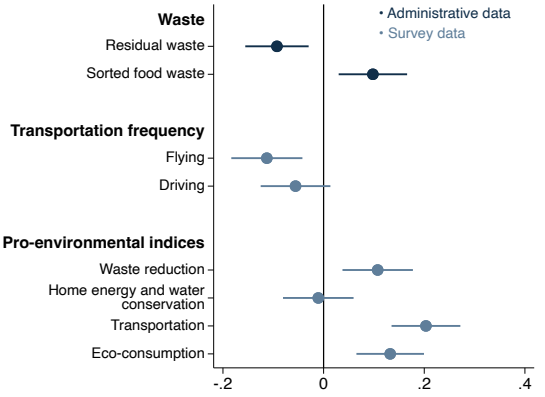
(a) Game 1 (Personal gain = $0.1)



(b) Game 2 (Personal gain = $2)



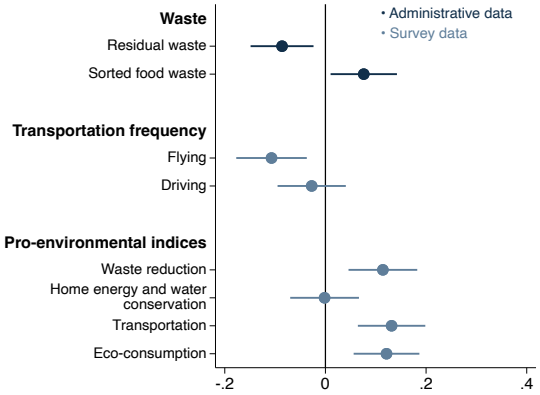
(c) Game 3 (Personal gain = $5)



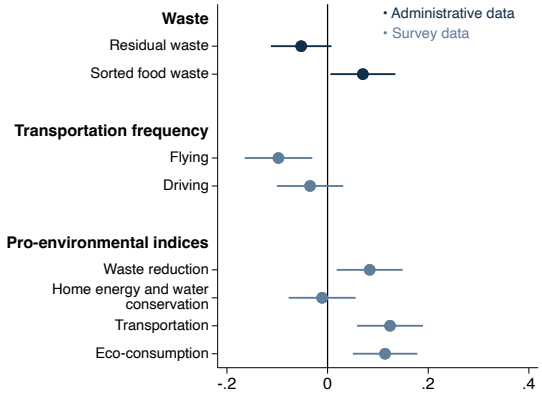
(d) Game 4 (Personal gain = $10)

Figure A.9: Prosociality predicts pro-environmental behaviors: behavior in individual games

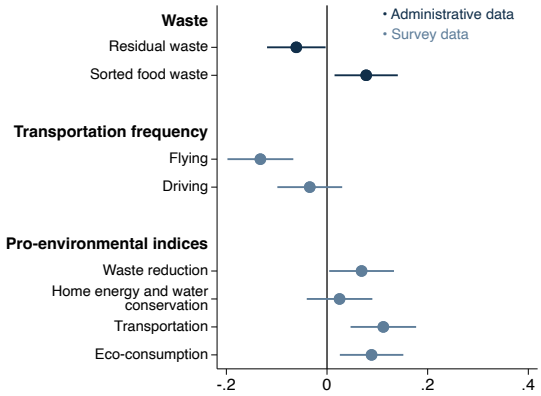
Notes. The figure shows coefficient estimates from a linear regression of the outcome variable (shown on the left) on prosociality, as measured in each of the seven externality games, controlling for age, gender, marital status, income, occupation, education, number of adult household members, number of children aged 0-2 year in household, number of children aged 3-6 years, number of children aged 7-11 years, number of children aged 12-17 years, and a set of postcode fixed effects (preregistered specification). The coefficient estimates give the change in the outcome variables in standard deviations when moving from the selfish choice that imposes externalities on others (=0) to the prosocial choice (=1). The sample consists of 3,569 observations for Residual waste and Sorted food waste and 3,718 observations for all other outcome measure. The figure also shows standard errors bars corresponding to a two-sided significance test at the 5%-level.



(a) Game 5 (Personal gain = $15)



(b) Game 6 (Personal gain = $25)

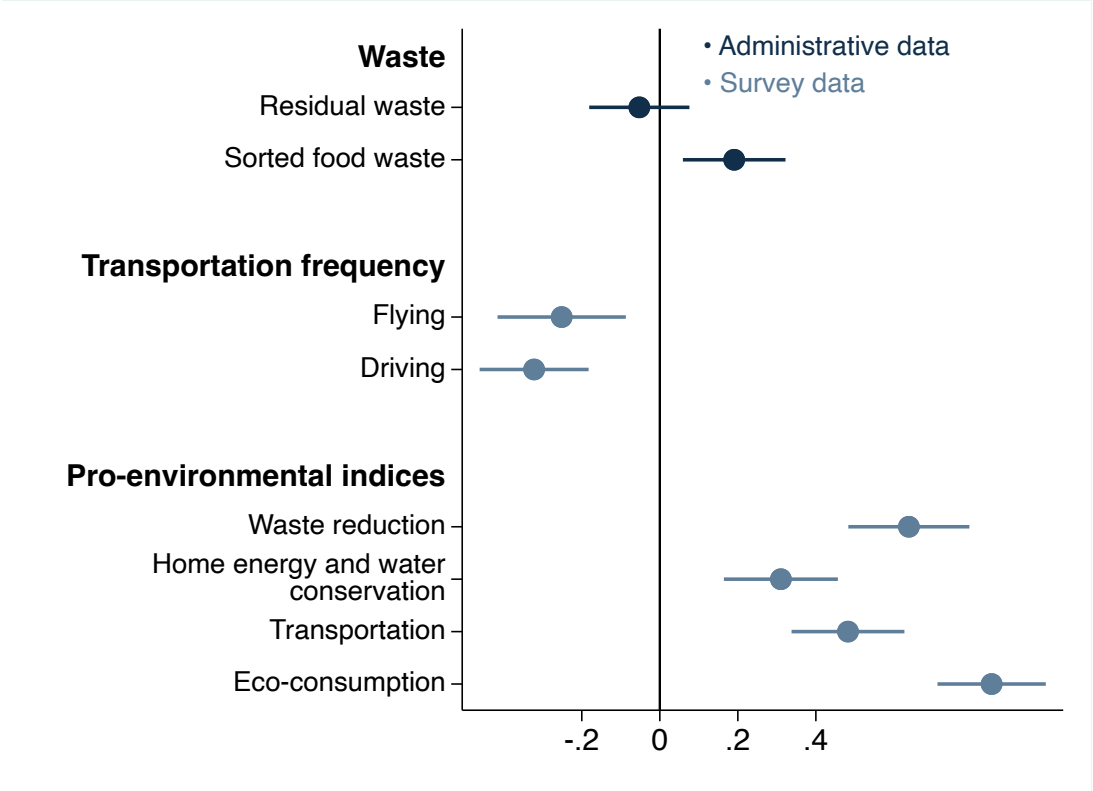


(c) Game 7 (Personal gain = $50)

Figure A.10: Prosociality predicts pro-environmental behaviors: behavior in individual games

Notes. The figure shows coefficient estimates from a linear regression of the outcome variable (shown on the left) on prosociality, as measured in each of the seven externality games, controlling for age, gender, marital status, income, occupation, education, number of adult household members, number of children aged 0-2 year in household, number of children aged 3-6 years, number of children aged 7-11 years, number of children aged 12-17 years, and a set of postcode fixed effects (preregistered specification). The coefficient estimates give the change in the outcome variables in standard deviations when moving from the selfish choice that imposes externalities on others (=0) to the prosocial choice (=1). The sample consists of 3,569 observations for Residual waste and Sorted food waste and 3,718 observations for all other outcome measure. The figure also shows standard errors bars corresponding to a two-sided significance test at the 5%-level.

Figure A.11: Prosociality predicts pro-environmental behaviors: survey measure for altruism



Note: The figure shows coefficient estimates from a linear regression of the outcome variable (shown on the left) on our survey measure of prosociality (altruism), controlling for age, gender, marital status, income, occupation, education, number of adult household members, number of children aged 0-2 year in household, number of children aged 3-6 years, number of children aged 7-11 years, number of children aged 12-17 years, and a set of postcode fixed effects (preregistered controls). The coefficient estimates give the change in the outcome variables in standard deviations when moving from least prosocial (=0) to most prosocial (=1). The sample consists of 3,569 observations for Residual waste and Sorted food waste and 3,718 observations for all other outcome measure. The figure also shows standard errors bars corresponding to a two-sided significance test at the 5%-level.

B Additional tables

Measure	Definition
Altruism	Willingness to "give to charity without expecting anything in return" (from 0 not at all willing to do to 10 = very willing to do). We code this variable linear from 0 to 1.
Risk preferences	Willingness to generally take risks (from 0 not at all willing to do to 10 = very willing to do). We code this variable linear from 0 to 1.
Time preferences	Willigness to give up something of value to you today to achieve something even better in the future? (from 0 not at all willing to do to 10 = very willing to do). We code this variable linear from 0 to 1.
Reciprocity	When someone does me a favor, I am willing to do something in return (from 0 = does not describe me at all to 10 = describes me perfectly. We code this variable linear from 0 to 1.
Trust	I assume that people only have good intentions (from 0 = does not describe me at all to 10 = describes me perfectly. We code this variable linear from 0 to 1.
Norm following	It is important to me to always behave correctly and to avoid doing things that people would say are wrong (from 0 = does not describe me at all to 10 = describes me perfectly. We code this variable linear from 0 to 1.
Age	What year were you born? We code this variable linear in years.
Gender	Do you identify as female or male? (Female, Man, Neither as a man nor a woman). We code dummies for the categories.
Marital status	What describes you best? (Single, Long-term relationship, Partner, Married or registered partner, Other). We code dummies for the categories.
Occupation	What is your main occupation? (Working, Unemployed, Students, Retired, Other). We code dummies for the categories.
Education	What education do you have? (Primary education or lower, Upper secondary education or folk university education, Post-secondary education (e.g. Qualified Vocational Education), Current university education, Higher education, Postgraduate education). We code dummies for the categories.
Income	How big is your entire household's total income per month after tax, including any allowances?. We code this variable linear in income.

Table A.1: Definition variables survey (1)

Measure	Definition
Number of year at current address	How long have you lived at your current address? (Since 2023, ..,Since before 2000)
Days away from home	How long in the last 12 months have you been away from your home address (e.g. on holiday or on business trips)? Feel free to answer even if you are not completely sure. (Less than 1 week, 1 to 2 weeks, Between 2 weeks and 1 month, 1 to 2 months, 2 to 3 months, 3 to 5 months, More than 6 months). We code dummies for the categories. E.g., the first dummy is coded as 1 if a participant chose Less than 1 week and as 0 otherwise. When we control for days away from home, we use the five dummies.
Work from home	How many hours a week do you usually work or study outside the home? (I do not work or study, 0 hours, 1-19 hours, 20-39 hours, 40 or more hours). We code dummies for the categories.
Number others work/study	How many other people in your household are either working or students? (0,1, 2, 3, 4 or more). We code this variable linear in number of adults. We code 4 or more as 4.
Work from home others	On average, how many hours a week do they usually work or study outside the home? (They do not work or study, 0 hours, 1-19 hours, 20-39 hours, 40 or more hours). We code dummies for the categories.
Second residence	Do you have a second residence (e.g., a summer house)? (Yes, No). We code this as a dummy that is 1 for Yes and 0 otherwise.
Days away in second residence	In the last 12 months, how many weeks did you spend in your second residence? (Less than 1 week, 1 to 2 weeks, Between 2 weeks and 1 month, 1 to 2 months, 2 to 3 months, 3 to 5 months, More than 6 months). We code dummies for the categories. We add a category that captures that person does not have a second residence.

Table A.2: Definition variables survey (2)

Table A.3: Sample statistics

	Mean	SD	Min.	Max.	N
Age	51.77	14.88	15	90	3,718
Female	0.50	0.50	0	1	3,718
Single	0.11	0.32	0	1	3,718
Sarbo (non-cohabiting partner)	0.04	0.19	0	1	3,718
Couple	0.20	0.40	0	1	3,718
Married	0.62	0.48	0	1	3,718
Other	0.02	0.14	0	1	3,718
Number adults in household	2.10	0.71	1	7	3,718
Number children 0-2 years	0.08	0.31	0	3	3,718
Number children 3-6 years	0.15	0.42	0	3	3,718
Number children aged 7-11 years	0.24	0.54	0	4	3,718
Number children aged 12-17 years	0.30	0.62	0	4	3,718
Elementary School or Lower	0.04	0.21	0	1	3,718
High-school	0.23	0.42	0	1	3,718
Professional Training	0.16	0.37	0	1	3,718
In College	0.01	0.11	0	1	3,718
College Degree	0.52	0.50	0	1	3,718
PhD	0.03	0.18	0	1	3,718
Employed	0.65	0.48	0	1	3,718
Unemployed	0.01	0.09	0	1	3,718
Studying	0.02	0.14	0	1	3,718
Retired	0.29	0.45	0	1	3,718
Other Professional Situation	0.03	0.17	0	1	3,718
Income 0-10000kr	0.01	0.08	0	1	3,718
Income 10001-20000kr	0.05	0.21	0	1	3,718
Income 20001-30000kr	0.09	0.29	0	1	3,718
Income 30001-40000kr	0.11	0.32	0	1	3,718
Income 40001-50000kr	0.14	0.35	0	1	3,718
Income 50001-60000kr	0.16	0.37	0	1	3,718
Income 60001-70000kr	0.14	0.34	0	1	3,718
Income 70001-80000kr	0.11	0.31	0	1	3,718
Income 80001-90000kr	0.07	0.25	0	1	3,718
Income 90001-100000kr	0.04	0.20	0	1	3,718
Income 100001-120000kr	0.04	0.19	0	1	3,718
Income 120001-150000kr	0.02	0.12	0	1	3,718
Income 150001-200000kr	0.01	0.11	0	1	3,718
Income more than 200000kr	0.02	0.13	0	1	3,718
Varberg municipality	0.63	0.48	0	1	3,718

Table A.4: Prosociality predicts pro-environmental behaviors: Robustness sample

	Model						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
i) Sample main text							
Residual waste	-0.35***	-0.17***	-0.12***	-0.14***	-0.15***	-0.15***	-0.15***
	(0.05)	(0.05)	(0.05)	(0.05)	(0.04)	(0.04)	(0.04)
Sorted food waste	-0.02	0.12**	0.12**	0.12**	0.12**	0.12**	0.11**
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
ii) Exclude all participants with invalid respondent ID							
Residual waste	-0.36***	-0.17***	-0.13***	-0.15***	-0.16***	-0.15***	-0.15***
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
Sorted food waste	0.00	0.14***	0.14***	0.14***	0.13**	0.14***	0.13**
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
iii) Include participants that moved in during 2023							
Residual waste	-0.34***	-0.17***	-0.12***	-0.14***	-0.15***	-0.15***	-0.14***
	(0.05)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
Sorted food waste	-0.02	0.11**	0.11**	0.11**	0.11**	0.12**	0.11**
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
Controls							
Household composition		yes	yes	yes	yes	yes	yes
Sociodemographics			yes	yes	yes	yes	yes
County fixed effects				yes	yes	yes	yes
Time at home					yes	yes	yes
Risk and time preferences						yes	yes
Reciprocity, Trust, Norm following							yes

Note: A total of 417 survey responses included an invalid respondent ID. In all but 12 cases, however, the mismatch is due to simple and easily identifiable errors like mistaking a lower-case *l* for an upper-case *I*, and we manually corrected these IDs. For the final sample, we manually corrected minor mistakes in submitted respondent IDs, and exclude participants that moved in 2023. This table show that results are robust if we exclude all participants with mistakes in respondent IDs (panel ii) or include participants that moved in 2023 (panel iii). The sample consists of 3,569 observations for "i) Sample main tex", 3,184 observations for "ii) Exclude all participants with invalid respondent ID" and 3,694 observations for "iii) Include participants that moved in during 2023". Sociodemographics includes the following controls: age, gender, marital status, income, occupation, education; Household composition includes the following controls: number of adult household members, number of children aged 0-2 year in household, number of children aged 3-6 years, number of children aged 7-11 years, number of children aged 12-17 years; County fixed effects includes a set of postcode dummies; Time at home includes the following controls: days away from home, frequency of work from home, frequency work from home other household members, number of other household members that work or study, the interaction between frequency work from home other household members and the number of other household members that work/study, days away in second residence and the distance to the nearest recycling station. Specification (5) is the pre-registered main specification. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.5: Prosociality predicts pro-environmental behaviors: Additional outcome measures

	Model						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Total waste	-0.30***	-0.08*	-0.05	-0.07*	-0.07*	-0.07*	-0.07*
	(0.05)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
Share sorted food waste	0.16***	0.16***	0.13***	0.13***	0.14***	0.14***	0.13***
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
Index environmental friendliness	0.28***	0.27***	0.19***	0.19***	0.19***	0.21***	0.19***
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
Controls							
Household composition		yes	yes	yes	yes	yes	yes
Sociodemographics			yes	yes	yes	yes	yes
County fixed effects				yes	yes	yes	yes
Time at home					yes	yes	yes
Risk and time preferences						yes	yes
Reciprocity, Trust, Norm following							yes

Note: The sample consists of 3,569 observations for Total waste and Share sorted food waste and 3,718 observations for Index environmental friendliness. Total waste is defined as residual waste plus sorted food waste, Share sorted food waste as sorted food waste divided by total waste, and Index environmental friendliness as the index aggregating the indices waste reduction, home energy and water conservation, transportation and eco-consumption. Sociodemographics includes the following controls: age, gender, marital status, income, occupation, education; Household composition includes the following controls: number of adult household members, number of children aged 0-2 year in household, number of children aged 3-6 years, number of children aged 7-11 years, number of children aged 12-17 years; County fixed effects includes a set of postcode dummies; Time at home includes the following controls: days away from home, frequency of work from home, frequency work from home other household members, number of other household members that work or study, the interaction between frequency work from home other household members and the number of other household members that work/study, days away in second residence and the distance to the nearest recycling station. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

C Full survey translated to English

GÖTEBORGS UNIVERSITET

We would like to ask you if you would like to participate in a research project. In this document you will receive information about the project and what it means to participate.

What is this project about?
The project studies opinions and behaviors linked to environmental questions. By participating in the study, you contribute to research in this area. The survey is aimed at approximately 20,000 residents in the municipalities of Partille and Varberg. The research is led by the University of Gothenburg.

How does the project work?
The study consists of this web survey where you answer a number of questions. This normally takes 10-15 minutes at most. No special knowledge is required to participate in the study. We will send you a compensation of SEK 50 after you fill in the questionnaire. Depending on how you answer certain survey questions, you can also earn up to an additional SEK 700. All payments are made via Swish.

Only one person per household can participate in the survey and thus receive compensation. Your participation is voluntary and can be stopped at any time by closing the survey. If you choose not to participate or wish to stop, you do not need to state why.

Data management and privacy
Within the framework of the project, your survey responses are collected and registered. Your answer is protected so that unauthorized persons cannot access it. This is ensured by an encrypted link between your personal data and the responses collected in the survey. The results from the project will be presented in research reports that only contain overall statistics about the participants, i.e. the number of participants, gender and age distribution, etc. When a full report has been completed (which normally takes more than a year), it can be ordered from the responsible researcher.

Responsible researcher
The University of Gothenburg is responsible for the project. Responsible researcher is senior lecturer Claes Ek at the Department of Economics and Statistics, e-mail claes.ek@economics.gu.se

Do you want to participate?

- ○ I want to participate
- ○ I do NOT want to participate

You will now be faced with seven decision situations. In these you are paired with a group of 20 other people participating in a completely different research study. ***Both you and the 20 other people start with an allocated amount of SEK 50 each.*** *You will then have the opportunity to increase your own compensation, which leads to the compensation of each of the other people being reduced by SEK 5. Remember that your answers are confidential.*

Be careful when making these decisions: *Once you have made your seven decisions, one of these will be randomly selected. Then a lottery takes place where half a percent of all survey respondents are paid based on what they chose in their randomly selected decision situation. This means that all your decisions may affect your own and others' compensation - so think carefully before you answer.*

Decision 1: Please choose between the following two options

- ○ You and the other 20 people keep your allocated starting amount
- ○ You increase your compensation by SEK 1 and the other 20 people lose SEK 5 each

---

Decision 2: Please choose between the following two options

- ○ You and the other 20 people keep your allocated starting amount
- ○ You increase your compensation by SEK 20 and the other 20 people lose SEK 5 each

---

Decision 3: Please choose between the following two options

- ○ You and the other 20 people keep your allocated starting amount
- ○ You increase your compensation by SEK 50 and the other 20 people lose SEK 5 each

---

Decision 4: Please choose between the following two options

- ○ You and the other 20 people keep your allocated starting amount
- ○ You increase your compensation by SEK 100 and the other 20 people lose SEK 5 each

---

Decision 5: Please choose between the following two options

- ○ You and the other 20 people keep your allocated starting amount
- ○ You increase your compensation by SEK 150 and the other 20 people lose SEK 5 each

---

Decision 6: Please choose between the following two options

- ○ You and the other 20 people keep your allocated starting amount
- ○ You increase your compensation by SEK 250 and the other 20 people lose SEK 5 each

---

Decision 7: Please choose between the following two options

- ○ You and the other 20 people keep your allocated starting amount
- ○ You increase your compensation by SEK 500 and the other 20 people lose SEK 5 each

We will now ask a series of questions about your willingness to act in different ways. How willing are you to…

Please indicate your answer on a scale from 0 to 10, where 0 means “not at all willing to do it” and 10 means “very willing to do it”. You can also use any number between 0 and 10 to indicate where you end up on the scale.

	0 = Extremely unwilling	1	2	3	4	5	6	7	8	9	10 = Extremely willing
...giving to charity without expecting anything in return?	○										○
...generally take risks?	○										○
...give up something of value to you today to achieve something even better in the future?	○										○

How well do the following statements describe you as a person? Answer on a scale from 0 to 10 where 0 means it "does not describe me at all" and 10 means it "describes me perfectly". You can also use any number between 0 and 10 to indicate where you end up on the scale.

	0 = Does not describe me at all	1	2	3	4	5	6	7	8	9	10 = Describes me perfectly
When someone does me a favor, I am willing to do something in return	○										○
I assume that people only have good intentions	○										○
It is important to me to always behave correctly and to avoid doing things that people would say is wrong	○										○

Please indicate how often you do the following: Answer on a scale from 0 to 3 where 0 means "never" and 3 means "always".	0 = Never	1 = Sometimes	2 = Often	3 = Always
Turn off lights that are not in use	○	○	○	○
Avoid driving	○	○	○	○
Walking, cycling or taking public transport for short journeys (i.e. less than 5 km)	○	○	○	○
Avoid traveling by air	○	○	○	○
Buy environmentally friendly products	○	○	○	○
Eat food that is organic, locally produced or seasonal	○	○	○	○
Avoid eating meat	○	○	○	○
Buy packaging-free products	○	○	○	○
Source sorter	○	○	○	○
Sort out food waste for compost	○	○	○	○
Save water by taking shorter showers	○	○	○	○
Reuse or repair instead of throwing away	○	○	○	○
Buy clothes and things second hand	○	○	○	○
Reusing shopping bags	○	○	○	○
Put on an extra sweater and lower the indoor temperature in winter	○	○	○	○

How often do you personally drive a petrol or diesel car, either as a driver or as a passenger?

- 6-7 days a week
- 3-5 days a week
- 1-2 days a week
- Once a month
- Less often
- Never

How many times during 2022 did you take a flight (round trip) for different types of pleasure trips - holidays, visiting family or friends, etc.?

- More than 10 times
- 6-9 times
- 3-5 times
- 1-2 times
- Never

What item takes the longest to break down in a landfill?

- Banana peel
- Plastic bottle
- Newspaper
- Glass bottle
- Don't know

To what extent do you agree with the following statements?

Please indicate your answer on a scale from 0 to 10, where 0 means "do not agree at all" and 10 means "agree completely". You can also use any number between 0 and 10 to indicate To what extent do you agree with the following statements?
Please indicate your answer on a scale from 0 to 10, where 0 means "do not agree at all" and 10 means "agree completely". You can also use any number between 0 and 10 to indicate where you end up on the scale.

	0 = Do not agree at all	1	2	3	4	5	6	7	8	9	10 = Completely agree
The Earth's climate is changing and this is mainly due to human influence	○										○
If current trends continue in the same direction, we will soon experience a major ecological disaster	○										○
Climate change affects me personally or will	○										○
Society today does too little to protect the environment	○										○
My private actions make a difference to the environment	○										○
It is important for the environment that all people sort	○										○
We should protect the environment even if this leads to a decrease in our material prosperity to some extent	○										○

What year were you born?

▼ 2005 or later ... 1930 or earlier

Do you identify as a woman or a man?

- ○ Woman
- ○ Man
- ○ Neither as a man nor a woman

What best describes you?

- ○ Single
- ○ Serbs
- ○ Roommate
- ○ Married or registered partner
- ○ Other, namely _____

What is your main occupation?

- ○ Working
- ○ Unemployed
- ○ Student
- ○ Retired
- ○ Other, namely _____

What education do you have? (Fill in your highest achieved level of education).

- ○ Elementary school education or lower
- ○ Upper secondary education or folk high school education
- ○ Post-secondary education (e.g. Qualified Vocational Education)
- ○ Ongoing university education
- ○ Higher education
- ○ Postgraduate education

What is **your entire household's** total income per month after tax including any allowances? Also include the student loan if you are a student. Feel free to answer even if you are not completely sure.

- ○ SEK 0 - 10,000
- ○ SEK 10,001 - 20,000
- ○ SEK 20,001 - 30,000
- ○ SEK 30,001 - 40,000
- ○ SEK 40,001 - 50,000
- ○ SEK 50,001 - 60,000
- ○ SEK 60,001 - 70,000
- ○ SEK 70,001 - 80,000
- ○ SEK 80,001 - 90,000
- ○ SEK 90,001 - 100,000
- ○ SEK 100,001 - 120,000
- ○ SEK 120,001 - 150,000
- ○ SEK 150,001 - 200,000
- ○ More than SEK 200,000

How many people under the age of 18 live in your household?

- ○ No people
- ○ 1 person
- ○ 2 people
- ○ 3 people
- ○ 4 people
- ○ 5 or more people

How many adults (over 18) live in your household? (incl. yourself)

- ○ 1 adult
- ○ 2 adults
- ○ 3 adults
- ○ 4 adults
- ○ 5 or more adults

How long have you lived at your current address?

▼ Since 2023 ... Since before 2000

How long in the last 12 months have you been away from your home address (eg on holiday or on business trips)? Feel free to answer even if you are not completely sure.

- ○ Less than 1 week
- ○ 1 to 2 weeks
- ○ Between 2 weeks and 1 month
- ○ 1 to 2 months
- ○ 2 to 3 months
- ○ 3 to 5 months
- ○ More than 6 months

How many hours a week do you usually work or study outside the home?

- ○ I do not work or study
- ○ 0 hours
- ○ 1-19 hours
- ○ 20-39 hours
- ○ 40 or more hours

How many other people in your household are either working or students?

- ○ None
- ○ 1 person
- ○ 2 people
- ○ 3 people
- ○ 4 people or more

On average, how many hours a week do they usually work or study outside the home?

- ○ They do not work or study
- ○ 1-19 hours
- ○ 20-39 hours
- ○ 40 or more hours

Do you have a second residence (for example, a summer residence)?

- ○ Yes
- ○ No

How much time in the last 12 months did you spend in your second home? Feel free to answer even if you are not completely sure.

- ○ Less than 1 week
- ○ 1 to 2 weeks
- ○ Between 2 weeks and 1 month
- ○ 1 to 2 months
- ○ 2 to 3 months
- ○ 3 to 5 months
- ○ More than 6 months

Please enter your Swish number so that we can carry out the payment.
Your number will only be used to complete the payout and will be treated confidentially.

_____

D Pre-Analysis Plan

Pre-analysis plan:
Social preferences and environmental behavior

Pol Campos-Mercade, Claes Ek, Florian H. Schneider and Magnus Söderberg

14 November 2023

1) Motivation

Many environmental behaviors negatively impact other people. We study whether social preferences drive environmental behaviors with such negative externalities. We measure social preferences and environmental behaviors, combining surveys with administrative data. We then test whether social preferences predict environmental behaviors with negative externalities on others. Here, we outline our analysis plan.

2) Design and definition of variables

Our study combines a survey, which measures social preferences and environmental behaviors, with administrative data on household waste.

2.1) Survey

In the survey, we first measure social preferences and then environmental behaviors. Finally, we collect data on knowledge, beliefs, norms and attitudes regarding the environment, and socio-demographics. In the following, we discuss how we measure social preferences and environmental behaviors. All other measures are discussed in the appendix.

Social preferences
We use a set of seven games to measure social preferences. In all games, the participants are in the role of "Player A". The player A then faces a tradeoff between her own payoff and the payoff of 20 other participants, the "player Bs". The player Bs will be recruited in a separate study.

In each game, player A and the 20 player Bs start with an endowment of 50 Swedish krona (SEK) each. Player A can then choose an option that benefits her, but has a small negative externality on the 20 player Bs. In each of the seven games, the payoff of each player B would be reduced by SEK 5. The benefit for player A depends on the game; in Game 1 to 7, she would receive an additional SEK 1, SEK 20, SEK 50, SEK 100, SEK 150, SEK 250 or SEK 500, respectively. Alternatively, player A can choose to not select the option with the negative externalities, in which case every player would receive the initial endowment of SEK 50. We refer to the choice of participant i in game j as $Prosociality_{i,j}$:

Prosociality$_{i,j}$ (secondary measure): 0 if participant *i* chooses the option with negative externalities in game *j*, 1 otherwise.

We will use these measures as secondary measures of prosociality (see discussion in footnote 5). More importantly, based on the choices in these seven games, we construct our **main measure** of prosociality, which is the average prosociality across the seven games:

Prosociality$_i$ (primary measure): $\frac{1}{7}\sum_{j=1}^{7} Prosociality_{i,j}$

Next, we ask multiple survey items that measure preferences and personality traits (see Appendix). Most importantly, we elicit altruism, which we will use as a secondary measure of prosociality:

- ***Altruism_survey$_i$*** (secondary measure): Willingness to "give to charity without expecting anything in return" (from 0 "not at all willing to do" to 10 = "very willing to do"). We will code this variable linearly from 0 to 1.

Environmental behaviors
We first ask participants how often ("Never", "Sometimes", "Often", "Always") they engage in 15 different environmental behaviors. We group these behaviors in four categories and then create an index for each of these four categories (see section 3.3 for details on how we create indices), which are secondary outcome measures:

Index waste reduction$_i$ (secondary):
- Buy packaging-free products
- Reuse shopping bags
- Sort waste
- Sort out food waste for compost
- Reuse or repair instead of throwing away

Index domestic energy and water conservation$_i$ (secondary):
- Turn off lights not in use
- Save water by taking shorter showers
- Put on an extra sweater and lower the indoor temperature in winter

Index transportation$_i$ (secondary):
- Avoid driving
- Walk, cycle or take public transport for short journeys (i.e. less than 5 km)
- Avoid traveling by air

Index eco-shopping and eating$_i$ (secondary):
- Buy environmentally friendly products
- Eat food that is organic, locally produced or seasonal
- Avoid eating meat
- Buy clothes and things second hand

We then aggregate these four indices in an index (see section 3.3) that captures overall environmental friendliness, which is the *primary outcome measure of the survey*:

Index environmental friendliness$_i$ (primary):

- Index waste reduction$_i$
- Index domestic energy and water conservation$_i$
- Index transportation$_i$
- Index eco-shopping and eating$_i$

We then also elicit the frequency with which people fly and use the car and construct the following secondary outcome measures:

> ***Frequency driving*** (secondary): How often do you personally drive a petrol or diesel car, either as a driver or as a passenger?[1]
>
> ***Frequency flying*** (secondary): How many times during 2022 did you take the flight (round trip) for different types of pleasure trips - holidays, visits to family or friends, etc.? [2]

2.2) Administrative data

We will link the survey data to administrative data on household waste. Based on the administrative data, we will construct the following outcome measures, which is our *second primary outcome measure of the study*:

> ***Household waste$_i$*** (primary)*:* Total unsorted ("residual") household waste in kg from the last 12 months.[3]

In addition, we will get access to the following control variables: composition of the household (number of household members, age and gender of each household members), distance to the nearest FTI recycling station, postcodes, and whether the household's waste collection cycle is two weeks.

3) Analysis

3.1) Main specification

We estimate the relationship between the environmentally friendly behaviors of our participants and social preferences. We regress our outcome variables that measure environmental friendliness, y_i (described in section 2.1 and 2.2.), on our measure of prosociality, $Prosociality_i$ (described in section 2.1):

$$y_i = b_0 + b_1 Prosociality_i + b_3 X_i + e_i$$

[1] Participants choose between "6-7 days a week", "3-5 days a week", "1-2 days a week", "Once a month", "Less often", and "Never". We then calculate the number of days they drive per month, that is, we code the options as 26, 16, 6, 1, 0.5 and 0 days, respectively.

[2] Participants choose between "More than 10 times", "6-9 times", "3-5 times", and "1-2 times", "Never". We code the options as 11, 7.5, 4, 1.5 and 0, respectively.

[3] To calculate *Household waste*, we define the "end date" as the day after the invitation letter was sent and the "start date" as 12 months before the end date. We then calculate total household waste between the start date and the end date. We will consider both the natural logarithm (LN) of household waste and the (untransformed) household waste as outcome measures. As secondary measures, we will also look at the household waste from the last 6 months.

where X_i is a vector of control variables, including age, gender, marital status, income, occupation, education (measured in the survey, see Appendix for definition of these variables), and number of adult household members, numbers of children aged 0-2 year in household, numbers of children aged 3-6 years, number of children aged 7-11 years, number of children aged 12-17 years, and a set of postcode dummies (measured in administrative data),[4] and e_i is an individual specific error robust to heteroscedasticity.[5]

We predict that individuals who are more prosocial behave more environmentally friendly. We will use a one-sided test to examine whether b_1 is statistically significantly larger than zero.

3.2) Heterogeneity analyses and additional analyses

We will also explore whether there are important heterogeneous relationships. We are in particular interested in gender. There is some evidence that women behave more environmental friendly then men (the "eco gender gap"), and we will study whether we can explain some of this gender gap with differences in prosociality.[6]

Moreover, we will also explore the role of other preferences and personality traits, knowledge, beliefs, norms and attitudes about the environment and climate change, and sociodemographics in shaping environmentally friendly behaviors (see Appendix for a definition of these variables).

3.3) Creating indices

We create the five indices described above as follows: We standardize each individual item (subtract the mean and then divide it by the standard deviation), add the items and divide the result by the number of items. Using an index as the main outcome variable instead of each outcome separately increases power and addresses multiple hypothesis testing.

Unless otherwise mentioned, we will consider all non-binary measures as continuous. For instance, when participants need to state how often they engage in environmental behaviors, we will code "Never" as 0, "Sometimes" as 1, "Often" as 2, and "Always" as 3. In the Appendix, we provide a definition of variables that capture other preferences and personality traits, knowledge, beliefs, norms and attitudes about the environment and climate change, and sociodemographics.

---

[4] When we consider the outcome *Household waste*$_i$, we also control for *Days away from home*, *Work from home*, *Work from home others*, the interaction between *Work from home others* and *Number others work/study*, *Number others work/study*, and *Days away in second residence* (see Appendix) and for the distance to the nearest FTI recycling station (measured in administrative data)

[5] As secondary analysis, we will replicate this analysis using *Altruism_survey*$_i$ and *Prosociality*$_{i,j}$ instead of $Prosociality_i$. We are particularly interested in *Prosociality*$_{i,6}$ and *Prosociality*$_{i,7}$, that is, the behaviors in the games where the decision makers can choose to forgo large payments (SEK 250 and SEK 500, respectively) to avoid small negative externalities (that add up to only SEK 100).

[6] We will focus on our survey measures of environmental friendliness. *Household waste*$_i$ is measured at the household level and, hence, does not allow us to study gender differences. Existing evidence indicates that women are less efficiency-focused then men. We therefore expect the largest gender differences in prosociality for *Prosociality*$_{i,6}$ and *Prosociality*$_{i,7}$, and, hence, are particularly interested in whether these measures can explain part of the eco gender gap.

4) Data collection and sample size

4.1) Data collection

We send invitation letters via mail to 18,202 households. It is unclear to us what proportion of invited households will participate in the study, but our best guess is that the proportion will be around 10% to 20%.

4.2) Exclusion criteria

We exclude participants who finished the survey within less than 5 minutes. We expect this to be the minimum amount of time one needs to fill out the survey considerately. For the analysis with the household waste data, we also exclude participants who moved in less than a year before the day we sent the invitation letter (that is, people that moved in after the “start date”, as defined in footnote 3).

Appendix: Other Variables

- **Risk preferences**: Willingness to "generally take risks" (from 0 "not at all willing to do" to 10 = "very willing to do"). We will code this variable linear from 0 to 1.
- **Time preferences:** Willigness to "give up something of value to you today to achieve something even better in the future? (from 0 "not at all willing to do" to 10 = "very willing to do"). We will code this variable linear from 0 to 1.
- **Reciprocity**: "When someone does me a favor, I am willing to do something in return" (from 0 = "does not describe me at all" to 10 = "describes me perfectly". We will code this variable linear from 0 to 1.
- **Trust**: "I assume that people only have good intentions" (from 0 = "does not describe me at all" to 10 = "describes me perfectly". We will code this variable linear from 0 to 1.
- **Norm following**: "It is important to me to always behave correctly and to avoid doing things that people would say are wrong" (from 0 = "does not describe me at all" to 10 = "describes me perfectly". We will code this variable linear from 0 to 1.
- **Knowledge about waste**: Which item takes the longest to break down in a landfill? (Banana Peel, Plastic bottle, Newspaper, Glass bottle, Don't know). We code this as 1 for "Glass bottle" and 0 otherwise.
- **Beliefs climate change is human made**: "The Earth's climate is changing and this is mainly due to human influence" (from 0 = "do not agree at all" to 10 = "completely agree"). We will code this variable linear from 0 to 10.
- **Beliefs impact climate change**: "If current trends continue in the same direction, we will soon experience a major ecological disaster" (from 0 = "do not agree at all" to 10 = "completely agree"). We will code this variable linear from 0 to 10.
- **Beliefs personal impact climate change**: "Climate change affects me personally or will" (from 0 = "do not agree at all" to 10 = "completely agree"). We will code this variable linear from 0 to 10.
- **Norms policy ambition**: "Society is currently doing too little to protect the environment" (from 0 = "do not agree at all" to 10 = "completely agree"). We will code this variable linear from 0 to 10.
- **Beliefs pivotality**: "My private actions make a difference to the environment" (from 0 = "do not agree at all" to 10 = "completely agree"). We will code this variable linear from 0 to 10.
- **Norms sort waste**: "It is important for the environment that all people sort" (from 0 = "do not agree at all" to 10 = "completely agree"). We will code this variable linear from 0 to 10.
- **Norms protect environment**: "We should protect the environment even if this leads to a decrease in our material prosperity to some extent" (from 0 = "do not agree at all" to 10 = "completely agree"). We will code this variable linear from 0 to 10.
- **Age**: "What year were you born?" We will code this variable linear in years.
- **Gender**: "Do you identify as female or male?" (Female, Man, Neither as a man nor a woman). We will code dummies for the categories.

- **Marital status**: “What describes you best?” (Single, Long-term relationship, Partner, Married or registered partner, Other). We will code dummies for the categories.
- **Occupation**: “What is your main occupation?” (Working, Unemployed, Students, Retired, Other). We will code dummies for the categories.
- **Education**: “What education do you have?” (Primary education or lower, Upper secondary education or folk university education, Post-secondary education (e.g. Qualified Vocational Education), Current university education, Higher education, Postgraduate education). We will code dummies for the categories.
- **Income**: “How big is your entire household's total income per month after tax, including any allowances?”. We will code this variable linear in income.
- **Children**: “How many people under the age of 18 live in your household?” (0, 1, 2, 3, 4, 5 or more). We will code this variable linear in number of children. We code “5 or more” as 5.
- **Adults**: “How many adults (over 18) live in your household? (incl. yourself)” (0, 1, 2, 3, 4, 5 or more). We will code this variable linear in number of adults. We code “5 or more” as 5.
- **Number of year at current address**: “How long have you lived at your current address?” (Since 2023, ..,Since before 2000)
- **Days away from home**: “How long in the last 12 months have you been away from your home address (e.g. on holiday or on business trips)? Feel free to answer even if you are not completely sure.” (Less than 1 week, 1 to 2 weeks, Between 2 weeks and 1 month, 1 to 2 months, 2 to 3 months, 3 to 5 months, More than 6 months). We will code dummies for the categories. E.g., the first dummy is coded as 1 if a participant chose “Less than 1 week” and as 0 otherwise. When we control for days away from home, we use the five dummies.
- **Work from home**: “How many hours a week do you usually work or study outside the home?” (I do not work or study, 0 hours, 1-19 hours, 20-39 hours, 40 or more hours). We will code dummies for the categories.
- **Number others work/study:** “How many other people in your household are either working or students?” (0,1, 2, 3, 4 or more). We will code this variable linear in number of adults. We code “4 or more” as 4.
- **Work from home others**: “On average, how many hours a week do they usually work or study outside the home?” (They do not work or study, 0 hours, 1-19 hours, 20-39 hours, 40 or more hours). We will code dummies for the categories.
- **Second residence**: “Do you have a second residence (e.g., a summer house)?” (Yes, No). We will code this as a dummy that is 1 for “Yes” and 0 otherwise.
- **Days away in second residence:** “In the last 12 months, how many weeks did you spend in your second residence?” (Less than 1 week, 1 to 2 weeks, Between 2 weeks and 1 month, 1 to 2 months, 2 to 3 months, 3 to 5 months, More than 6 months). We will code dummies for the categories. We will add a category that captures that person does not have a second residence.