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SOC2050

**Driving Behavioral Change for
an Economic and Social Transition towards more
Resilience and Sustainability in Luxembourg**

Driving Behavioral Change for an Economic and Social Transition towards more Resilience and Sustainability in Luxembourg (SOC2050)[*]

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Executive summary

The SOC2050 study, commissioned by Luxembourg Strategy and conducted by LISER from November 2022 to August 2023, assessed the citizens' interest in transitioning society and the economy in Luxembourg towards greater resilience and sustainability. This initiative contributes to the United Nations Goal – Ensure sustainable consumption and production patterns (SDG12). This report describes the final results of the longitudinal online survey conducted in SOC2050. This study surveyed 912 individuals who participated in a three-wave study over 10 months and who provided rich information about their behaviours and attitudes toward sustainability. Four domains were selected for their major impact on sustainability and their carbon footprint: meat consumption, mobility patterns, home energy consumption, and the acceptance of financial sacrifices to reduce one's carbon impact. The survey also collected in each wave participants' support towards six hypothetical policies aimed at regulating or taxing unsustainable behaviours.

The study participants were recruited among Luxembourg residents and cross-border workers. After calibration to be representative of Luxembourg's age and gender demographics, the participants are 50% females, 32% under 35 years, 73% employed, and 43% earning below 6000 euros monthly. The sample includes 40% native Luxembourgers, with 48% residing in urban areas and 69% holding a higher education degree. Interestingly, 26% don't believe human activity is the main cause of global warming, and 55% think there is no scientific consensus on human impact on climate change. Despite this, 62% express concern over global environmental issues. Locally, 68% are pessimistic about Luxembourg's environmental future, predicting a severe decline by 2050. Notably, 21% hold a fatalistic view that drastic behavioural changes would not improve sustainability, while 48% are personally connected to someone affected by pollution-related illnesses or property damage due to climatic events.

In terms of behaviours, respondents, consume on average 6.3 meals containing animal proteins weekly and heat their homes to 20.1°C, with 22% living in highly energy-efficient homes. For mobility, they are willing to spend an extra 16 minutes on public transport over a 30-minute car journey. About one third are ready to donate their earnings for carbon credits. Two thirds buy locally produced goods, nearly half purchase organic products, a third prefer trains over flights, and buy bulk or second-hand items.

In terms of policy support, four out of six hypothetical sustainable measures are supported by a majority of respondents if accompanied by public support plans. Stronger regulations on meat production and a higher VAT on meat gained 64% and 37% support. Over half backed hypothetical quotas on fossil fuels and 65% supported a rental tax on energy-inefficient dwellings, half endorsed banning cars in densely populated areas, while 23% supported a motorway toll. However, without plans, only two policies maintain majority backing.

Beyond this description, the report addresses two central questions. The first question explores how sociodemographic factors, constraints, psychological aspects, and social norms influence these behaviours and attitudes toward sustainability. High-income individuals (those who earn more than 8000 euros per month) are more likely to engage in behaviours like buying organic food, donating for carbon offsets and living in energy-efficient homes, but may also indulge in unsustainable practices due to their purchasing power, like eating meat and having a more intensive use of electric devices. They also show higher policy support in general, except for tolls on motorways. Women consume less animal proteins and show stronger support for meat regulation policies. They also tend to donate more for carbon offsetting and to buy organic and second-hand

products, but on the other hand, favour home temperatures. For urban residents, the frequent use of public transport, shaped by urban infrastructure, is mirrored in their support for quotas on fossil fuels. Employed individuals generally invest less in home energy renovations and sustainable transport, and are less inclined to donate a portion of their survey earnings, possibly reflecting a different valuation of their time. Those under 35 show less interest in eating game and are less likely to donate lottery winnings. They also engage less in home renovations but more often live in energy-efficient homes. In contrast, individuals over 65 frequently turn off lights, unplug devices, avoid flights, and donate lottery winnings, yet live in houses with more heating and less energy efficiency than young people, and are less likely to buy second-hand items. Notably, the only characteristic that only has positive effects on sustainable behaviours and attitudes is higher education.

The analysis was further enriched by examining the impacts of personality traits and behavioural biases. It reveals that prosocial orientations (captured by traits of altruism, empathy, and warmth) and inclinations toward individual self-improvement (captured by openness, growth mindset, and conscientiousness) stand out as significant predictors of sustainable behaviours. Interestingly, other traits encourage certain sustainable behaviours whereas they discourage others, such as procrastination, extraversion, and assertiveness, confirming the complex interplay between individual characteristics and sustainable practices.

The second question examines whether targeted communications can increase the desirability of a sustainable transition. This second question is addressed through a randomised controlled trial in which information treatments are randomly assigned to participants. These treatments provide participants with information about sustainable behaviour and attitudes in society, aiming to correct the widespread underestimation of other people's efforts, called "pluralistic ignorance". Two treatments were implemented: one correcting perceptions of social norms toward sustainability (NORMS), and the other informing about the levels of support toward green policies (POLICY).

The NORMS treatment effectively increased intentions to buy local goods and to reduce animal protein consumption. The POLICY treatment slightly increased willingness to carpool and buy local, but decreased likelihood to donate bonus earnings ; however, these changes were not sustained over time. Regarding policy support, the POLICY treatment notably increased support for meat regulation and housing policies both immediately and three months later. The NORMS treatment also increased support for meat regulations.

Overall, while not all behaviours were significantly impacted, the treatments positively influenced certain practices and attitudes, particularly in areas like meat consumption and housing energy conservation. These interventions showed either positive or neutral effects, suggesting that information treatments correcting misperceptions about other people's behaviours and opinions can be a cost-efficient method to promote sustainability in Luxembourg.

In the areas that were covered by both parts of the SOC2050 project (the qualitative approach of WP1 and the quantitative approach of WP2 and WP3), several notable intersections were observed. For instance, the desirability, or at least the capacity for a societal transition is hindered by financial constraints, in particular in the domain of investments in energy efficiency at home. Being wealthier is however no guarantee for a sober lifestyle. Instead, relaxing financial constraints often leads to higher meat consumption and a higher usage of electric devices. Men and individuals active on the labor market also appear to adopt less sufficient consumption patterns. Time constraints also play a major role, either to change mobility habits or to organise renovations and overcome bureaucratic barriers. Finally, a common finding between both parts of the study

is that people are open to more regulations (and to a lesser extent taxes), but these constraining policies need to be accompanied by coherent plans providing citizens with sustainable solutions to support their efforts.

To conclude, the report highlights that pro-environmental behaviour stems from a mix of sociodemographic elements, personality traits, and societal perceptions. Key drivers include higher education, prosocial orientations and self-development. While time and financial constraints matter, easing them doesn't guarantee sustainable actions and may even have unintended effects. Fear-based messages, highlighting risks and social judgments might also be counterproductive, possibly discouraging engagement or fostering resistance. Instead, strategies emphasising education and the reinforcement of positive social values seem more promising. Our causal estimation of the effects of communications addressing misconceptions about society's behaviours shows promise, but probably has short-lived impacts, at least within this study's communication intensity. Thus, relying solely on information campaigns is insufficient, and one of the key lessons of this study is that effective societal change requires comprehensive public policies that offer tangible alternatives to unsustainable behaviours. The report concludes with some specific policy recommendations.

1   Introduction

At a time when market economies are constantly striving for growth, production and consumption patterns are contributing to the existential challenges facing the planet as a whole (e.g. global warming, pollution, reduced biodiversity, scarcity of raw materials and rising energy prices). Numerous stakeholders – such as public authorities, associations and non-governmental organisations, citizens – are trying to raise awareness to these fundamental issues, with limited success.

Luxembourg Strategy has commissioned LISER to execute the SOC2050 study. This study sheds light on the willingness of socio-economic actors (consumers, employees, employers, investors, decision-makers) to change their behaviours, habits and attitudes towards more sustainability and resilience for Luxembourg's society and economy.

The SOC2050 project has adopted two complementary approaches – a qualitative, in-depth study and a quantitative, survey-based analysis. Figure 1 describes the structure of the project.
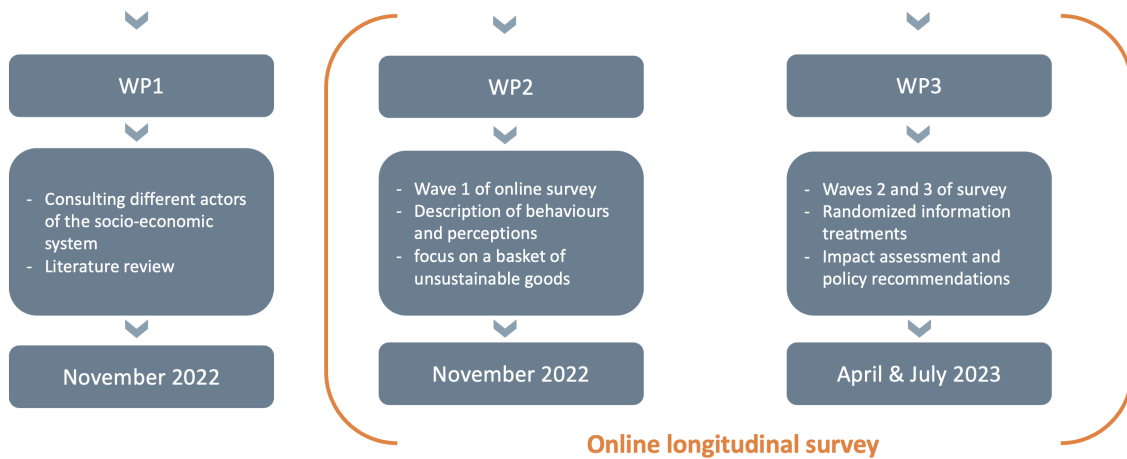

Figure 1. Structure of the SOC2050 project

The first, qualitative, work package focused on the "supply" side of the socioeconomic system (company management and employee representatives in the industry and construction sectors), but also involved consumer associations and non-governmental organisations. Through semi-structured interviews, several barriers and accelerators of change were identified.

While these findings can be found in detail in the first SOC2050 report submitted in February 2023, we provide here a short summary of this qualitative analysis articulated around barriers and accelerators to a sustainable transition. First, barriers include inequality in terms of innovation capacity among companies, skilled labour shortages, and unequal household capacity for investing in energy renovation. The lack of transparency and bureaucratic burden to access public aid in the domain of energy renovation is also notable. Second, WP1 identified as accelerators of change regulatory reforms and public tenders to enhance decarbonisation, investments in professional training, and the involvement of staff delegations in ecological issues. Group interviews with ecological NGOs and youth organisations revealed a more critical view of the current economic system focused on growth and over-consumption, seen as obstacles to ecological transition. These groups proposed making information more accessible to guide consumers and reorienting the education system to more highly value craftsmanship and agriculture careers.

The second approach, which covers the second and third work packages of SOC2050, is the

subject of this final report. It complements the first report both in terms of angle and of method, as it provides a quantitative analysis focused on the demand side, by studying the behaviours, norms and attitudes of a sample of almost 1000 individuals. The overarching topic of this report is thus the exploration of why individuals collectively struggle to modify their lifestyles, despite understanding that their current practices jeopardise economic, social, and environmental systems in the short to medium term.

The first central question addressed in this report is how do sociodemographic characteristics and constraints (e.g., time and money), psychological factors, and social environments influence our behaviour and attitudes toward sustainability? This first question is addressed through an online incentivised survey in which a wide variety of information is collected about participants through 3 waves over 10 months.

The topics covered in the survey concern behaviours, attitudes and norms, with a particular focus on three domains that, according to a study carried out by the Luxembourg Institute for Science and Technology (LIST) – https://carbonnerd.list.lu/decarbonisation – have the greatest impact on carbon emissions, namely food consumption, mobility patterns, and household energy consumption. It is crucial to understand that emphasising carbon-emitting behaviour is not solely an environmental concern. In Luxembourg, reducing these emissions offers tangible economic advantages, from lowering energy expenses and lessening dependency on energy imports to spurring local innovation and enhancing industrial competitiveness. Additionally, it paves the way for new opportunities in sustainable finance, aligning Luxembourg's economic growth with environmental sustainability.

The second central question of this study is whether targeted communications can foster sustainable behaviours and attitudes, and if such an impact can persist for at least three months. To address this, a randomised controlled trial (RCT) was integrated into the second wave of the survey. An RCT is a scientific method used to evaluate the effectiveness of an intervention – in this case, targeted communications. Participants are randomly assigned to either a treatment group (who receive the information) or a control group (who do not). This randomisation ensures that any differences observed between the two groups can be attributed to the intervention itself, rather than other variables.

In our RCT, the information treatments concern society's sustainable behaviour and attitudes. This information aims to correct misperceptions whereby individuals tend to think of themselves as more virtuous than others, a phenomenon referred to as "pluralistic ignorance." Since people tend to underestimate others' efforts towards sustainability, they may feel discouraged and reduce their efforts because of mistaken beliefs. The hypothesis, supported by research from psychology, sociology, and behavioural economics, therefore posits that correcting these misperceptions could improve both attitudes and behaviour. While in the second wave of the panel we assess the impact of this information on respondents' attitudes and intentions, the third wave allows us to assess these effects' persistence and the possible materialisation on intentions into actual actions.

This report is organised as follows. In Section 2, we describe the survey design, provide information about its implementation and the sociodemographic characteristics and beliefs (trust in science and institutions, concerns for the future, fatalism,...) of our sample. In Section 3, we describe our outcome variables, i.e. behaviours and attitudes toward sustainability. Sections 4 and 5 provide an answer to the first central question of the project. Indeed, in Section 4, we explain how participants' behaviour and policy support are influenced by their sociodemographic characteristics. In Section 5, we go one step further and introduce additional explanatory factors

such as personality traits and individual behavioural biases. Section 6 provides an answer to the second key question, by describing how information treatments introduced at the start of wave 2 causally impact participants' intentions to change behaviour (in wave 2), as well as their actual behaviour (in wave 3). This section also allows us to understand how information treatments impact immediate (wave 2) reactions in terms of donation behaviour and support to policies, and whether this effect survives 3 months later (in wave 3).

2 Methodology

2.1 Description of the longitudinal online survey

In November 2022, LISER launched an online longitudinal study by contacting about 3,700 volunteers who, during previous LISER surveys, had given their consent to be recontacted and take part in other surveys.[1,2] Among them, 1,292 people participated in the first wave of the survey. Wave 2 was launched in April 2023, with the participation of 1026 respondents from the first wave. Wave 3 was launched in August 2023, with 912 participants who eventually replied to all 3 waves and constitute our main sample.

The outcome variables covered in the survey include various behaviours with important sustainability dimensions, such as animal protein consumption, mobility patterns, home heating, insulation and energy-efficient investments. One drawback of these outcomes is that they are based on individual reports made online, not on actual observations of these behaviours. To address this potential limitation, in each wave we offered participants the possibility to donate part of their monetary compensation for participating in the study (see below) to contribute to a carbon offsetting project. This donation choice goes beyond a mere statement as it is eventually executed by the survey platform. Another outcome that we measure concerns attitudes toward sustainability. More specifically, we present participants with 6 hypothetical green policies and ask them to express their support toward them under various contexts and in each wave of the survey.

Scientific evidence from numerous fields, including psychology, sociology, and behavioural economics (e.g. Bicchieri (2005), Bicchieri (2016); Goerges and Nosenzo (2020)) has established that individuals do not operate in a vacuum but that their choices are affected by peers and society through social norms. On the one hand, individuals are influenced by the dominant societal behaviour, the perception of which constitutes the "empirical expectations" formed by individuals ("what I think others do"). On the other hand, they are also influenced by the dominant normative judgments in society: these are the "normative expectations" ("what I think others approve of"). To elicit participants' perceptions of these norms and attitudes in society, we applied incentivised state-of-the-art techniques (Bicchieri (2005), Bicchieri et al. (2022); Krupka and Weber (2013)) to the context of sustainability. This consists of asking participants to guess what will be the answers of other participants and what they think other participants consider as an 'appropriate' behaviour. To encourage participation as well as ensure participants' efforts to accurately report their perceptions of social norms, respondents were compensated with a fixed reward of €10 and a bonus for correct answers (ranging from €10 to €30). In addition, 10 participants in each wave were randomly selected through a lottery and offered a prize of 250 euros.

Beyond the measurement of these outcomes, a wide set of explanatory variables were captured in the survey to answer the first question of the project. One of the project's contributions is to provide a particularly rich set of explanatory factors, specifically in the domain of personality traits and behavioural biases. Our baseline set of factors, which is used throughout the analysis, is composed of "exogenous" variables, i.e. variables which can be considered as fixed, predetermined

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[1]The choice of interviewing volunteers was guided by pragmatic aspects while remaining scientifically valid. Indeed, the experimental literature has shown that the use of volunteer samples has a negligible impact on the measures of preferences and other factors of interest (see for example Anderson et al. (2013); Falk et al. (2013); Abeler and Nosenzo (2015)).

[2]These volunteers were recruited at the end of national surveys carried out by trained interviewers, in agreement with STATEC. Ethical principles and GDPR regulations were rigorously followed, and individuals were informed about the use of their data and their rights. In addition, subjects were reminded that they would remain anonymous in all the studies carried out.

characteristics that cannot be influenced by the outcomes that we study, to avoid a bidirectional influence between individuals' characteristics and their sustainable behaviour. These exogenous control variables include age, employment status, higher education, presence of children of less than 18 years of age in the household, and an indicator of living in an urban or rural area.

2.2   Description of the sample of participants

The descriptive statistics displayed in Table 1 are based on the 912 respondents who participated in the three waves of the survey.[3]. The data are weighted to reflect the age structure and the gender composition of the population of Luxembourg (Table A–1). After calibration, 50% are women, 32% are aged below 35 and 15% are aged above 65. About 73% of the sample is active in the labour market (either employed part-time, full-time or self-employed). The share of low-income individuals is 43%, the median-income group represents 29%, and the high-income group represents 28%.[4] A bit less than half of the sample was born in Luxembourg (40%) and 48% declared to live in an urban area (as opposed to a rural area). A large part of the sample (69%) has a university or other higher education degree. The variables described in this paragraph compose the set of sociodemographic characteristics which are the baseline explanatory factors used in Sections 4, 5 and 6.

Table 1. Description of the sample

	Mean
Sociodemographic characteristics	
Low income	0.43
High income	0.28
Higher education	0.65
Aged below 35	0.32
Aged above 65	0.15
Born in Luxembourg	0.40
Employed	0.73
Living in urban area	0.48
Children ($<$18)	0.32
Female	0.49
Beliefs	
Human activity is not the main cause of climate change	0.26
No clear scientific consensus on the impact of humans on climate	0.55
Very/extremely worried about the state of the planet	0.62
Fatalism	0.21
Do not trust	0.34
Pessimism for 2050	0.68
Acquaintance sick due to pollution or property damaged by climate events	0.48

The second part of Table 1 describes the perceptions and first-hand experiences of respondents concerning environmental and climatic damages. These statements were made in the first and second waves of the survey.

About one-quarter of the study participants (26%) consider that human activity is <u>not</u> the main

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[3]See Figure A–2 in Appendix 1

[4]Income information was collected via intervals of 2000 euros. The median of total net household monthly income is located in the 6000-8000 euro interval. Based on this, we define "low income" as less than 6000 euros, and "high income" as more than 8000 euros.

cause of global warming and 55% considered that there is no scientific consensus on the impact of human activity on climate change.[5] The majority of respondents (62%) is concerned about global environmental issues. At the local level, 68% are pessimistic about the state of the environment in Luxembourg and its surroundings, considering on average that it will decline from "good or very good" today, to "bad or very bad" in 2050. About one-fifth of the sample (21%) are fatalistic in the sense that they believe that even if the majority of the population adopted drastic changes in their behaviours (to stop eating meat, to stop using the car and the plane, and to rely on renewable energies at home), this would anyway not improve the sustainability of the local environment and economy. Half of the respondents (48%) know a victim of pollution-related disease or someone whose property was damaged by climatic events.

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[5]While the actual proportion is debated, it is commonly admitted that the proportion of scientists considering that humans are the cause of global warming exceeds 80% `https://www.forbes.com/sites/uhenergy/2016/12/14/fact-checking-the-97-consensus-on-anthropogenic-climate-change/`.

3 Behaviours and attitudes towards sustainability

This section describes the key behaviours and attitudes of participants. These were measured during the baseline survey at wave 1. This is therefore before respondents were exposed to any information treatment.

3.1 Behaviours

Table 2 summarises the main behaviours across various domains. Standard deviations are not provided for binary variables. First, the table shows that respondents consume an average of 6.3 meals containing animal proteins per week, with a standard deviation of 3.8. We developed an innovative 'sufficiency index', a scale ranging from 0 to 100, gauging an array of frugal behaviours.[6] The sufficiency index has an average of 55.9 in our sample, with a standard deviation of 16.9. In terms of energy efficiency at home, respondents heat their homes to an average temperature of 20.1° (degrees Celsius) with a standard deviation of 1.5. One respondent in five (22%) lives in a home with an Energy Performance Contract (EPC) of A, B or C, i.e. the highest levels of insulation and energy performance standards, and the same proportion of respondents invested in the energy efficiency (insulation or renewable energy investments) in the 2 years preceding the survey.

To measure attitudes towards mobility in a way that allows comparability across individuals, we presented respondents with a hypothetical situation in which they would regularly undertake a 30-minute journey by car. Instead of this car journey, we suggested an alternative mobility solution (public transport such as tram, train, or bus), possibly combined with an alternative mode of transport (scooter, bicycle, walking). We asked participants how much extra time they would be ready to spend with this alternative to forgo the car. Respondents indicated that they are willing to spend an additional 16 minutes on top of the initial 30 minutes, with a standard deviation of 17.8. It's worth noting that 29% of respondents use public transport several times a week, 39% use public transport or soft mobility every day, and 16% own a fully electric or hydrogen car.

Respondents were proposed to forgo earnings to contribute to the purchase of carbon credits. The extent to which respondents forgo earnings provides a precise monetary metric of their willingness to sacrifice personal earnings for the cause of decarbonising the planet. Because this action goes beyond mere declarations as it has real implications for the remuneration they will receive, this measure is arguably the most concrete (and reliable) gauge of 'sustainable' behaviour available in the survey. As participants' remuneration is based on two components (base earnings or the remuneration for participation and a lottery of 10 prizes of 250 euros), we measured this willingness to make financial efforts in two ways (base earnings and a possible lottery prize of 250 euros). On average 31% of respondents are willing to donate their base earnings to contribute to the purchase of carbon credits. Regarding the lottery, we asked participants which proportion of the 250-euro prize they would be willing to forgo to the purchase of carbon credits if they win the lottery. The forgone proportion of the prize was on average 30% (that is about 84 euros, Table 2).

Other attitudes towards consumption Table 3 displays the proportions of respondents who regularly engage in various behaviours aimed at reducing their carbon footprint. The most frequently adopted practices include switching off lights (95% of respondents), turning off electrical

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[6]These behaviours include (i) repairing damaged goods, (ii) giving or selling old goods, (iii) refraining from buying new goods when old ones are still functional, and (iv) not having unused goods at home. Each action is rated on a scale from 0 to 25, cumulatively contributing to a maximum potential of 100.

Table 2. Main behaviours

	Mean	Stand. dev.
Consumption		
Animal proteins	6.3	(3.8)
Sufficiency index	55.9	(16.9)
Energy efficiency at home		
EPC (A, B or C)	0.22	
Home investments (pre-2023)	0.22	
Home temperature	20.1	(1.5)
Mobility		
Mobility time	15.8	(17.8)
Weekly use of public transport	0.29	
Daily use of public transport or soft mobility	0.39	
Owns a fully electric or hydrogen car	0.16	
Contribution to carbon offsets		
Donation of base earnings	0.31	
Donation of lottery gains	0.30	

appliances (70%), drying clothes outside when the weather permits (68%), and buying local goods (68%). Almost half of the respondents (49%) regularly purchase organic products. Additionally, a third of respondents (33%) often opt for train travel instead of flying and choose to buy items in bulk and/or second-hand (31%). Less than one in five respondents consumes game (e.g. deer, boar, ...) or wild fish (17%), while only one in ten participates in carpooling (11%).

Table 3. Sustainable habits

	Mean
Avoid taking the plane	0.33
Carpooling	0.11
Buy organic	0.49
Buy local	0.68
Buy second-hand	0.31
Turn off the lights	0.95
Unplug electrical devices	0.70
Hang the laundry	0.68
Buy in bulk	0.31
Eat game	0.17

3.2 Policy support

Respondents were presented with two types of hypothetical sustainable policy measures (regulations and taxes). These 2 types of policies concerned each of the 3 main study domains (meat consumption, car use, and home energy consumption), leading to a total of six hypothetical measures. After presenting each policy one by one, we asked participants whether they would support it. It is important to note that we first highlighted that these policies would be accompanied by massive support plans that would provide sustainable alternatives (to meat, fossil energy for home heating, and car use, respectively). In a second step, we asked for participants' support in the absence of these public plans.
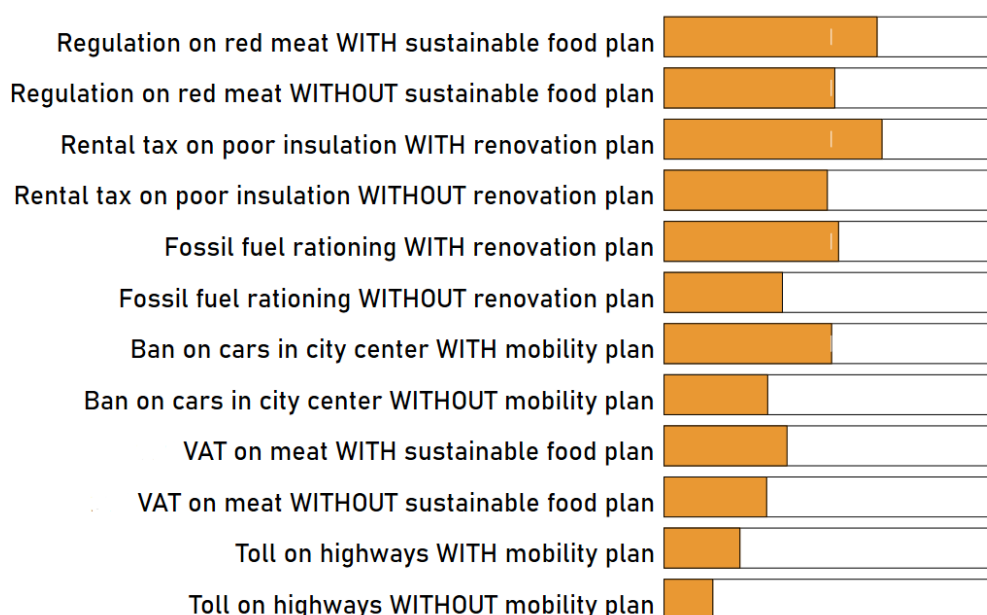
Figure 2. Level of support toward sustainable policies with and without support plans, reweighted sample

Figure 2 summarises the level of support toward these policies.[7] We first comment on the levels of support in the presence of the support plans.

Regarding meat consumption, the first measure involved the implementation of stringent regulations on meat production, such as mandating that only meat sourced from culled cows be sold. The second was to increase VAT on meat to 17%. In the presence of a public plan aimed at expanding the supply of non-animal proteins, a clear majority of respondents (64%) expressed support for more regulations on red meat production, while 37% were in favour of an increase in VAT.

In terms of home energy consumption, the first proposed measure was the introduction of quotas on fossil fuel production, and the second was the introduction of a tax on rents perceived by landlords renting insufficiently insulated dwellings. In the hypothetical presence of a support plan facilitating home renovations and subsidising energy-efficient investments, more than half of the respondents (52%) were in favour of quotas, and 65% supported the housing tax.

For mobility, the first proposed measure was to ban all cars from densely populated areas, while the second was to introduce a toll of 5 euros for the use of Luxembourg's motorways (or 10 euros for a round trip, for example). With a support plan expanding the quantity and quality of public transport solutions, about half of the respondents (50%) expressed support for banning cars from densely populated areas, and just under a quarter (23%) favoured the introduction of a toll on Luxembourg's motorways.

To conclude, the most important finding concerning policy support is the crucial role played by support plans accompanying sustainable policies. Indeed, while four policies out of six were supported by a majority of participants if public plans accompanied these measures, only two policies would—with just 50% and 51%—receive majoritarian support in the absence of these plans. These two policies, which in the presence of support received a support level of about 2/3,

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[7]These values are obtained after calibrating the study participants' composition to the age and gender composition of Luxembourg's resident population.

are regulations on red meat and a tax on landlords renting energy-inefficient dwellings.

In the next sections, our attention will be restricted to the level of policy support when public support plans accompany them.

4 Determinants of behaviours and attitudes towards sustainability

Having shown in Section 3 the prevalence among the participants of the range of behaviours and opinions that our study covers, we now delve into an examination of the extent to which these behaviours vary along a number of sociodemographic variables.

4.1 Sustainable behaviours and their determinants

We start with the study of the sociodemographic determinants of our main outcome variables, as illustrated in Figure 3. In this Subsection, we systematically analyse each behaviour individually, detailing every characteristic that demonstrates a statistically significant association at or below the 10% significance level.[8] The effect of each characteristic on the dependent variable is to be interpreted in comparison to the reference group, which represents middle-income men without higher education, aged between 35 and 65, born outside of Luxembourg, inactive, and living in a rural area without children.

Animal proteins High-income individuals and young people tend to consume more animal proteins than low- and middle-income individuals and people aged above 35. In contrast, people with a higher education degree, people born in Luxembourg and women consume less animal proteins (relative to people without higher education, to people born abroad and to men, respectively).

Home temperature Elderly individuals, women, parents and people born in Luxembourg tend to maintain higher home temperatures.

Home investments People aged below 35 and those living in urban areas are less likely to engage in home renovations to improve insulation and diversify their sources of energy. In the case of young adults, this possibly stems from the fact that they tend to already live in more energy-efficient homes (see below).

Mobility Regarding our hypothetical experiment to replace 30 minutes of car with sustainable transport, both low-income and high-income individuals are willing to spend more extra time on sustainable mobility than middle-income people, though low-income individuals have the highest willingness to spend time on public transport. The opposite applies to parents, suggesting that time constraints play an important role in decisions pertaining to mobility modes.

Weekly public transport use Higher education and living in urban areas positively correlate with weekly use of public transport.

Donations for carbon offsetting Elderly individuals, high-income earners, and women to a lesser extent demonstrate a greater propensity to donate their base survey compensation and a significant portion of their hypothetical lottery winnings. In contrast, low-income individuals, parents, the younger demographic and those who work exhibit a lower likelihood of making such donations. This could reflect a differing valuation of money and time, possibly due to tighter financial constraints and a more immediate focus on personal and family needs.

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[8]In the figures, the thin bars represent 90% confidence intervals, hence coefficient estimates whose thin bars do not cross the black vertical line at 0 are significant at 10%.
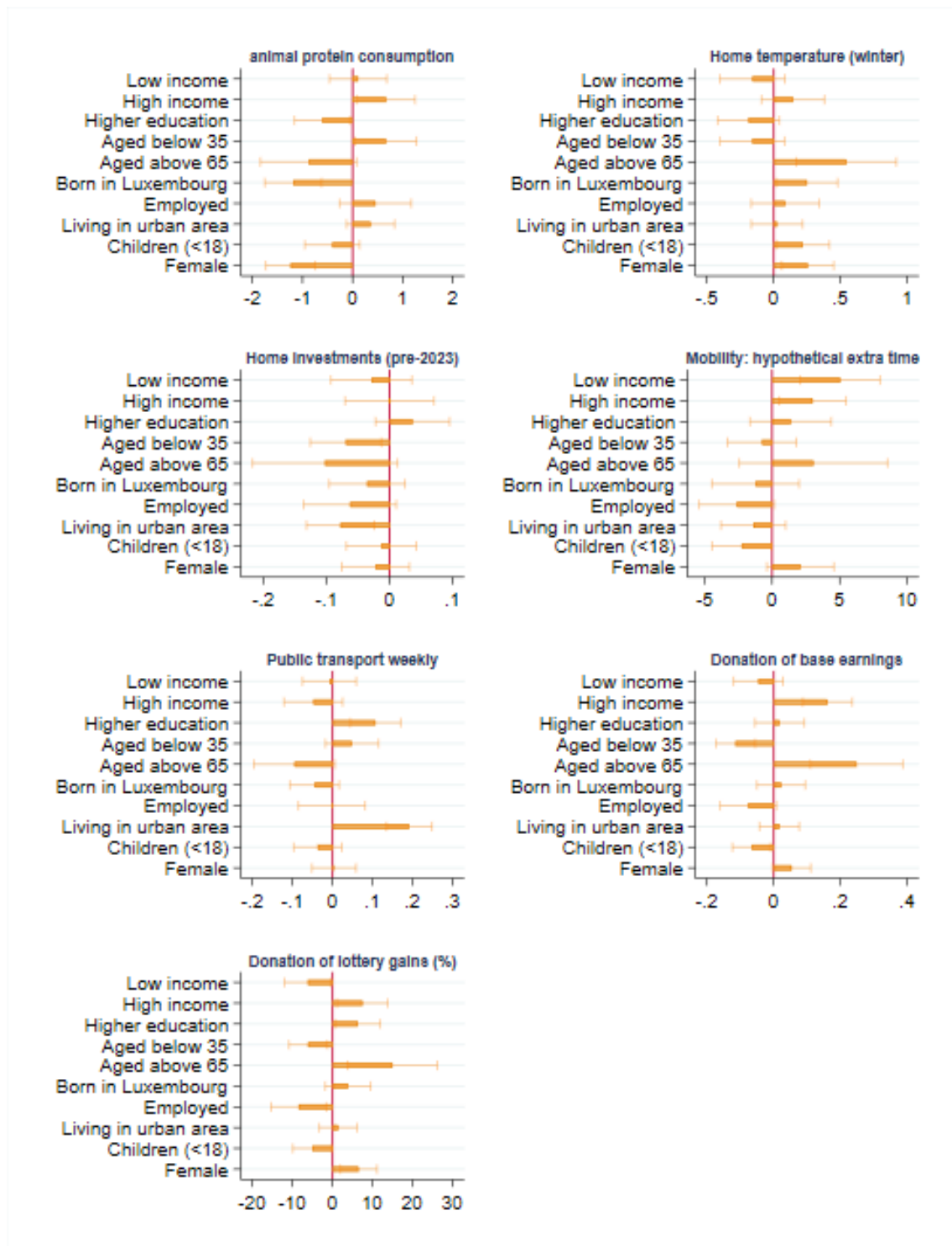
Figure 3. Impacts of sociodemographic characteristics on main behaviours
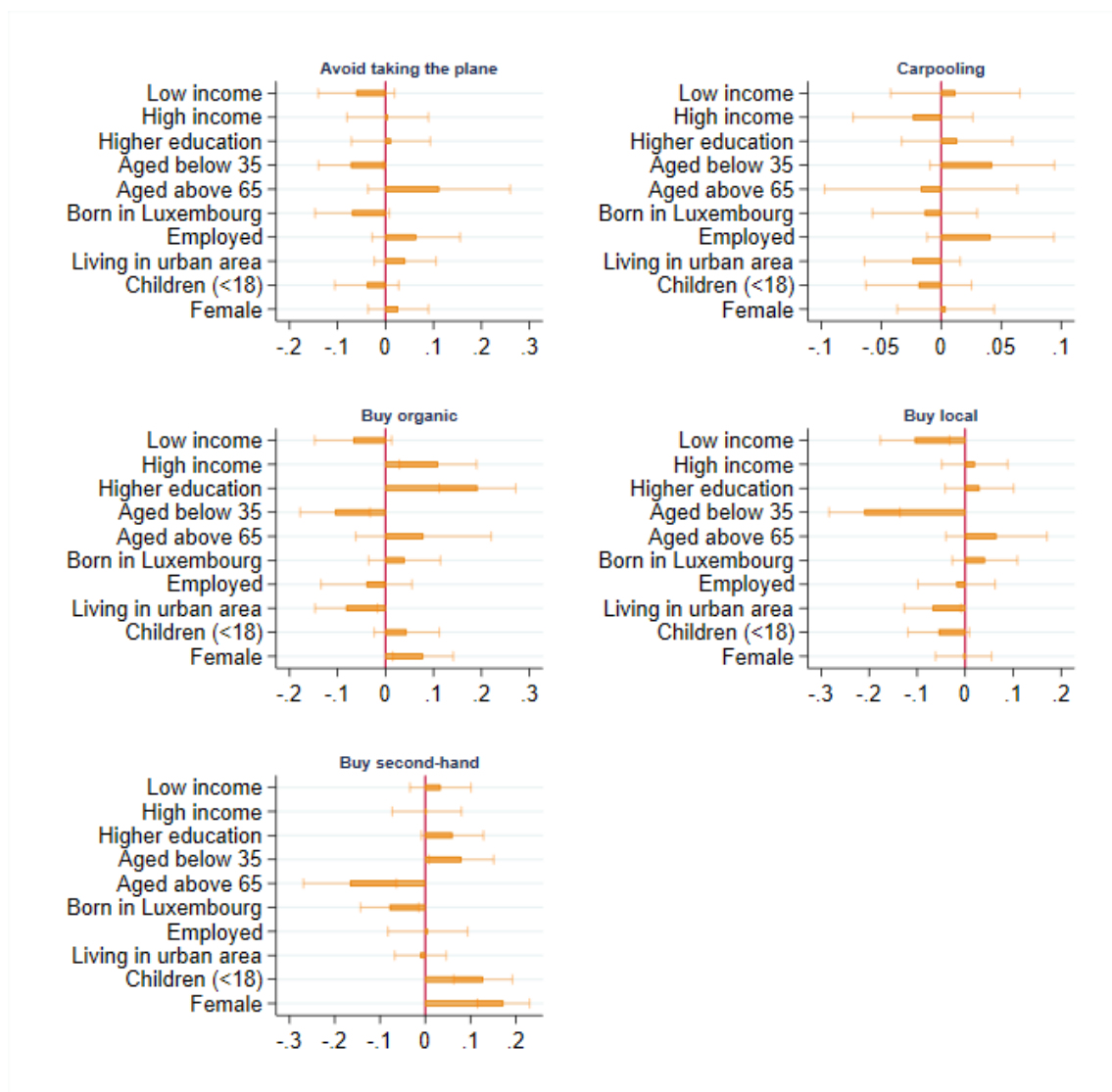
Figure 4. Impacts of sociodemographic characteristics on main sustainable habits

Figure 4 displays the association of sociodemographics with five sustainable habits related to mobility and (organic, local, or second-hand) consumption patterns. First, we observe that older individuals are more likely to avoid taking the plane. In carpooling, no significant patterns emerge, indicating that this behaviour may not be strongly influenced by sociodemographic factors. Buying organic is higher among women, and people with high income and/or higher education, reflecting higher financial capability and possibly greater environmental consciousness. In contrast, young adults and people in urban areas are less keen on buying both organic food and locally produced goods. Low-income individuals are also less likely to buy locally. For buying second-hand, younger individuals, parents and women show a greater propensity, while those born in Luxembourg and aged above 65 are less likely.
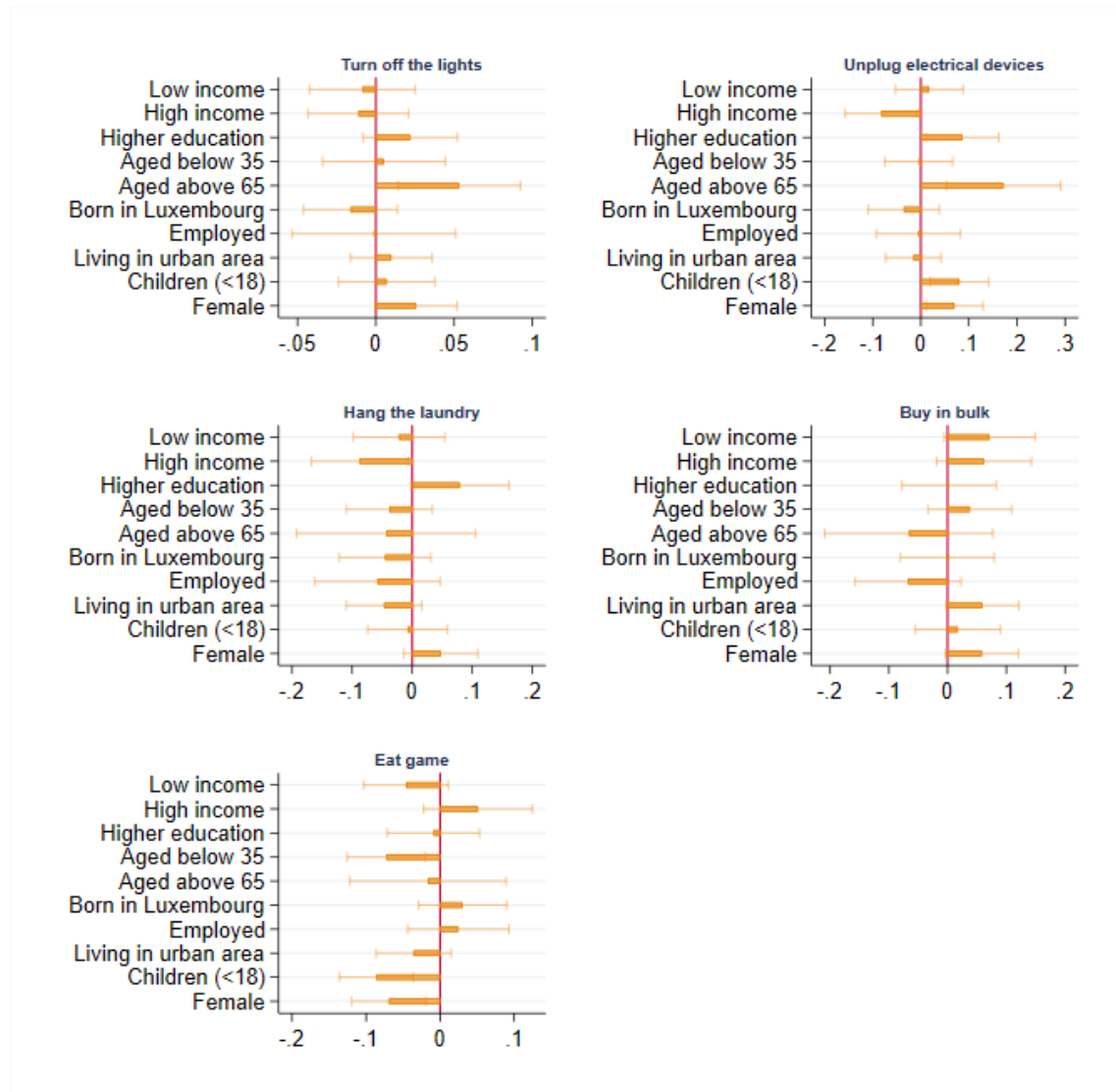
Figure 5. Impacts of sociodemographic characteristics on other sustainable habits

Figure 5 shows the association of traits with five other sustainable habits related to electricity use and to specific consumption patterns. Older individuals are more conscientious with turning off the lights and unplugging electric appliances, while high-income individuals are less inclined to unplug devices. Hanging the laundry is less prevalent among high-income individuals. Buying in

bulk does not seem to be affected by any sociodemographic characteristics, whereas consumption of game is less prevalent among younger individuals, parents and women, suggesting dietary preferences are influenced by age and gender.
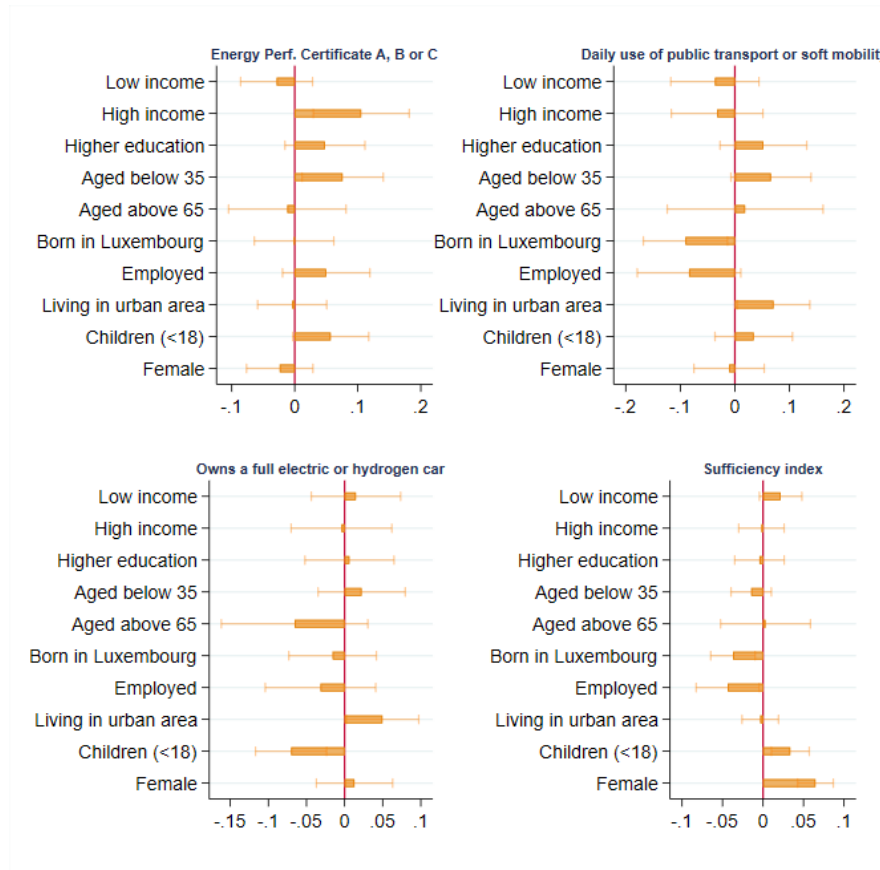
Figure 6. Impacts of sociodemographic characteristics on other outcomes

Figure 6 shows a last set of behaviours. Young adults and people with high income have a higher likelihood of living in a more energy-efficient home. The daily use of public transport or soft mobility seems less prevalent among people born in Luxembourg, and more common among people living in urban areas. People with children are less likely to own a fully electric or hydrogen car, possibly due to practical constraints, whereas people living in urban areas are more likely to own such type of car. Frugal consumption (captured by our sufficiency index, which reflects the tendency to refrain from buying new goods and from having unused goods, as well as to repair damaged goods and give or sell old goods) is significantly higher among women and parents, and lower among employed individuals and people born in Luxembourg, suggesting gender-specific, cultural and practical differences in consumption patterns and lifestyle choices.

Analysing the key themes in the study, a coherent narrative emerges, highlighting how various sociodemographic factors coherently influence sustainable behaviour by theme.

Mobility Mobility is primarily influenced by age, income and location. Older individuals tend to fly less and are more open to sustainable mobility options, though the latter varies significantly within this age group. Meanwhile, low-income individuals also demonstrate a willingness to adopt

more sustainable transport methods, plausibly driven by financial considerations. Urban living emerges as another key factor, positively impacting public transport usage, and highlighting the role of urban infrastructure and accessibility in shaping mobility choices.

Energy efficiency and consumption In energy-related behaviour, age and gender emerge as significant determinants. Older individuals, women and people born in Luxembourg tend to maintain higher home temperatures. On the other hand, young adults, especially in urban areas, are less likely to engage in home renovations for energy efficiency, possibly due to already residing in more energy-efficient homes. High-income groups use their means to ensure high energy efficiency, but at the same time exhibit less inclination towards basic energy-saving practices like unplugging devices or hanging the laundry.

Consumption in general Young adults are less inclined to buy locally produced goods and organic food, whereas they are more likely to eat meat. Income positively impacts consumption of organic and local goods, but also of meat. Women and highly educated individuals tend to eat less meat and more organic food. Women and parents tend to be more frugal and to buy more second-hand goods, whereas workers and people born in Luxembourg display a lower sufficiency index.

Donations for Carbon Offsetting High-income earners demonstrate a greater propensity to donate for carbon offsetting, as do elderly individuals. Conversely, low-income individuals, parents and young adults show a lower likelihood of making such donations, possibly due to financial constraints and a different valuation of money and time spent on the survey.

4.2   The role of sociodemographic factors

In this subsection, we summarise the results through a different angle, i.e. the role of each sociodemographic characteristics on all behaviours taken together. This highlights that no specific group can be said to consistently behave "more sustainably" than others, highlighting the complexity and diversity of sustainability practices among different population groups.

Age Older individuals demonstrate a greater tendency to avoid air travel, turn off lights, unplug electric appliances, and donate for carbon offsetting, indicating a heightened environmental consciousness or responsibility. However, they tend to live in houses with more heating and less energy efficiency than young people, are less likely to buy second-hand items, suggesting a preference for traditional practices over newer sustainable trends.

Income High-income individuals consume more animal proteins and make a more intensive use of electric devices. On the positive side, they are more likely to live in energy-efficiency dwellings, buy organic food, and demonstrate a greater propensity to donate for carbon offsetting.

Education Higher education is, all else equal, the only characteristic that is unambiguously associated with more sustainable behaviours in multiple domains. People with higher education are less likely to consume animal proteins and more likely to use public transport regularly, to buy organic food, to donate their winnings for carbon offsetting, and to unplug electric appliances.

Geographic Origin Perhaps surprisingly, people born in Luxembourg consume less animal proteins than people born abroad. However, they tend to maintain higher home temperatures, make less frequent use of sustainable mobility, buy less second-hand goods and have a lower propensity towards frugality.

Gender Women consume fewer animal proteins and tend to maintain higher home temperatures. They demonstrate a greater propensity to donate for carbon offsetting and are more likely to buy organic and second-hand products, and have more frugal attitudes in general.

Parenthood Parents maintain higher home temperatures and face time constraints that plausibly affect their mobility modes. They are also less willing to donate for carbon offsets, but are more likely to buy –possibly specific– second-hand goods.

Urban/Rural Residence People living in urban areas are less likely to engage in home renovations for energy efficiency and to buy local goods and organic food. On the other hand, they are more inclined to use public transport.

Employment Status Interestingly, people active on the labor market are less likely to donate for carbon offsets and have a lower propensity towards frugal consumption, suggesting that stress and time constraints may affect their attitudes towards sustainability.

This analysis reveals that sociodemographic characteristics shape sustainable behaviours through the influence of a mix of constraints and preferences. Less financially constrained individuals are more inclined to make costly sustainable investments, yet may also indulge in unsustainable practices due to their purchasing power. In contrast, low-income individuals lean towards economical but sustainable choices, balancing financial limitations with environmental considerations. Urban residents, benefiting from shorter travel distances and better access to public transport, show a preference for sustainable mobility options. However, they face greater challenges in home renovations and energy modifications. The elderly and women exhibit distinct sustainable preferences, possibly driven by comfort and health-oriented concerns. Last but not least, parental and employment statuses indicate time constraints impacting behaviours and attitudes towards sustainability.

This multifaceted picture emphasises that sustainable living is intertwined with personal circumstances and societal influences. Recognising these diverse factors is crucial for developing effective, inclusive sustainability strategies that cater to the varied needs and constraints of different demographic groups. This leads us to the next subsection, which deals with individuals' support for (hypothetical) policies aimed at improving sustainability.

4.3 Determinants of support toward sustainable policies

Figure 7 shows variations in the support for six hypothetical policies across sociodemgoraphic characteristics.

A car ban in populated areas would be more supported by high-income individuals, possibly reflecting a greater ability to adapt to such changes without personal inconvenience. Those employed are less supportive, likely due to the impact on their daily commute. The 5-Euro toll on Motorways would be more supported by individuals with higher education, suggesting an awareness of the environmental benefits of tolls. However, employed individuals are less supportive,

possibly due to the direct financial impact on their daily commutes. Strict regulations on red meat would be more supported by women, who also have a lower consumption of meat. Support for the increase in VAT on meat to 17% is notably higher among individuals with a higher education and high-income individuals. Quotas on Fossil Energy are more supported by individuals living in urban areas, possibly due to lower dependence on fossil fuels in urban settings. A 10% rental income tax for energy-inefficient dwellings would be less supported by people born in Luxembourg, who are on average more likely to be landlords.

Reading these results along population characteristics, the following patterns emerge. First, low-income individuals are more opposed to highway tolls, and though it is not significant, to a higher VAT on meat. For other policies, they are similar to individuals belonging to the median income group. On the other hand, high-income individuals would be more likely to support most policies, in particular for an increase in VAT on meat, but less so for the highway toll and the rental tax.

Individuals in employment tend to show less support for motorway tolls, likely due to their more frequent use of roads compared to active people. They tend to display lower support for other policies in general, though differences are not significant.

Those with higher education levels show higher support for the most unpopular policies (tolls on motorways and 17% VAT on meat), likely due to a greater awareness of environmental issues.

Women are similar to men in their support for all policies except one, i.e., regulations on meat, possibly due to their lower consumption.

Young adults show less support for motorway tolls yet exhibit greater backing for fossil energy rationing. This latter stance may stem from their residence in more energy-efficient homes and their higher reliance on public transport, although the latter is not significant.

Urban residents show more support for quotas on fossil energy and higher support for tolls on motorways (though not significant), in line with urban lifestyles that may be less reliant on cars and fossil fuels compared to rural areas.

Those born in Luxembourg show slightly higher support for an increase in the VAT on meat, but are generally less supportive of our hypothetical policies, in particular regarding a rental income tax for inefficient dwellings.

4.4 Conclusion of the role of sociodemographic factors on behaviour and policy support

Overall, these results reveal how the specific preferences and constraints of different demographic groups cohesively influence their sustainable behaviour and their attitudes toward sustainability policies. One of the most intriguing insights from this section is the nuanced influence of sociodemographic factors, aside from education, on sustainable behaviours. These characteristics indeed exhibit opposite effects across different behaviours and attitudes, indicating that no specific population segment consistently outperforms others in adopting sustainable practices. Financial status, lifestyle choices, awareness and practical considerations all play complex roles in shaping these dynamics.

While sociodemographic characteristics provide objective measures of time and financial constraints, they only imperfectly capture preferences and mental processes. The next section attempts to open the black box of what impacts people's thinking when faced with decisions related to sustainability.
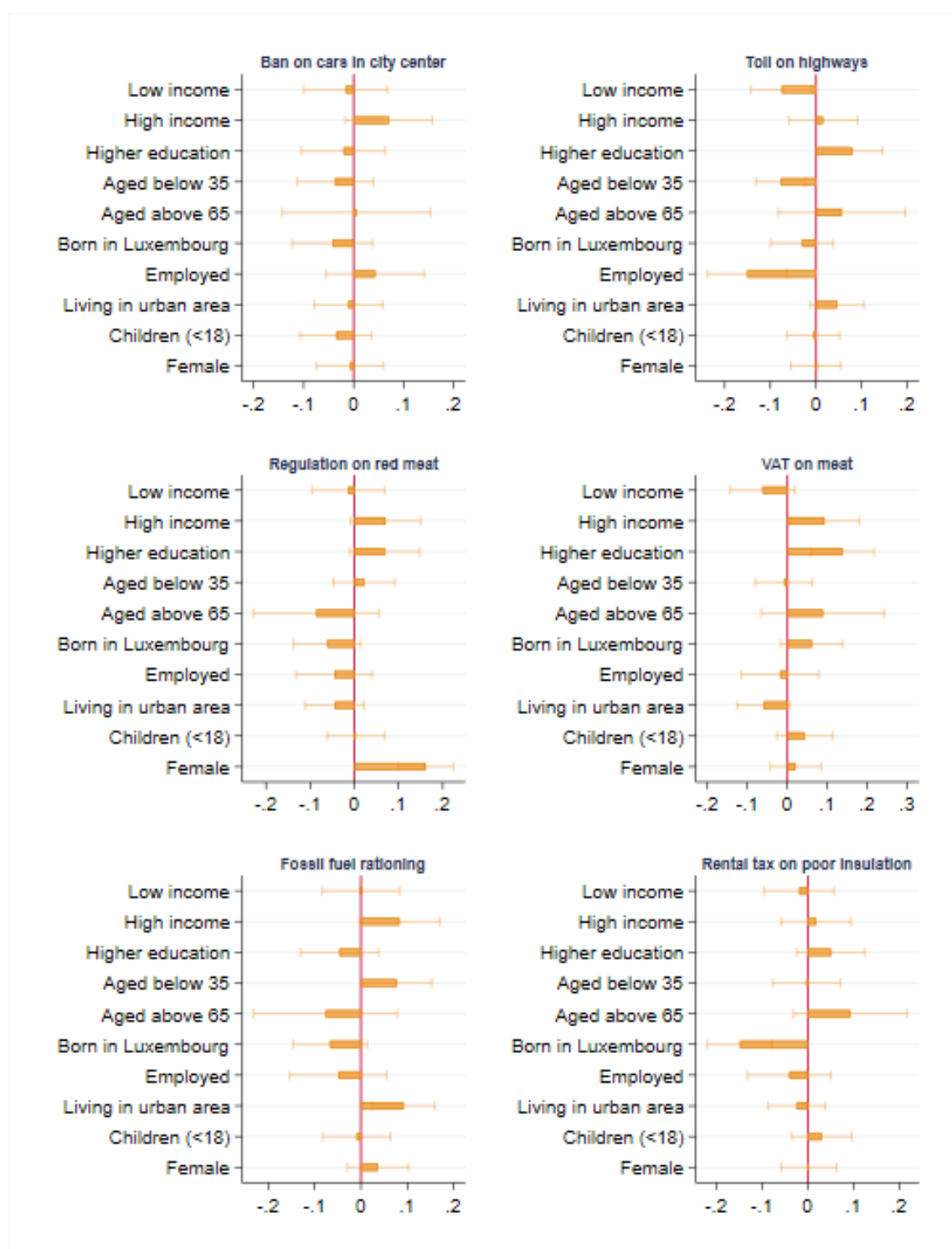
Figure 7. Impacts of sociodemographic characteristics on support for sustainable policies

5   Mental processes and sustainable behaviour

In this study, we were able to gather information on a rich and nuanced tapestry of personality traits and behavioural biases. This offers comprehensive and original insights to improve our understanding of what drives sustainable behaviour.

Personality traits and cognitive biases were mostly measured in Wave 3 on a total sample of 912 individuals. However, we excluded data from participants who completed the questionnaire in less than 20 minutes – a duration deemed too short for participants to be engaged carefully with this demanding questionnaire.[9] Therefore, we focus our analysis for this section on a subsample of 788 respondents to ensure the reliability of our findings.

The Section is structured as follows. We first describe the personality traits and cognitive biases identified by the literature as relevant to sustainability. We provide descriptive statistics of these traits in our sample and compare them with those of various reference studies. We then provide regression analyses of how these traits, in combination with the sociodemographic characteristics of Section 4, contribute to explaining sustainable behaviours. The end of Section 5 concludes and provides some policy recommendations.

5.1   Personality traits and cognitive biases

In this first Subsection, we describe and provide descriptive statistics on the list of personality traits and cognitive biases that we collected. This selection of traits and biases was based on the academic literature linking traits and sustainability in social sciences. The interested reader can find in Appendix C.2 a full explanation of the chosen personality traits and cognitive biases, along with what relationships past scientific literature has found concerning pro-environmental behaviour, and a detailed explanation of the score calculation. Table 4 lists all the traits and biases used in the regression analyses of Section 5.2, and provides the average scores, standard deviations and range of scale of all traits and biases in our sample.

We start the description of Table 4 with 7 personality traits. The first five, commonly known as the **Big Five**, are the most widely recognised and empirically supported framework for describing human personality. Also known as the Five Factor Model, the Big Five have been identified as important traits associated with a wide variety of behaviours and attitudes, including in the domain of sustainability.

- **Openness to Experience** features characteristics like imagination and insight. People high in this trait tend to have a broad range of interests and are open to new experiences and ideas. They are often creative, curious, and willing to explore new things.
- **Conscientiousness** reflects how organised and dependable a person is. High conscientiousness is characterised by a strong sense of duty, discipline, and responsibility. People with high conscientiousness are often meticulous, well-organised, and reliable.
- **Extraversion** is exemplified by excitability, sociability, talkativeness, assertiveness, and high amounts of emotional expressiveness. Extroverted individuals are often outgoing and thrive in social situations, enjoying interaction with others.
- **Agreeableness** includes attributes like trust, altruism, kindness, affection, and other prosocial behaviour. People who score high in agreeableness are typically cooperative, warm,

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[9]Though this selection criterion was less impactful, we also removed extreme values involved in the specific question pertaining to the measurement of the "Endowment Effect" (see below). These extreme values, which may be due to respondent misunderstanding or possibly lack of engagement, might otherwise have skewed results and affected the validity of the study.

Table 4. Descriptive statistics of personality traits

	Mean (Standard deviation)	Range of scale
Personality traits		
Openness	3.44 (0.89)	5 points
Conscientiousness	3.94 (0.76)	5 points
Extraversion	3.08 (0.96)	5 points
Agreeableness	3.46 (0.75)	5 points
Neuroticism	2.61 (0.88)	5 points
Assertiveness	3.74 (0.67)	5 points
Warmth	3.93 (0.73)	5 points
Cognition		
Rationality	2.10 (0.91)	3 points
Growth mindset	2.78 (0.86)	4 points
Risks and losses		
Risk propensity	5.12 (2.43)	10 points
Loss aversion	9.15 (8.21)	-
Endowment effect	-0.85 (36.38)	-
Time preferences		
Procrastination	1.77 (0.59)	3.5 points
Patience	6.94 (2.30)	10 points
Social preferences		
Self-consciousness	3.26 (0.80)	5 points
Empathy	3.62 (0.63)	5 points
Positive reciprocity	8.67 (1.59)	10 points
Negative reciprocity	4.53 (2.41)	10 points
Altruism	6.81 (2.56)	10 points

and considerate. They are often good at resolving conflicts and maintaining positive social relationships.

- **Neuroticism** is associated with emotional instability, anxiety, moodiness, irritability, and sadness. Individuals high in neuroticism may experience mood swings, stress, and often perceive ordinary situations as threatening.

The values of Openness (3.44), Extraversion (3.08), and Agreeableness (3.46) are aligned with values found by Rammstedt and John (2007), who analysed these traits in a large representative sample of the German adult population (respectively 3.41, 3.24 and 3.20). Relative to this study, our participants showed a slightly lower average in Conscientiousness (3.94 compared to 4.10), and the only domain in which the two studies significantly differ concerns Neuroticism (2.61 compared to 3.49 for Emotional Stability).

In addition to the Big Five, we added two personality traits due to their association with stereotypes of femininity and masculinity. This choice was motivated by the finding in the literature that masculine attitudes tend to correlate with less sustainable behaviour. We follow the methodology of Abele et al. (2016) to measure **warmth** (associated with femininity) and **assertiveness** (associated with masculinity). Both assertiveness (3.74) and warmth (3.93) display relatively high values in our sample.

The second block of traits in Table 4 pertains to **cognition**. We measured two traits related to cognition. First, **rationality in decision-making** refers to the ability to make choices that are logical, well-informed, and aimed at achieving the best possible outcome. It involves using reason and evidence to evaluate options and their potential consequences. The Cognitive Reflection

Test (CRT) is a psychological tool used to assess a person's tendency to override an impulsive, incorrect response and engage in reflective thought to arrive at a correct answer. It measures the capacity to engage in effortful cognitive processing, which is a key aspect of rational thinking. The CRT typically presents questions that have seemingly intuitive but incorrect answers, requiring deeper cognitive processing to solve correctly. In our dataset, the mean score was 2.10 correct answers, with over 40% of participants answering all three problems correctly. This performance is higher than Frederick (2005), which, across 3,428 participants from 35 separate studies, reported an average of 1.24 correct answers (with sample means ranging from 0.57 to 2.18), suggesting that our sample is composed of above-average individuals in terms of cognition.

Second, the notion of a "**growth mindset**" captures the belief that abilities and intelligence can be developed with effort and learning, rather than a fixed mindset, where abilities are seen as static and unchangeable. To assess growth mindset, we examine responses to the statement, "Your intelligence is something about you that you can't change very much." Disagreeing with this statement thus indicates a growth mindset. In our study, 62% of participants disagreed or strongly disagreed with this statement. This finding aligns closely with the OECD's results, where 65.4% of students participating in PISA demonstrated a similar perspective.

The third block of traits in Table 4 concerns **attitudes towards risks and losses**. Risk-taking behaviour, that is the **tendency to engage in risks** was captured on a scale between 0 and 10, where 0 represents complete risk aversion and 10 represents full risk-seeking behaviour. The average score in our study, 5.1, suggests a moderate tendency among participants to take risks.

Loss aversion, which generally – but not necessarily – also relates to uncertainty, suggests that people tend to prefer avoiding losses over acquiring equivalent gains. We quantified loss aversion using the approach of Gächter et al. (2022), which is based on choosing the terms of a bet. More specifically, participants were asked what maximal loss they were ready to suffer in a bet with a 50% chance of losing and 50% chance of winning a prize. The prize of the bet was to be granted 20 points, which impacted their likelihood of earning a bonus as part of their survey payment.[10] On average, participants were willing to risk losing 10.9 points against the opportunity of earning 20 points. Taking the difference between these two values implies an average loss aversion score of 9.1.

The **endowment effect** is a related psychological phenomenon where people ascribe higher value to things merely because they own them. Considering a specific item, the endowment effect is based on the comparison between the price a person is willing to pay to purchase an item (the willingness to pay, noted WTP) and the price this person requires to sell it when the item is owned (the willingness to accept, noted WTA). An individual is subject to the endowment effect if their WTA is higher than their WTP, whereas it would be rational for both values to be equal. To measure participants' sensitivity to the endowment effect, we described a fictitious scenario involving a special event in a cinema to participants. They were then sequentially asked about their WTP and WTA for a ticket to this special event. On average their WTP was 0.85 euros lower than their WTA, in line with the prediction of the endowment effect.

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[10] In our study, participants were awarded a number of points depending on the accuracy of their answers to questions about the elicitation of social norms (in the domain of sustainable behaviours and attitudes). Participants who correctly predicted other respondents' behaviours and attitudes were offered up to 10 points per question, and participants with the largest total of points were offered a monetary bonus. The outcome of this bet led participants to either increase their total by 20 points, or decrease it by the amount they would deem acceptable for taking the bet.

The fourth block of traits in Table 4 concerns **time preferences**. **Patience** concerns the way individuals value present benefits compared to future ones. In our sample, we obtained an average score of 6.94 on a scale from 0 (strong preference for immediate benefits) to 10 (strong preference for future benefits). This indicates a general inclination among participants towards considering long-term outcomes in their decision-making process.

Procrastination is the act of delaying or postponing tasks or decisions. It often involves avoiding specific, unpleasant or daunting tasks, by engaging in more pleasurable or easier activities. It can be separated into two different components: Procrastination ex-ante refers to the delay in task initiation, knowing beforehand that this delay will likely lead to negative outcomes. It's essentially procrastinating despite being aware of the potential adverse consequences; Procrastination ex-post, on the other hand, is recognising the negative impact of procrastination only after the fact. We asked participants to reflect on their usual process when filling out their tax forms, evaluating the likelihood of postponing the task and how often they failed to meet their intended deadlines. Merging these two scales, participants exhibited an average procrastination score of 1.77 out of 3.5.

The fifth and last block of Table 4 concerns **social preferences**, which include altruism, positive and negative reciprocity, as well as self-consciousness.

Self-consciousness is a psychological concept that measures one's awareness of oneself, encompassing three elements: Private Self-Consciousness, which pertains to attention to personal inner thoughts and emotions; Public Self-Consciousness, which deals with concerns about how others perceive one; and Social Anxiety, defined as the fear of being negatively judged in social settings. Using a 1 to 5 Likert scale, we follow the approach of Scheier and Carver (1985) who introduced the Self-Consciousness Scale. Our average scores of Private Self-Consciousness (3.44), Public Self-Consciousness (3.31) and Social Anxiety (3.04) are somewhat higher than values found in Scheier and Carver.[11] By aggregating the values of these three subscales, we created a composite Self-Consciousness index.

Empathy is the ability to understand and share the feelings of another person. It involves recognising and appreciating the emotions of others, often leading to a sense of shared experience or emotional connection. It is divided into two components: Empathic Concern, which assesses emotional empathy, or feelings of compassion for others in distress, and Perspective Taking, which assesses cognitive empathy, or the tendency to see the world from others' viewpoints. The Interpersonal Reactivity Index (Davis, 1980) is based on these two subscales. The average empathy score displayed in Table 4 is slightly below the literature average.

Positive reciprocity is the inclination to respond favourably to others' positive actions, like returning kindness or cooperation, having a high average score of 8.67 (out of 10). This indicates a strong tendency among participants to respond positively to favourable actions by others.

Conversely, **negative reciprocity**, i.e. the tendency to retaliate against others' negative actions, like responding to hostility with hostility, averaged 4.5 (out of 10).

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[11] Differences in average scores between our study and Scheier and Carver (1985) range between 0.1 for Public Self-Consciousness to 0.57 for Private Self-Consciousness). These differences are likely due to time and cultural differences between the two samples.

Last but not least, **altruism** is a key driver for selfless environmental actions. In our sample, the average score of altruism is 6.8 (out of 10), suggesting a significant inclination towards altruistic behaviour among participants.

5.2 The impacts of personality traits and cognitive biases on sustainable behaviours

We analyse here the impacts of personality traits and cognitive biases on the sustainable behaviours and attitudes described in Section 3. More specifically, we follow the same regression-based approach of Section 4. While this previous section only included standard sociodemographic characteristics, this section enriches the list list of explanatory variables by adding the personality traits and behavioural biases described in Section 5.1. Note that, in addition to these multivariate regressions, the interested reader will find one-to-one correlation measures between traits and behaviours in Appendix C.[12]

5.2.1 How sustainable behaviours and attitudes are impacted by traits

We begin by examining how each outcome variable is impacted by traits and biases. Later on, we will instead describe the role of each trait on the entire list of outcomes studied. It is important to note that, while the following figures are based on regressions that include all explanatory variables (i.e., sociodemographic characteristics as well as traits and biases), for brevity the figures presented here do not include the effects of sociodemographic characteristics.[13] In the text, we exclusively focus on discussing the traits and biases that demonstrate a statistically significant impact at the 10% level.

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[12] The core of this Section is focused on multivariate regression results, since unlike one-to-one correlations, regressions inform about "ceteris paribus" effects treating all other observable factors constant. One possible concern of multivariate regressions, though, is that as the number of explanatory variables increases, the correlations between these explanatory variables could increase and harm our results' significance. We present in Table D-12 of Appendix C the Variance Inflation Factors (VIF) of our explanatory variables, showing that multicollinearity is not an issue.

[13] The full list of coefficient estimates is provided in Tables of Appendix C.
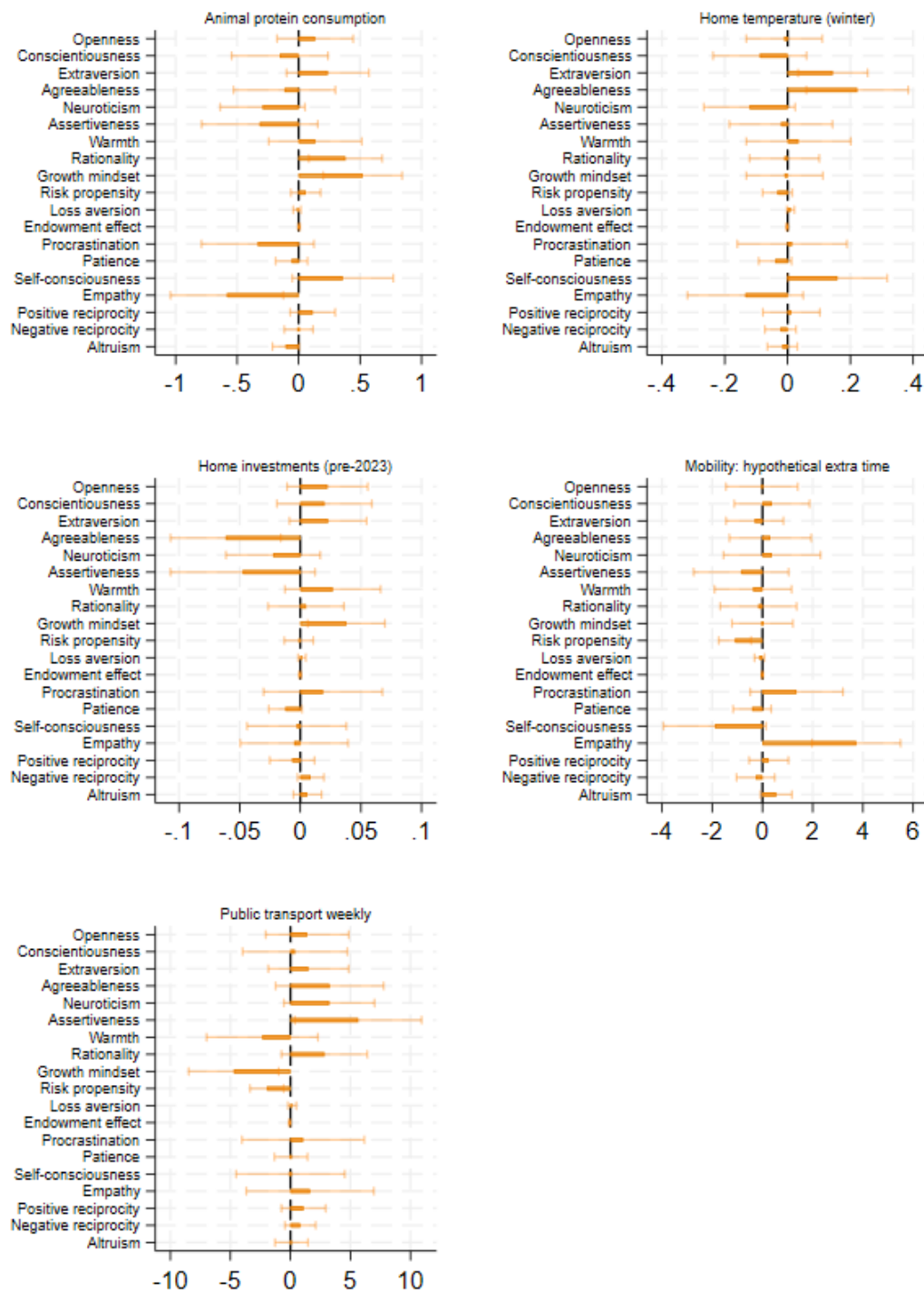
Figure 8. Impacts of personality traits on main behaviors

Figure 8 displays the impacts of traits and biases on the principal behaviors investigated in our study. The consumption of animal proteins shows a strong negative association with Empathy and a strong positive association with Growth Mindset, alongside a moderate positive association with Rationality. Higher levels of home heating are observed among individuals with higher Agreeable-

ness, exhibiting a strong magnitude of effect, as well as with Extraversion and Self-consciousness, both showing a moderate magnitude of effect. Housing renovation decisions, on the other hand, are strongly negatively influenced by Agreeableness, whereas having a Growth Mindset has a (close to significant) positive effect. The willingness to accept extra time to replace the car with soft mobility modes is very strongly positively influenced by Empathy, while it experiences a small negative effect from the propensity towards risk, and a sizeable negative (though not statistically significant) effect from Self-consciousness. The frequency of public transport usage suffers a moderate negative impact from Growth Mindset, a small negative impact from Risk propensity, and a very small negative impact from the Endowment Effect. On the other hand, frequent use of public transport is strongly boosted by Assertiveness.
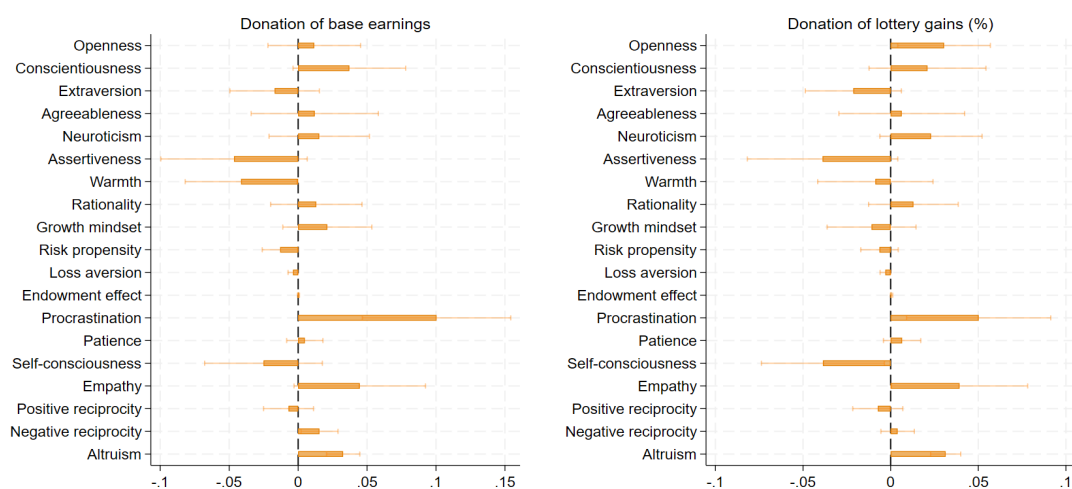
Figure 9. Impacts of personality traits on donations

Figure 9 illustrates the impacts of traits on donation decisions. The likelihood of donating one's payment is positively influenced by several traits. Altruism has a moderate effect on increasing this likelihood, while Negative Reciprocity contributes to it, albeit with a smaller effect. Procrastination stands out with a very strong effect in the same direction. On the other hand, Warmth and Loss aversion tend to decrease the likelihood of donation, with Warmth having a moderate effect and Loss aversion showing a very small effect. Although Conscientiousness shows a positive influence and Assertiveness a negative one, neither relationship is statistically significant.

Regarding the proportion of lottery gains that individuals are willing to donate in the event of winning the lottery, several traits predict this behavior. Openness and Procrastination both positively predict this willingness, with Openness having a moderate effect and Procrastination a strong one. Similarly, Empathy and Altruism are also positive predictors, each with a moderate effect. In contrast, Self-consciousness is associated with a negative impact, also of moderate magnitude. While Assertiveness appears to have a negative impact, this relationship is not statistically significant.
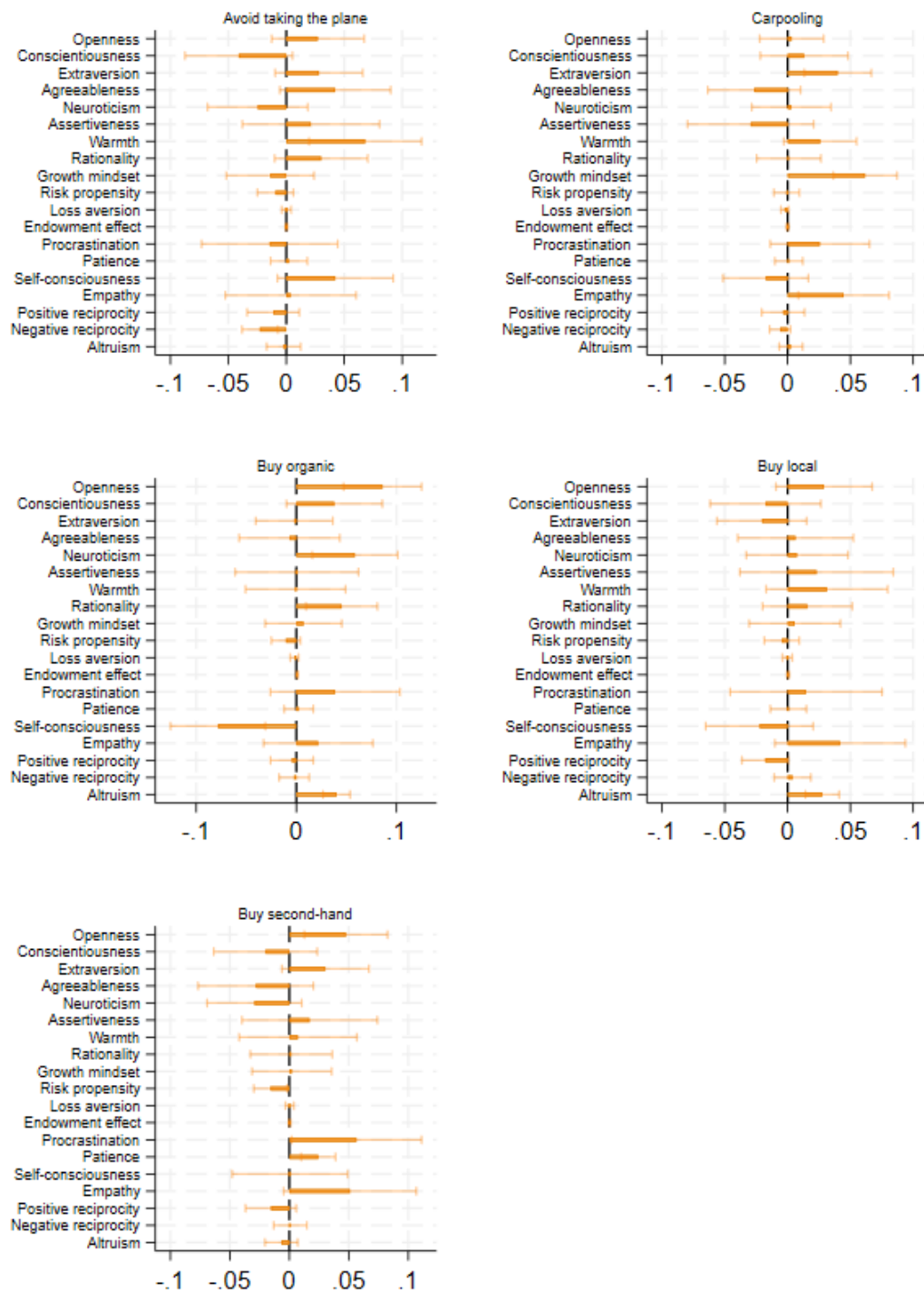
Figure 10. Impacts of personality traits on main sustainable habits

Figure 10 illustrates the impacts of various traits on five main sustainable habits.

Avoiding taking the plane is significantly influenced by Warmth, which has a very strong positive effect. Negative reciprocity, on the other hand, has a small negative impact on this habit. Addition-

ally, Agreeableness and Self-consciousness are positively associated with avoiding flying, while Conscientiousness has a negative association, but these relationships are not statistically significant.

Carpooling is positively influenced by several traits. Empathy and Extraversion both contribute positively with moderate effects. The most significant influence on carpooling comes from a Growth Mindset, which has a very strong positive effect.

The tendency to buy organic products is shaped by a mix of traits. The Endowment Effect has a very small positive influence, while Altruism and Neuroticism each have moderate positive effects. Openness contributes positively with a strong effect, and Rationality also has a moderate positive impact. In contrast, Self-Consciousness negatively affects this habit with a strong effect.

When it comes to buying local products, Altruism is the only trait positively associated with a moderate effect. Empathy also appears to have a higher magnitude of effect, but this relationship is not statistically significant.

Finally, the purchase of second-hand items is positively influenced by Openness, Procrastination, and Patience, each exhibiting a strong effect. Conversely, Risk propensity negatively influences this habit with a moderate effect. Similar to the previous cases, Empathy shows a high magnitude of effect but lacks statistical significance.
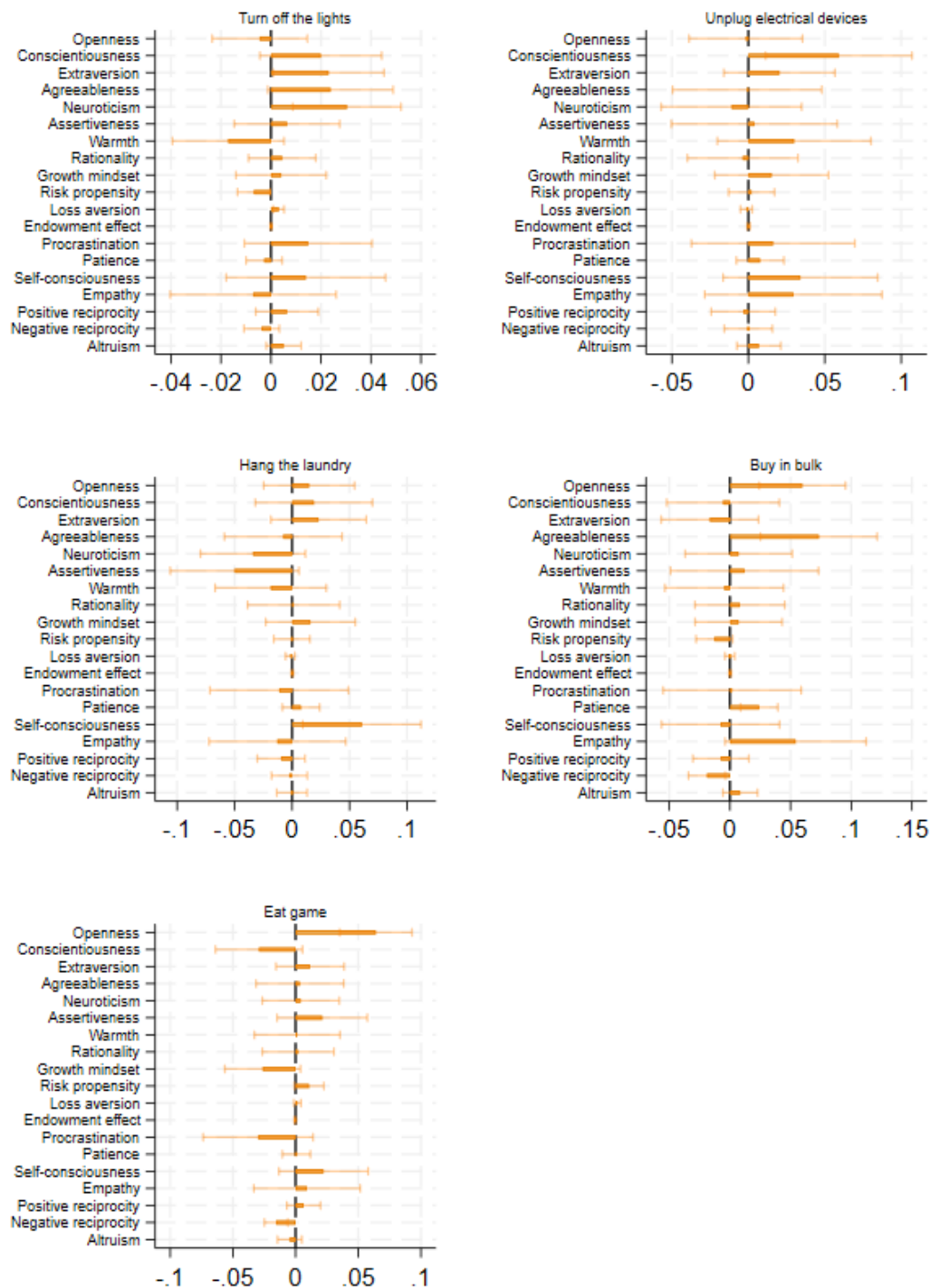
Figure 11. Impacts of personality traits on other sustainable habits

Figure 11 illustrates the impacts of traits on five other sustainable habits, focusing on electricity use and specific consumption patterns.

Turning off the lights is a habit that varies with certain personality traits. Individuals with high

scores in Extraversion tend to turn off lights more often, showing a moderate effect. Neuroticism also plays a significant role, with a strong effect in the same direction. Loss aversion has a smaller, yet positive effect on this habit. However, those high in Risk propensity are less likely to turn off lights, also with a small effect. Agreeableness and Conscientiousness exhibit strong magnitudes of effect, but their relationships with this habit are not statistically significant.

In the case of unplugging electrical devices, Conscientiousness stands out as the only significant trait with a very strong positive effect.

The practice of hanging laundry is heavily influenced by Self-Consciousness, which has a very strong positive effect. This indicates a higher preference for this eco-friendly method among more self-conscious individuals.

Buying in bulk is positively influenced by a few traits. Agreeableness has a very strong positive effect, Openness shows a strong positive effect, and Patience contributes with a moderate positive effect. Negative Reciprocity, in contrast, is associated negatively with this habit. Empathy, while showing a substantial magnitude of effect, is not found to be statistically significant.

Lastly, the preference for eating game is positively associated with Openness, which has a very strong effect in encouraging this sustainable habit.
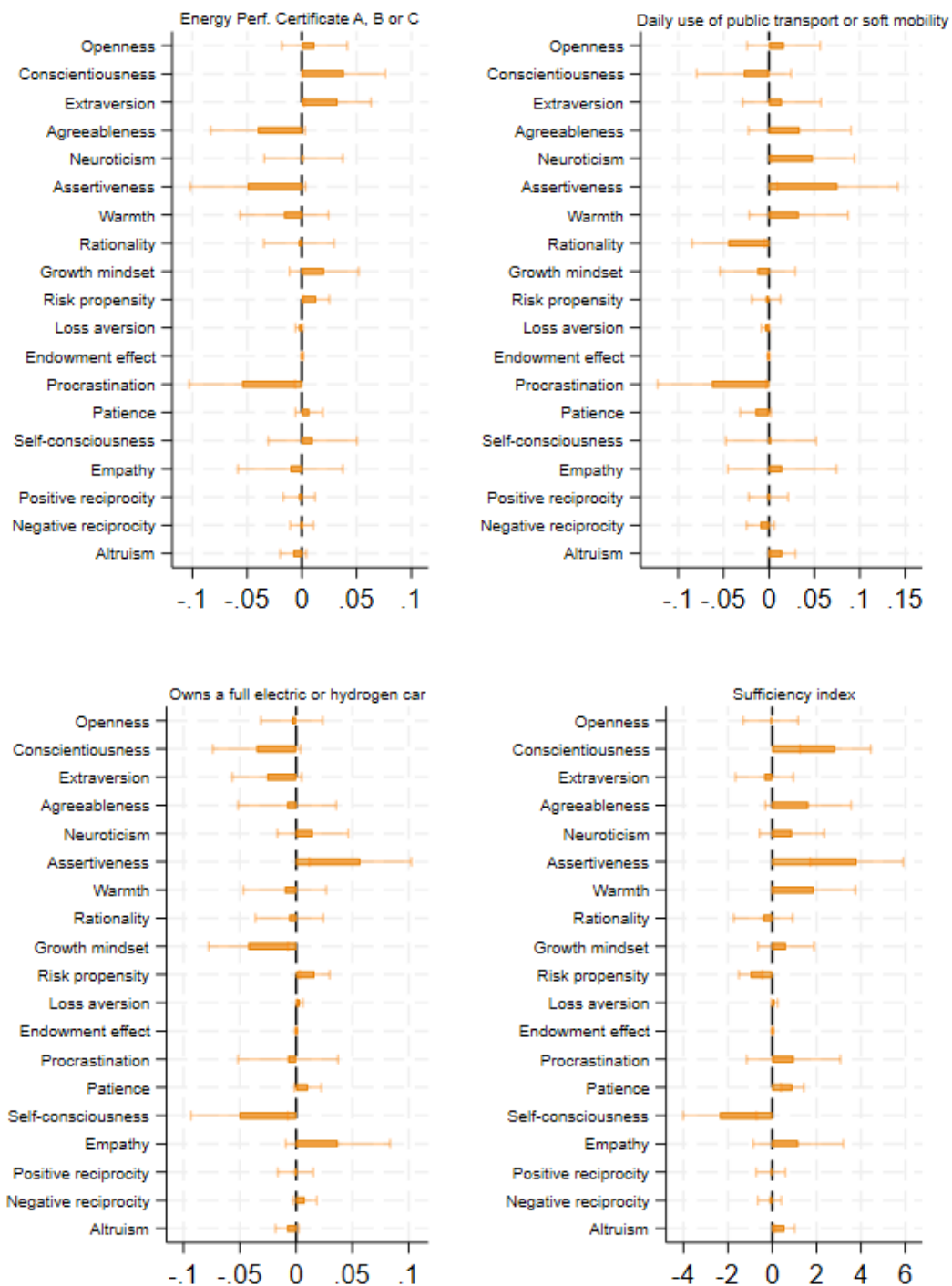
Figure 12. Impacts of personality traits on other outcomes

Figure 12 presents the influence of various traits on different lifestyle choices related to energy efficiency and mobility.

The likelihood of living in a dwelling with high energetic performance is influenced by sev-

eral traits. Individuals high in Extraversion and Conscientiousness are more likely to live in such dwellings, with Conscientiousness showing a moderate effect. Risk propensity also plays a role, albeit with a smaller effect. In contrast, those high in Procrastination are less likely to live in energy-efficient homes, with a strong negative effect. Assertiveness also shows a noticeable negative effect, but this is not statistically significant.

The daily use of public transport or soft mobility is shaped by a mix of positive and negative influences. Procrastination and Rationality have negative impacts, with Procrastination showing a strong effect and Rationality a moderate one. Conversely, Neuroticism, Assertiveness, and Altruism positively influence this behaviour. Neuroticism has a moderate effect, while Assertiveness shows a very strong effect, and Altruism contributes a small effect.

Owning an electric car is less common among individuals with a Growth Mindset, which has a moderate negative effect, and those high in Self-Consciousness, showing a strong negative effect. However, those who are loss-averse, have risk-seeking propensity, or are assertive are more inclined to own such vehicles. Loss aversion has a very small effect, risk-seeking a small effect, and Assertiveness a very strong effect in promoting this behaviour.

Finally, frugal consumption, as measured by our sufficiency index, is positively influenced by Conscientiousness, Assertiveness, Altruism, and Patience. Conscientiousness and Assertiveness have strong effects, while Patience contributes a moderate effect, and Altruism adds a small positive effect. On the other hand, Self-consciousness and Risk propensity are negatively associated with frugal consumption showing strong and moderate effects, respectively.

5.2.2 Policy support

The analysis of how support for sustainable policies is influenced by personality traits and behavioural biases reveals distinct patterns across different policy areas.

In the realm of mobility policies, the support for banning cars in populated areas varies based on specific traits. People showing Altruism and Negative Reciprocity are more likely to support this policy, both traits having a moderate effect. Procrastination also plays a role, though its effect is not statistically significant. However, individuals with high Extraversion, which has a strong effect, and Patience, with a moderate effect, are less likely to support this policy. Regarding tolls on highways, the only positive predictor is Warmth, with a strong effect.

When considering policies related to animal proteins, there is a commonality in the influencing traits. Regulations on red meat find more support among individuals characterised by Altruism, Growth Mindset, and Procrastination, with moderate, very strong, and strong effects respectively. On the other hand, an increase in VAT on meat to 17% tends to face opposition from those high in Self-consciousness and Extraversion, both exhibiting moderate effects.

Home energy policies show a different set of influencing factors. Support for quotas on fossil energy is positively correlated with Openness, Warmth, and Altruism, each showing moderate to strong effects. Conversely, Extraversion, with a very strong effect, negatively impacts support for this policy. Procrastination again shows a moderate-to-strong effect, but its influence is not statistically significant.

Lastly, the policy of rental income tax on energy-inefficient dwellings garners more support from individuals with traits of Altruism, Procrastination, and Self-consciousness, with moderate, very strong, and strong effects, respectively. In contrast, Neuroticism, with a strong effect, tends to reduce support for this policy.
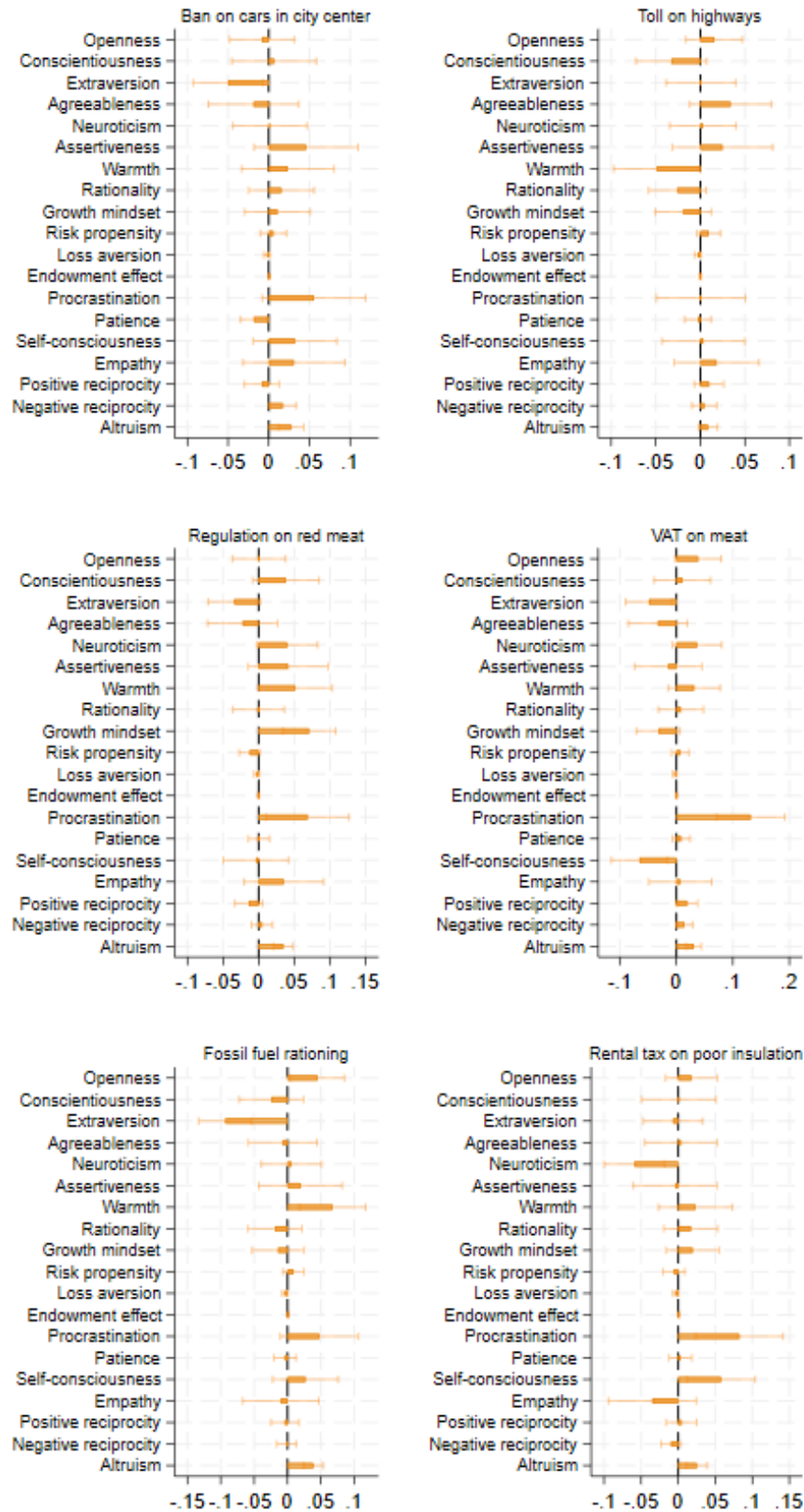
Figure 13. Impacts of personality traits on support for sustainable policies

5.2.3 The impacts of each trait on behaviours and attitudes towards sustainability: summary

Let us start by listing the traits that are the **main drivers of sustainable behaviours and attitudes**. Interestingly, a coherent pattern emerges among two blocks of three personality traits. First, **altruism** stands out as the most important trait in favour of sustainability, being identified as a critical predictor on eleven occasions. It not only encourages donation behaviours but also aligns with habits conducive to sustainability. This includes a preference for products that are organic and produced locally, consistent use of public transportation or alternative mobility solutions, and a frugal approach to consumption. Altruism also displays robust support for five out of six assessed policies, highway tolls being the only exception.

Empathy is associated with reduced meat consumption and encourages accepting additional time for transitioning to softer mobility options, donating lottery winnings, and carpooling.

Warmth, linked to stereotypes of femininity, is correlated with avoiding air travel, more frequently turning off lights, and supporting highway tolls.[14]

Prosocial orientations, which involve altruism, empathy and warmth, therefore appear to play an important role in sustainable practices. The other three traits reveal another interesting pattern.

Conscientiousness enhances device-unplugging practices, frugal consumption, home energy efficiency.

Openness to experience boosts the likelihood of making donations and engaging in carpooling, purchasing organic and second-hand goods, and fosters support for fossil energy quotas.

Growth Mindset favours reducing animal protein consumption, improving home energy efficiency, supporting meat regulation policies, and substantially fostering carpooling at the expense of public transport and personal electric cars.

This second block of traits (conscientiousness, openness and growth mindset) therefore highlights the importance of adaptability and self-development in pro-environmental practices.

Ambiguous effects were found for six traits. First, Procrastination impedes the adoption of energy-efficient housing and sustainable transportation, aligning with the tendency to postpone immediate costly actions. However, this trait fosters donations for carbon offsets and support for various environmental policies. This positive influence might stem from procrastination's specific time discounting: donations and policy implementation occur in the future and/or hypothetically, which might align better with the procrastinator's higher tolerance for costs that are deferred.

Extraversion facilitates carpooling and switching off lights but leads to higher preferences for indoor heating, reduced interest in energy-efficient home improvements, and less support for restrictions on fossil energy and higher meat taxes.

Assertiveness, often associated with masculinity, supports housing energy performance, daily public transport use, and overall sufficiency index, even though it has large –but not significant– negative effects on meat consumption, donations and air-drying.

Risk propensity correlates with a higher likelihood of adopting electric vehicles and frugal consumption patterns, and living in an energy-efficient dwelling. However, this inclination typically coincides with a lesser commitment to sustainable practices such as using public transport, purchasing second-hand items, and conserving energy.

Neuroticism promotes sustainable practices like turning off lights, buying organic, and regular use of public transport, but it negatively correlates with support for taxing rental income from

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[14]Though this is marginally significant, warmth appears however to discourage carbon offset contributions

energy-inefficient housing.

The last trait having mixed effects is Self-consciousness: it is positively associated with air-drying laundry, but negatively impacts the donation of lottery earnings, electric car ownership, and leading a lifestyle of sufficiency. Its mixed effects extend to policy support, negatively correlating with higher meat taxes but positively with a tax on rental income from inefficient properties.

Finally, some traits impact behaviours less frequently or with a very low magnitude. For instance, Negative Reciprocity has significant effects in five domains, but these effects are always minor in comparison to other traits.[15]

Agreeableness, paradoxically, hinders the adoption of energy-efficient housing while encouraging bulk purchasing.

Loss Aversion decreases the likelihood of donations but motivates the choice of electric vehicles and turning off lights. The Endowment Effect, in contrast, supports organic purchases but discourages frequent public transport use. Rationality is associated with higher consumption of animal proteins and lower public transport usage, yet it positively correlates with organic purchasing. Positive Reciprocity exclusively boosts support for increased meat VAT. Finally, patience increases the propensity to purchase second-hand and in bulk.

5.3   Policy recommendations and conclusion

Our study's comprehensive examination of a wide array of traits in relation to sustainable behaviours and attitudes underscores the intricacy of human dispositions toward sustainability. Prosocial orientations (captured by traits of altruism, empathy, and warmth) and adaptability (captured by openness, growth mindset, and conscientiousness) stand out as significant predictors of sustainable behaviours. Still, a significant number of traits demonstrate mixed effects. Indeed, in line with the findings of Section 4, this complexity echoes the ambiguous effects of sociodemographic characteristics. This finding is one of the key contributions of this study, and it could only be achieved thanks to the wide scope of behaviours and attitudes that were covered.

This nuanced understanding emphasises the need to carefully design policies to promote sustainability. Our recommendations, which mostly concern public communication strategies and educational policies, highlight the importance of taking this heterogeneity into account.

First, public communications should emphasise the societal and environmental benefits of sustainable actions, particularly highlighting altruism, openness, and empathy. These messages should adopt a supportive and motivating tone, avoiding negativity. Second, in addition to these prosocial values, educational policies should focus on nurturing adaptability and curiosity, as illustrated by the importance of openness, growth mindset, and conscientiousness.

Finally, many other traits have mixed effects, and communication triggering reactions related to these traits ought to be careful and anticipate their possible backfiring effects, in particular in the domains of risk aversion and self-consciousness.

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[15]Negative Reciprocity positively predicts charitable giving and consumption of game meat, but negatively influences sustainable behaviours such as avoiding air travel and bulk purchasing.

6 Norms, behaviours and information experiment results

Norms are an essential determinant of social behaviour. Past research has shown that social and personal norms play a key role in consumer decision-making (see Melnyk et al., 2010, for a meta-analysis of 200 studies) and, specifically, in sustainable consumption behaviour (see Cialdini and Jacobson, 2021; Saracevic and Schlegelmilch, 2021, for recent reviews on the topic). In this section, we examine the interplay between norms and sustainable choices and attitudes in our study.

We first discuss the use of norms as an intervention to promote sustainable behaviour and outline the three types of norms commonly studied in the literature. We then examine the relationship between behaviour, attitudes, and norms identified in Wave 1. We describe the treatment interventions introduced in Wave 2, based on our prior analysis, and report their effect on the subsequent attitudes and self-reported behaviour measured in Wave 2 and Wave 3.

6.1 Norms and sustainable behaviour

Despite being commonly included in theoretical arguments, the empirical measurement of norms was scarce until relatively recently (Krupka and Weber, 2013). In sustainability research, incentivised elicitation of norms remains scant. However, this technique has proven to be especially useful in establishing the connection between norms and environmental behaviour (e.g. Andre et al., 2021a; Banerjee et al., 2021; Vesely and Klöckner, 2018). Vesely and Klöckner (2018) use the Krupka-Weber Protocol (Krupka and Weber, 2013) to show that the more socially appropriate an eco-friendly behaviour is perceived to be, the more likely it is to be chosen by individuals.

There are three kinds of norms commonly elicited in behavioural studies (for a recent review, see Nosenzo and Görges, 2020) and included in Bicchieri's theory of social norms (Bicchieri, 2005, 2016). These are: injunctive norms, descriptive norms and personal norms. According to Bicchieri, the three of them matter for norm compliance. We describe them below.

6.1.1 Injunctive norms

Injunctive norms, prescriptive norms or normative beliefs (from hereon used interchangeably) correspond to those norms that arise from second-order beliefs regarding what is appropriate or inappropriate behaviour. In order words, they are beliefs about what others think one ought to do.

There is evidence that normative beliefs drive intentions to purchase sustainable clothing (Carfora et al., 2021) and predict recycling behaviour (Andersson and Von Borgstede, 2010) and energy conservation efforts (Jachimowicz et al., 2018).

6.1.2 Descriptive norms

Descriptive norms or empirical beliefs (from hereon used interchangeably) are beliefs about how common a behaviour is. In other words, they are beliefs about what others actually do (Bicchieri and Xiao, 2009).

Descriptive norms have been found to predict water conservation attitudes and intentions (Maria Knight Lapinski and Lee, 2007). Additionally, clean environments that convey a descriptive norm of anti-littering result in less littering afterwards (Bergquist et al., 2021; Cialdini and Jacobson, 2021; Cialdini et al., 1990).

6.1.3 Personal norms

Finally, personal norms are the individual's own opinions of what ought to be done (Bicchieri et al., 2022).

Personal norms also strongly predict the intention to purchase sustainable clothing (Carfora et al., 2021) and recycling behaviour (Andersson and Von Borgstede, 2010), and are positively associated to investing in higher energy efficiency houses (Fischbacher et al., 2021).

6.1.4 Norm elicitation methods

A common (injunctive) norm elicitation method is the Krupka-Weber Protocol (Krupka and Weber, 2013), where participants play in an incentivised coordination game where they must rate the social appropriateness of a range of actions according to what they believe the majority would think. They may gain additional monetary compensation if they are accurate.

Another popular method used in the literature to elicit all three norms at once is the procedure used by Bicchieri and Chavez (2010) and Bicchieri et al. (2022). A first group of participants answers what they personally consider is appropriate behaviour in a given situation or reveals their actual behaviour. Then, a second group of participants either guesses the most frequent response to the personal belief question given by the first group (injunctive norms) or their most frequent behaviour (descriptive norms), both in an incentivised manner.

In the SOC2050 study, we used a mixture of both methods: participants needed to guess the most common response given by other survey participants regarding their personal behaviour and opinions, and they were rewarded for providing accurate guesses.

6.2 Norm nudges

Norm-nudging interventions (exposing participants to information about injunctive norms, descriptive norms and/or personal norms) have proven to be successful for decreasing energy consumption (Schultz et al., 2008; Nolan et al., 2008; Allcott, 2011), increasing recycling behaviour (Schultz, 1999), decreasing household water use (Ferraro et al., 2011), decreasing use of plastic bags (De Groot et al., 2013), augmenting towel reuse in hotels (Goldstein et al., 2007; Reese et al., 2014), decreasing use of private transportation (Kormos et al., 2015), and financially supporting renewable energy (Vesely and Klöckner, 2018), among others.

However, nudging participants with norms about environmental behaviour doesn't always work as intended, and sometimes it can even backfire (e.g. Griesoph et al., 2021; Richter et al., 2018; Gravert and Collentine, 2021). This is commonly known as the "boomerang effect".

Generally, there is evidence that messages emphasising both injunctive and descriptive norms are more effective than exposing participants to these norms separately (Hallsworth et al., 2017; Schultz et al., 2008).

In a study about household energy conservation, information about the descriptive norm made high-consuming households reduce their consumption to get closer to the average, however, they also made low-consuming households increase their consumption for the same reason (boomerang effect). In the injunctive + descriptive norm treatment, the negative effect disappeared (Schultz et al., 2008).

Eliciting these types of norms and understanding their differential (and synergistic) impact on consumer beliefs and choices is important to design a comprehensive policy intervention. At the

same time, a correct diagnosis of the prevalent norms is also essential: for instance, it only makes sense to rely on a descriptive treatment if descriptive norms are aligned with injunctive norms; that is, if people generally behave well (Cialdini and Cliffe, 2013). When people mostly behave in an undesirable way, an injunctive-only treatment makes more sense (Benabou and Tirole, 2011).

6.3 Pluralistic ignorance

6.3.1 Evidence from the literature

A very specific case of misperception of norms called "pluralistic ignorance" has been documented in the environmental behaviour literature (Geiger and Swim, 2016; Sparkman et al., 2022), and it is a significant predictor of people's hesitance to change.

Pluralistic ignorance refers to a situation in which second-order beliefs do not correspond to the majority of first-order beliefs in a given group. In other words, it arises when there is a shared and systematic misperception of public opinion and behaviors.

Misperceptions about the majority's opinions make those concerned about climate change silence themselves and not discuss climate change with others (Geiger and Swim, 2016). Similarly, both supporters and detractors underestimated the public support for offshore wind energy in the US (Sokoloski et al., 2018), and people overestimated the proportion of climate change deniers in the Australian population (Leviston et al., 2013).

More recently, a large-scale study in the US revealed a significant misperception in policy support: 80–90% of Americans underestimated the prevalence of support for major climate change mitigation policies and climate concerns. While 66–80% Americans supported these policies, they estimated the prevalence to be between 37–43%.

Andre et al. (2021b) provided evidence that correcting these misperceptions can significantly increase climate mitigation efforts. Replicating previous results, they found in a first-wave survey that participants greatly underestimated the prevalence of both descriptive and injunctive norms in regards to fighting climate change. Providing the correct information about norms in a subsequent experiment increased participants' donations to a charitable organisation fighting against global warming.

These findings make us conclude that if there is a misalignment in people's sustainable norm beliefs in Luxembourg, correcting these misperceptions could be a promising intervention to influence behaviour.

6.3.2 Pluralistic ignorance and information treatments in SOC2050

We base our analyses on the sample that fully participated in all three Waves (N = 912), consistent with the approach used in earlier sections.

In the next two subsections, we provide evidence of widespread pluralistic ignorance across various behaviours and normative judgments (descriptive and injunctive norms), and policy support.[16] This information is communicated in Wave 2 to two randomly assigned groups of individuals. We then test whether our information treatments, which correct the misperceptions identified in the first wave, can modify intentions, actual behaviour and policy support. Specifically, participants were randomly allocated to either the NORMS treatment (n = 304), the POLICY treatment (n = 303), or the Control group (no treatment, n = 305).

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[16]Shapiro-Wilk tests for normality indicated that none of the variables discussed in the subsequent subsections were normally distributed (p < .001 for all). Hence, we used non-parametric tests for our comparative analyses.

6.4 The NORMS treatment

In Section 3.1, we described the average behaviours in the three key domains of the study. In this Subsection, we briefly remind these statistics and present participants' perceptions of others' behaviours and normative judgments. This information constitutes the NORMS treatment. Since pluralistic ignorance is widespread in these domains, the NORMS treatment provides a clear correction of excessively negative perceptions made by a majority of participants.

Table 5. Pluralistic ignorance: behaviours and norms

	Own's answer (mean)	Expected modal answer (mean)
Animal proteins	6.3	8.2
Animal proteins: personal norm	4.5	5.2
Home temperature	20.1	20.9
Home temperature with high insulation: personal norm	20.1	20.5
Home temperature with low insulation: personal norm	20.4	20.7
Mobility time	15.8	13.5
Mobility time: personal norm	26.9	24.5

Wilcoxon signed-rank test: all p<0.05

6.4.1 Animal protein consumption

Respondents reported consuming, on average, 6.3 meals with animal proteins (meat, fish, or seafood) per week. However, when asked about the most common response they believed other survey participants would give to the same question (descriptive norm), the average estimate was 8.2 meals per week. A Wilcoxon signed-rank test confirmed that this overestimation is statistically significant (p < .001). This indicates a discrepancy between the actual behaviour of participants and what they perceive as the descriptive norm: they overestimate others' consumption of animal proteins.

Furthermore, after informing respondents about the high energy costs associated with producing meat, fish, and seafood, we asked about the number of meals containing animal proteins that they deemed ethically appropriate to consume per week (personal norm). The mean response was 4.5 meals. When asked to guess the most common answer given to the earlier question (injunctive norm), the average estimate was 5.2 meals. This overestimation was again significant (p < .001), suggesting that participants' perceptions of the social approval for meat consumption frequency are not aligned with reality.

6.4.2 Housing and related energy consumption

Respondents heated their homes to an average temperature of $20.1°$ when there were less than $10°$ outside. They also believed that other respondents would heat their homes slightly more ($20.9°$, p < .001). In view of adopting a more sustainable lifestyle, respondents defined their personal norm (what is ethically appropriate to do) at a home temperature of $20.4°$ for low-insulated homes and of $20.1°$ for high-insulated homes. However, again, they overestimated other respondents' answers ($20.7°$ for low-insulated homes and of $20.5°$ for high-insulated homes, p < .001).

6.4.3 Mobility and car use

In the hypothetical mobility question in which respondents stated how much time they would be ready to sacrifice to forgo car usage over a regular 30-minute trip, the acceptable extra time given on average by respondents was 16 minutes. When asked about their perception of others' willingness to sacrifice time for sustainable transport, they predicted that the most common response would be 14 minutes. This difference is significant ($p < .05$).

To elicit their normative judgement of what is a socially responsible mobility behaviour, we asked respondents to consider which was the ethically appropriate extra time to sacrifice in view of adopting a more sustainable lifestyle. Whereas the mean response was 27 minutes, respondents guessed that the most common response would be 25 minutes ($p < .001$).

6.5 The POLICY treatment

As described in Section 3.2, we asked respondents whether they would support 6 hypothetical policies: a regulation and a tax on the 3 domains (meat, home energy consumption and mobility). When it comes to assessing others' policy support, pluralistic ignorance also prevails. Interestingly, these excessive negative perceptions are generally shared by both supporters and detractors of a policy. We revealed the actual support level found in Wave 1 to participants in the POLICY treatment to correct this misperception.

Table 6. Pluralistic ignorance: policy support

	Supporters (%)	Expectation (%)
Regulation on red meat	64	36
VAT on meat	37	25
Fossil fuel rationing	52	36
Rental tax on poor insulation	65	45
Ban on cars in city center	50	34
Toll on highways	23	20

Wilcoxon signed-rank test: all p<0.001

6.5.1 Animal protein consumption

For instance, regarding the meat regulation policy, 64% of respondents declared they would support it. However, they estimated that only 36% of survey respondents would do so. This underestimation is significant ($p < .001$). In a similar vein, 37% of respondents declared their support for an increase of the VAT on meat to 17%, but they believed that on average, only 25% of participants would agree to it ($p < .001$).

We conducted a more in-depth analysis examining the predictions of supporters and detractors separately. As expected, detractors of a policy underestimated the proportion of supporters by a larger extent. However, both supporters of the regulatory policy (Mean estimation = 40%, $p <$ .001) and detractors (Mean estimation = 29%, $p < .001$) underestimated the amount of supporters significantly. The same pattern arose for supporters of the taxing policy (Mean estimation = 31%, $p < .001$) and detractors of it (Mean estimation = 21%, $p < .001$).

6.5.2 Housing and related energy consumption

Both of the home energy policies were supported (52% and 65% for the regulation and the tax, respectively). Again, respondents underestimated this proportion (they expected it to be 36% and 45%, respectively, $p < .001$). Supporters (mean expectations: 44% and 52%, $p < .001$) underestimated public support to a lesser extent than detractors (mean expectations: 27% and 34%, $p < .001$), but still significantly.

6.5.3 Mobility and car use

Exactly half of respondents supported the regulatory policy and 23% supported the taxing policy, but they expected that only 34% and 20% would do so, respectively ($p < .001$). For the regulatory policy, the underestimation was shared between supporters (mean expectation: 43%, $p < .001$) and detractors (mean expectation: 25%, $p < .001$). On the other hand, only detractors underestimated the support for taxing policy (mean expectation: 15%, $p < .001$) whereas supporters actually overestimated it (mean expectation: 32%, $p < .001$).

6.6 Evidence on the causal impact of information treatments

We now report our estimates of the impact of information treatments on behaviours. So, does correcting misperceptions about other people's behaviours and attitudes influence individual actions?

In the following subsections we will report the impact of the treatment interventions on behaviours and policy support. For details about p-values and coefficients, see Appendix D. Confidence intervals in the figures are reported at the 90% level.

6.6.1 Immediate effect: intentions to change behaviours (expressed in Wave 2)

Main behaviours We asked participants to report how they intended to behave in the upcoming three months. Those exposed to the NORMS treatment predicted that they would consume less weekly meals with meat, fish and seafood compared to the Control, and that their house would have a lower temperature. On the other hand, they also intended to use soft transportation[17] less frequently than Control (which could be the product of a potential "boomerang effect").

There were no significant differences between the POLICY and the Control group.

Other sustainable habits done frequently We also requested that participants specify which among the 10 other sustainable habits, measured in Wave 1, they intended to perform frequently in the upcoming three months. Compared to the Control group, those in the NORMS treatment intended to buy local products more frequently. Those in the POLICY treatment group were also more likely to report that they planned to carpool frequently.

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[17]Frequency of soft mobility and public transport usage were measured in a scale where 5 represented "Daily", 4 represented "Several times a week", 3 represented "Several times a month", 2 represented "Several times a year", and 1 represented "Never".

Figure 14. Predicted behaviour in the upcoming months (Wave 2)
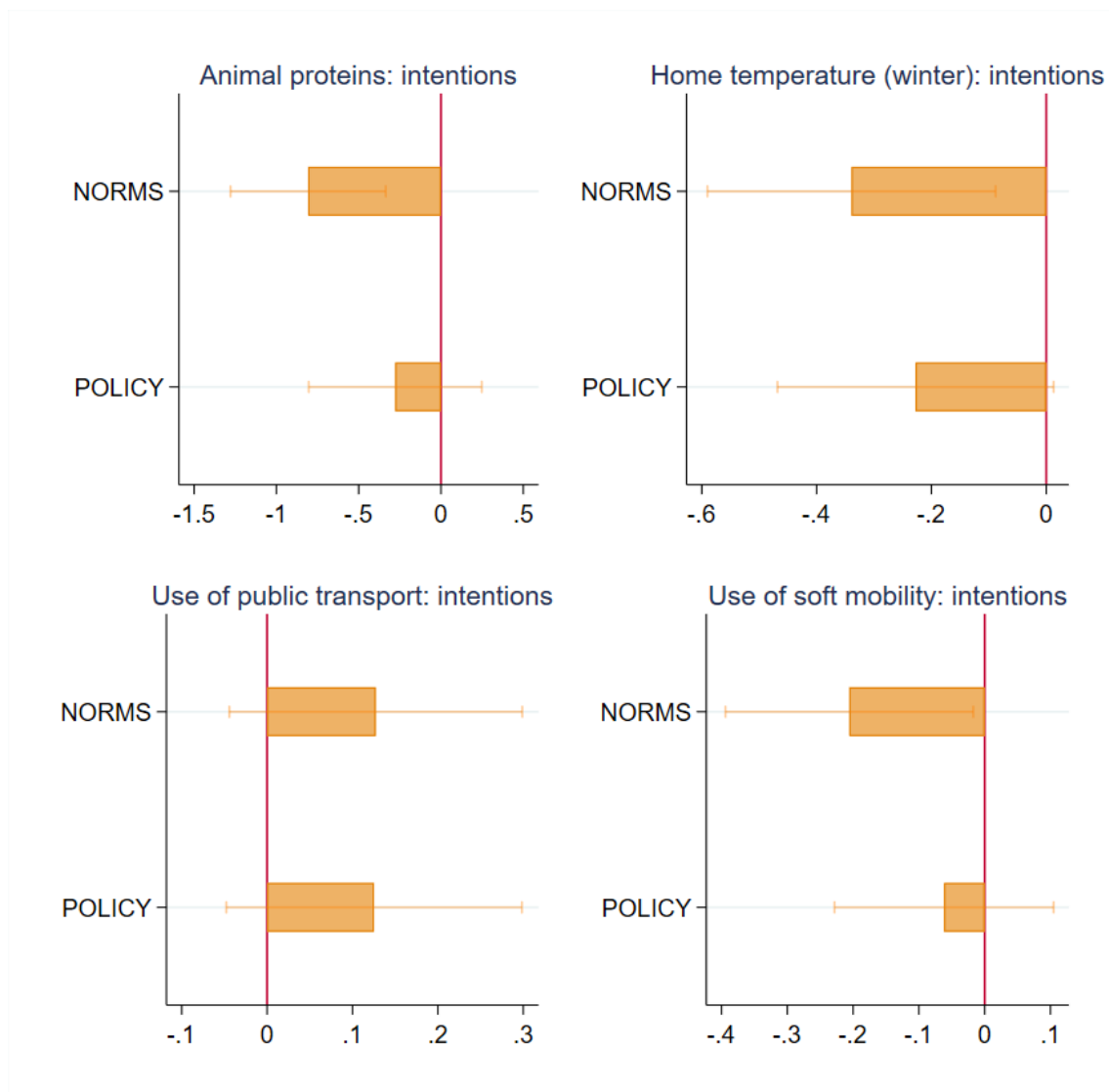
Figure 15. Other predicted sustainable habits in the upcoming months (Wave 2)
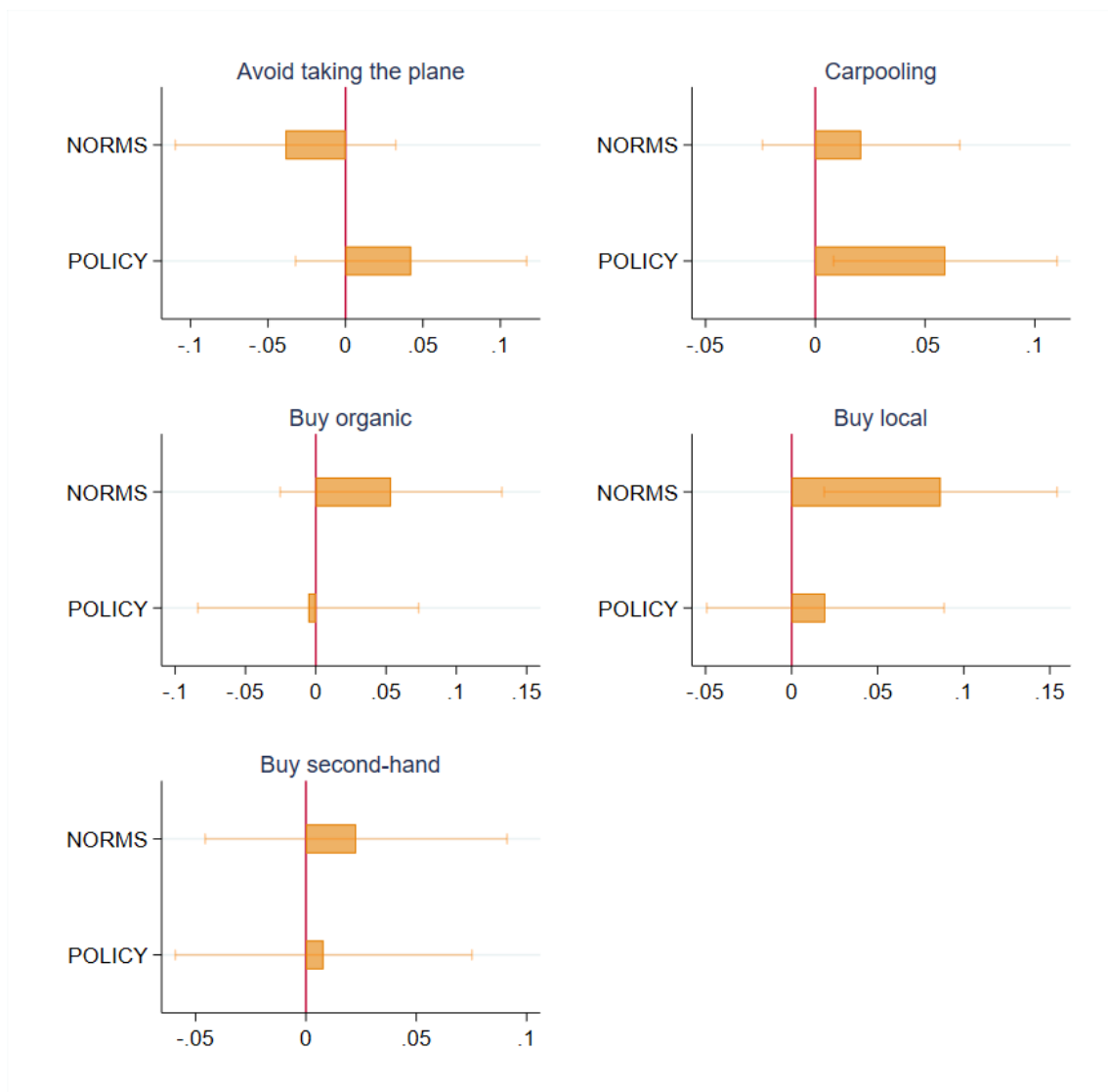
Figure 16. Other predicted sustainable habits in the upcoming months (Wave 2)
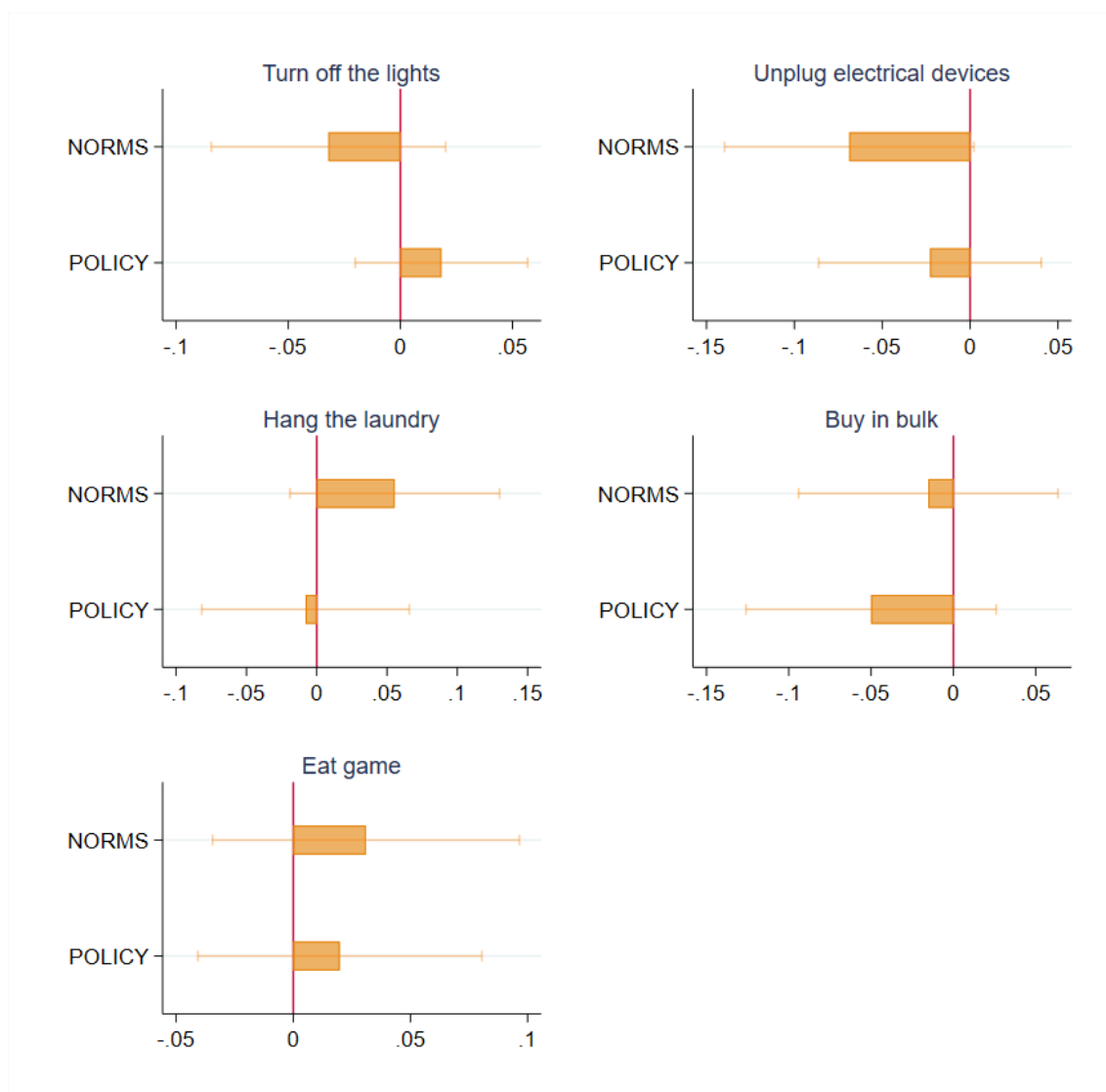
6.6.2 Effect after three months: did intentions translate into actions? (Wave 3)

Main behaviours   Those exposed to the NORMS treatment were more likely to report consuming fewer weekly animal protein meals when asked three months later, compared to Control. Importantly, the negative intentions regarding soft mobility usage did not translate into actual behavioural change. Since Wave 3 asked participants about their current behaviour, we were unable to verify if their home temperatures were actually lower, as respondents completed the survey during summer. We did inquire about their home temperatures during hot weather, but we did not observe notable differences between the treated and untreated groups.

Other sustainable habits done frequently   Although those treated with NORMS had higher intentions of buying local products frequently, interestingly, those exposed to the POLICY treatment were the ones who actually increased the frequency of this behaviour.

Figure 17. Behaviours (Wave 3)
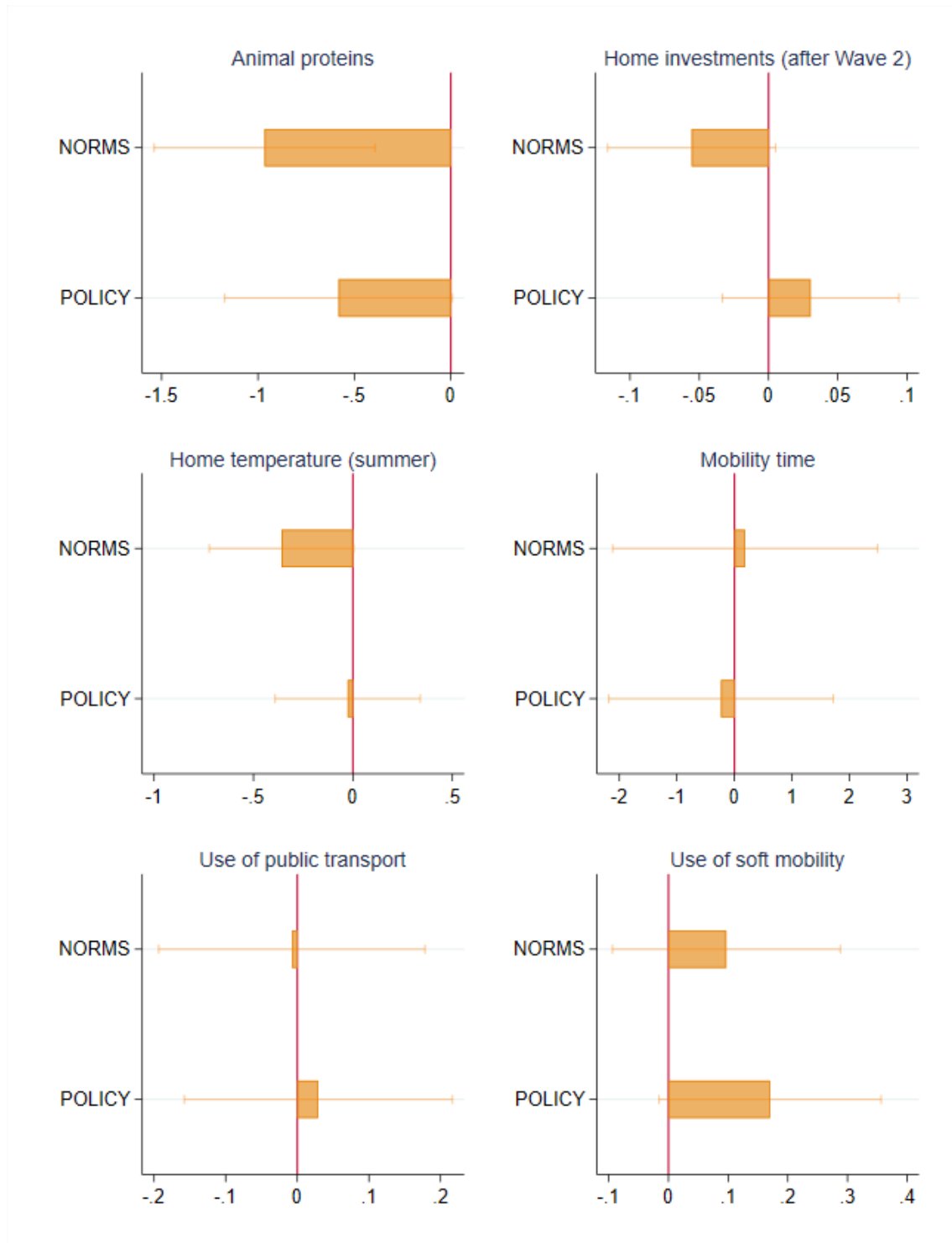
Figure 18. Other sustainable habits done frequently (Wave 3)
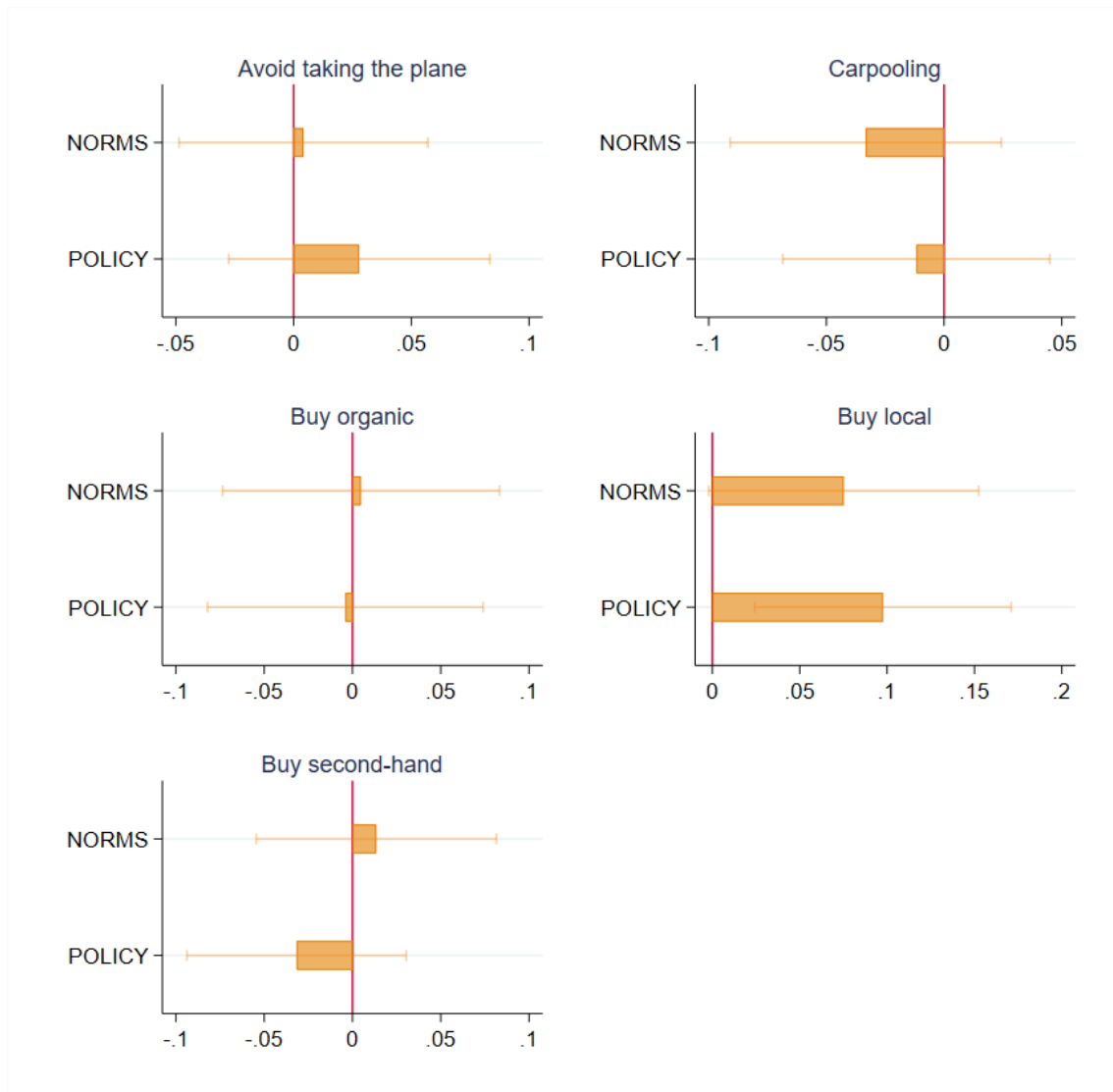
Figure 19. Other sustainable habits done frequently (Wave 3)
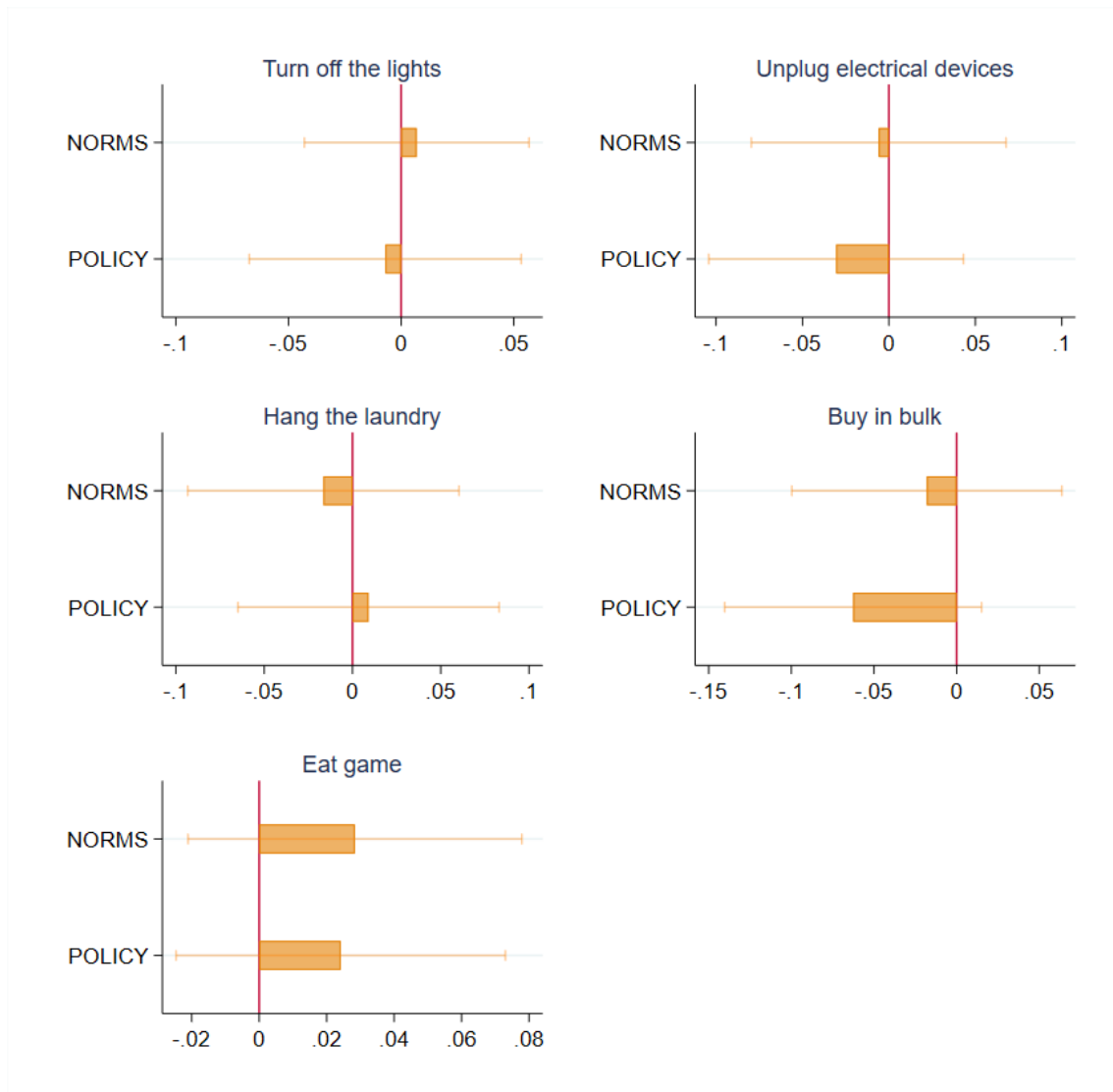
6.7 Acceptance of financial sacrifices for the purchase of carbon credits

There were no significant differences between the NORMS group and the Control group, suggesting that revealing information about norms of sustainable behaviour is not effective in pushing participants into active economic action to fight climate change.

Those exposed to the POLICY treatment were less likely to unconditionally donate their bonus earnings in Wave 2 compared to Control, which could be another possible instance of a boomerang effect. However, these differences disappeared after three months.

Figure 20. Donations (Wave 2)
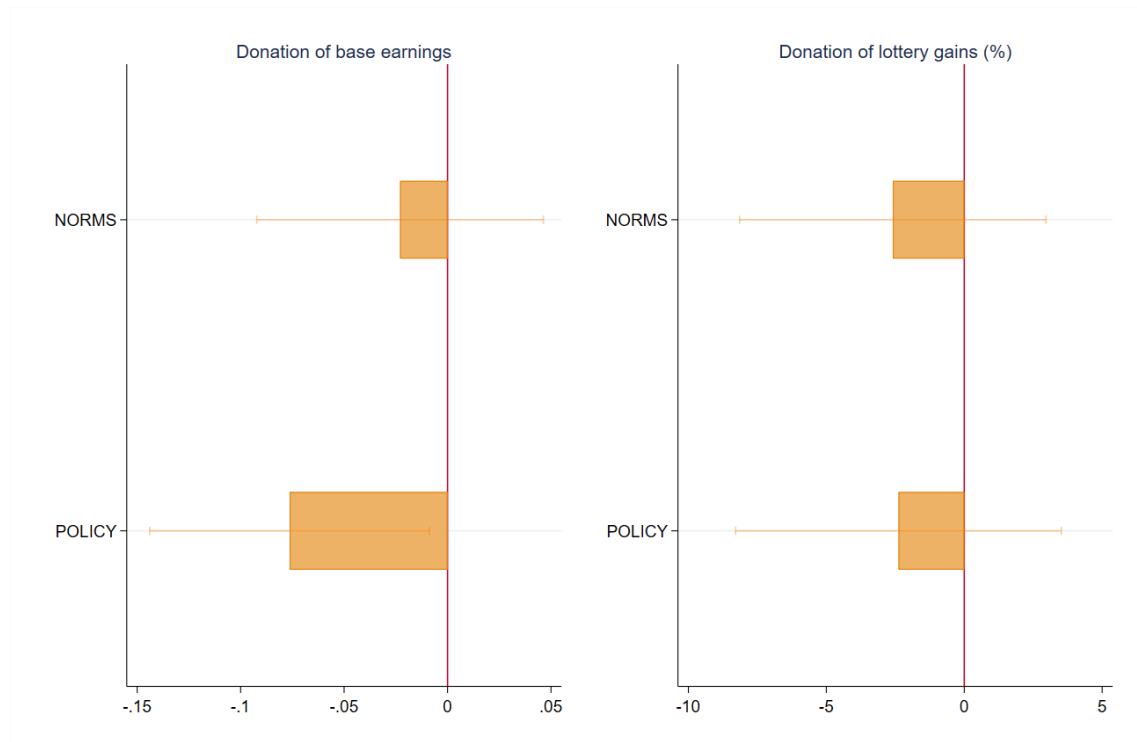
6.8 Policy Support

After being exposed to the treatments in Wave 2, we asked participants once again their personal willingness to support the 6 hypothetical policies presented in Wave 1. We also asked them about their support for a real policy being implemented currently in Luxembourg: a carbon tax amounting to 30€ per tonne of CO_2 emitted.

We asked about their support both after being immediately exposed to the treatments in Wave 2, and once again after 3 months had passed (Wave 3).

6.8.1 Immediate effect (Wave 2)

Those exposed to the POLICY treatment were more likely to support the regulatory policies for housing and meat compared to the control group. They were also more likely to support the tax policy for housing. More importantly, we did not observe any negative effects on those policies that were revealed to be supported by a minority in Wave 1, specifically the tax for mobility and meat.

Figure 21. Donations (Wave 3)
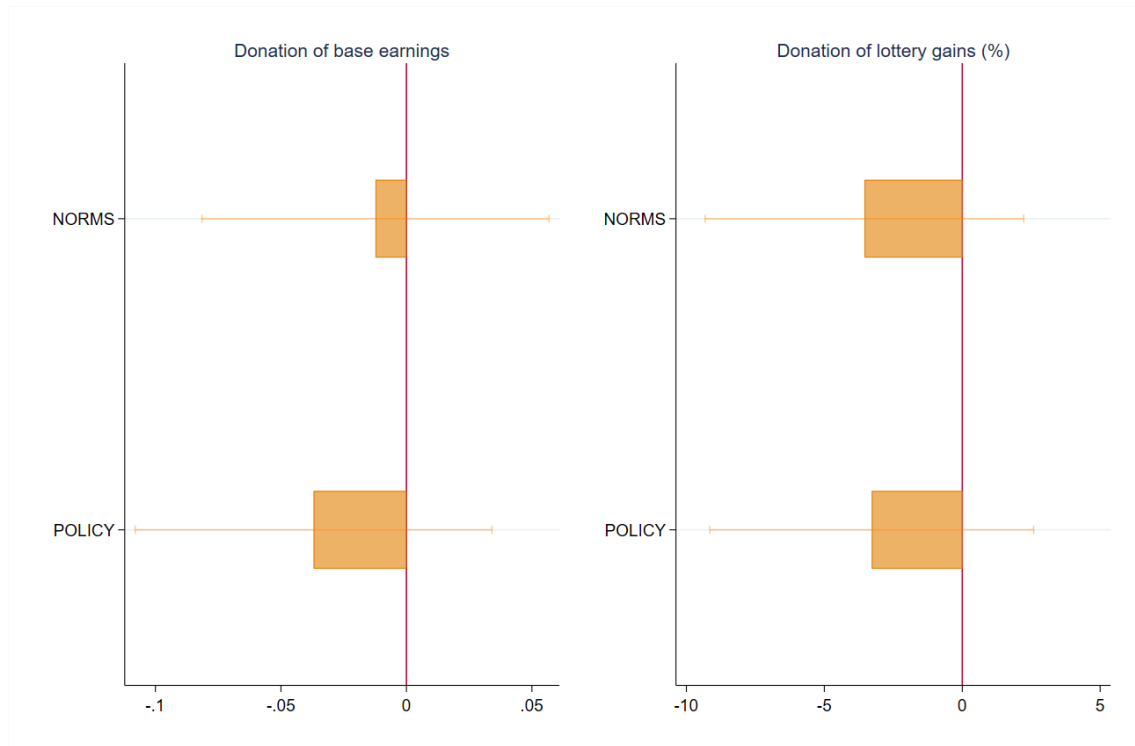
Those exposed to the NORMS treatment were also more likely to support the regulation on meat.

6.8.2 Effect after three months (Wave 3)

The positive effects of the POLICY treatment in Wave 2 persisted in Wave 3: participants were more likely to support the regulatory policies for meat and housing compared to control. In a similar vein to the results of Wave 2, those exposed to the NORMS treatment were also more likely to support meat regulations compared to Control.

6.9 Conclusion

In sum, we find evidence in the first wave of our survey of pluralistic ignorance regarding environmental practices in Luxembourg. Participants, through incentivised tasks, misperceived the prevalence of sustainable practices, the level of social norms (what is deemed appropriate), and the support for hypothetical tax and regulatory policies. The misperception points to a clear direction of pessimism: people think others engage in less sustainable practices and attitudes than they actually do.

Interestingly, regarding policy support, we observed that this pessimism is generally shared by respondents both in favour of and against a policy (with the exception of the car toll). This suggests that the overly negative perceptions of the Luxembourgish population's climate support attitudes are generalised and not solely driven by supporters or detractors.

In the second wave, we implemented two treatments aimed at correcting participants' misperceptions: (i) of behaviour and norms (NORMS), and (ii) of the level of policy support (POLICY).

Figure 22. Policy support (Wave 2)
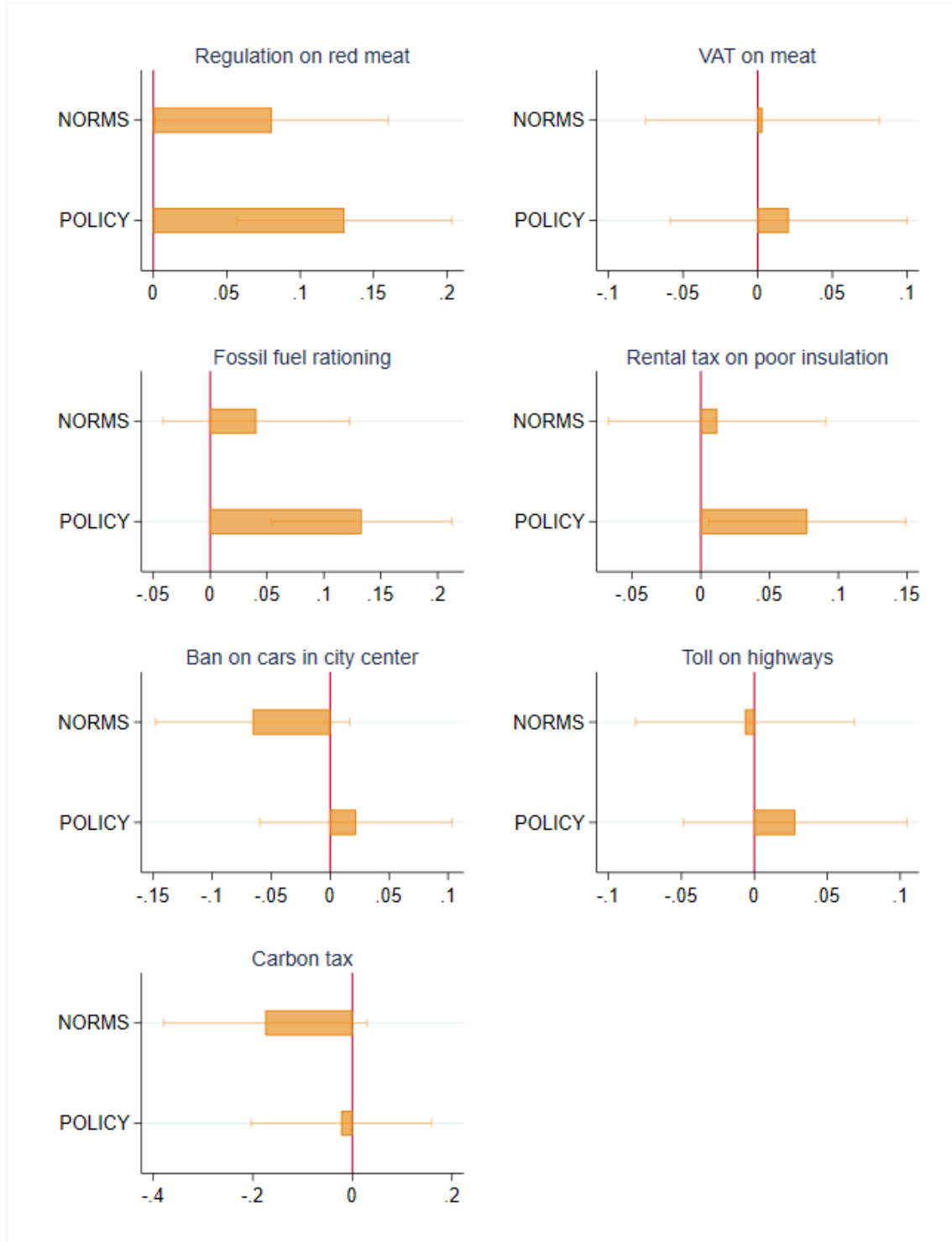
Figure 23. Policy support (Wave 3)
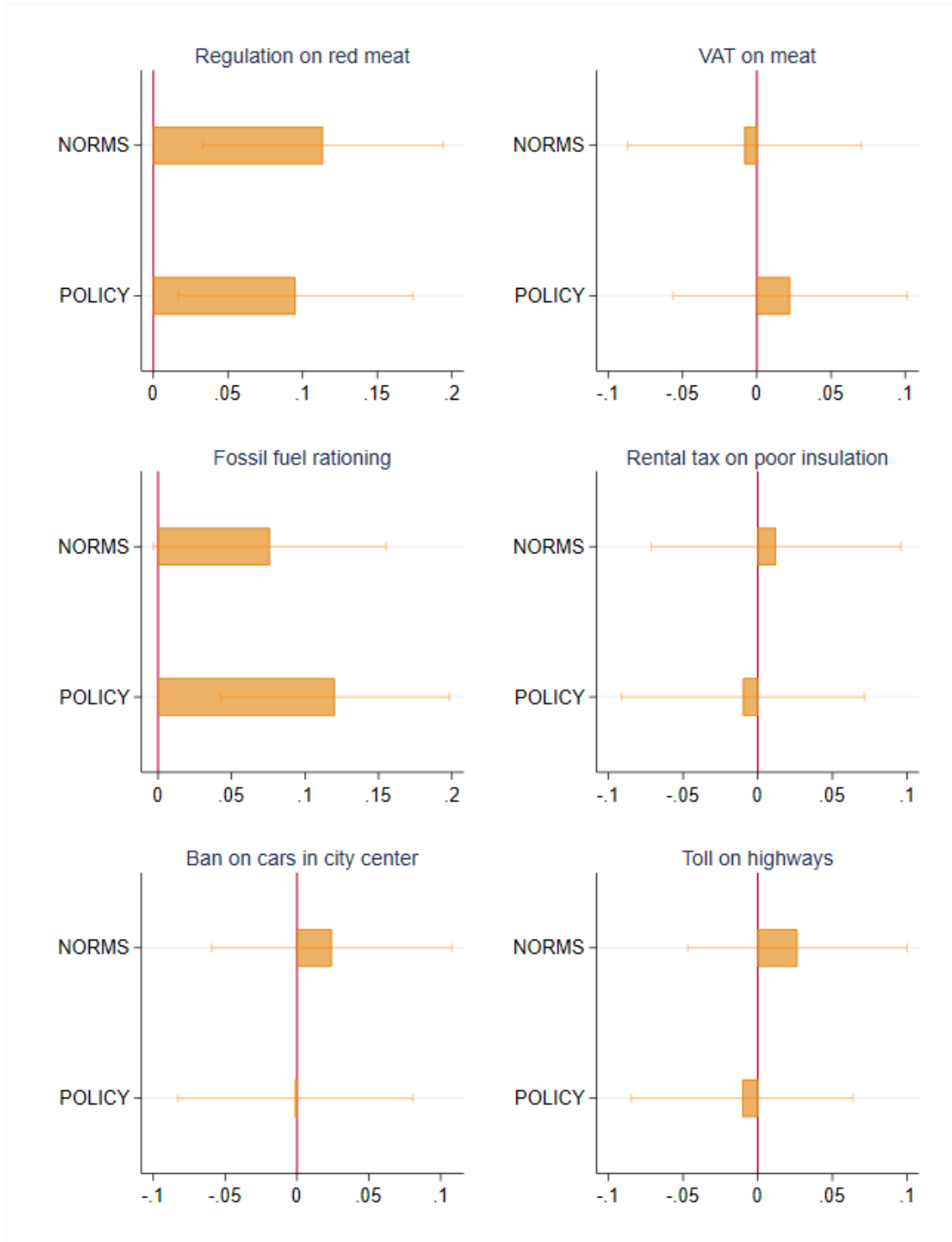
Behaviours The NORMS treatment had positive results, increasing intentions to consume fewer animal protein meals (measured immediately) and reducing actual animal protein consumption (measured three months later). It also increased intentions to have lower home temperatures during cold weather and to buy locally more frequently. We could not measure in Wave 3 if the intentions to lower home temperatures were translated into real actions since the survey was distributed during summer. We did not detect any significant differences between treated and untreated groups for home temperatures during warm weather. We also didn't observe any differences in the frequency of buying locally between NORMS and Control in Wave 3. Interestingly, the NORMS treatment also negatively impacted intentions to use soft mobility frequently, which could suggest an incidence of the boomerang effect. However, these intentions did not translate into actual behaviour three months later.

The POLICY treatment led to a higher willingness to carpool in Wave 2—which did not result in an actual behavioural difference in Wave 3—and a greater likelihood to frequently buy local products when asked in the third wave.

Additionally, the POLICY treatment also led to a lower likelihood of donating bonus earnings in Wave 2. Again, these differences disappeared after three months. On the other hand, the NORMS group were not more likely to donate their earnings in neither of the Waves.

Policy Support The POLICY treatment increased support for two out of six policies: regulations for meat and housing. These effects arose when asked immediately (Wave 2), and they were also sustained when asked again three months later. Those exposed to the NORMS treatment were also more likely to support meat regulations, both immediately and three months later.

Conclusion on the role of information treatments While the treatments did not significantly impact all behaviours measured, they were successful in changing participants' practices and attitudes in several areas. The greatest impact seems to be on those domains that are easier to change, such as meat consumption and housing energy conservation (especially the first), and on policies aimed at restricting consumption levels (vs. imposing a tax).

On the other hand, our results suggest that revealing information about norms of sustainable behaviour and support for sustainable policies is not effective in promoting (immediate) economic action to fight climate change. Revealing the support for hypothetical policies was also not effective in spurring support for a real policy currently being implemented in Luxembourg (the carbon tax).

More importantly, although we observed some negative effects of the treatments in intentions and bonus donations in Wave 2 (a potential short-term backlash), those were not sustained in Wave 3. We did not observe any negative effects in policy support, not even for policies that were revealed to be supported by a minority.

Hence, the final effect of our treatments were overall either positive (with domains easier to change and behaviour and policies directly related to the treatments), or neutral (with domains more resistant to change, and behaviour and policies less directly related to the treatments). With all this, we can conclude that information treatments aimed at correcting misperceived norms and attitudes can be a cost-efficient method to promote sustainability in Luxembourg.

7 Conclusion and policy recommendations

The analysis presented in this report reveals that pro-environmental behaviour is influenced by a complex interplay of sociodemographic factors, personality traits and perceptions about society's behaviour and attitudes. Higher education, prosocial orientations (altruism, empathy, warmth) and self-improvement (openness, growth mindset, conscientiousness) stand out as significant predictors of sustainable behaviours. Time and financial constraints also play important roles, however, alleviating such constraints cannot lead with certainty to sustainable behaviours and may even backfire. Similarly, alarming communications that trigger fears of risks and of social judgments may have positive effects in some domains, but can also be counterproductive in others. Giving a central role to education policies, as well as promoting and acknowledging the importance of positive social values appears to be a better strategy. Also, policies that correct pluralistic ignorance were found to have significant impacts, though the duration of their effects is yet to be determined and is likely small. As such, information campaigns should indeed not be considered as a standalone policy instrument. In particular, the study reveals the critical importance of putting in place large-scale, coherent policies involving the provision of concrete sustainable solutions to induce change.

Based on these findings, we suggest a few policy recommendations.

Financial Incentives and Support for Low-Income Groups   Considering the financial constraints faced by low-income individuals, focus efforts on providing subsidies or incentives for sustainable practices, in particular for home energy renovations. Programs offering bulk buying options for sustainable products could also be beneficial.

Lifestyle Campaigns for High-Income Individuals   Tailor campaigns to high-income groups to encourage a shift toward a more sustainable lifestyle. Despite their financial flexibility, these groups may indulge in unsustainable practices due to purchasing power. Campaigns could focus on reducing meat consumption and promoting energy-frugal lifestyles.

Urban Infrastructure Development   Enhance public transport systems to support both residents and cross-border workers, while discouraging the use of personal cars.

Engagement Programs for the Young and Elderly   Develop targeted programs for different age groups, by acknowledging their highly specific strengths and challenges, in particular in housing.

Targeted Communication Strategies   Utilise the findings from the randomised controlled trials to develop communication strategies that address pluralistic ignorance. Informing the public about the actual levels of sustainable behaviour and policy support in society can enhance the desirability of sustainable transition.

Enhancing prosocial values (Altruism, Empathy, warmth)   Develop educational programs and public campaigns designed to nurture these values, recognising these traits as key drivers in promoting sustainable practices. Initiatives should include multifaceted sustainability projects that encourage community involvement and workshops aimed at understanding the environmental impact.

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Enhancing adaptability values (openness, growth mindset, and conscientiousness)   Craft educational initiatives that bolster critical thinking and creative problem-solving. Foster resilience, perseverance, and a positive approach to challenges. Prioritise responsibility, structured goal-setting, and achievement, shaping individuals who are proactive and capable of thriving in changing environments.

Comprehensive Policy Frameworks   Ensure that constraining policies like regulations and taxes are accompanied by supportive measures. Provide citizens with practical and sustainable alternatives to assist in their transition to more sustainable practices.

Employment Considerations   Address the less sustainable consumption patterns observed among working individuals by taking into account their specific challenges, in particular if they are young parents. Work and parenting are both associated with a different valuation of time and busy lifestyles. Policies acknowledging these challenges and promoting individual sustainable achievements should be encouraged.

Connection to Luxembourg Strategy's vision

The findings of this report resonate with the Luxembourg Strategy's vision for a sustainable transition of Luxembourg. We identified four domains with particularly strong intersections.

Circularity and Frugality   Awareness among consumers regarding sustainable practices, particularly in food and energy, is a promising foundation upon which to build. The role of education is pivotal in reinforcing circular consumption habits. However, achieving true sufficiency remains a challenge when financial constraints are lifted, indicating the need for further research to understand this dynamic and inform future strategies.

Youth, Knowledge, and Innovation   The youth displays a commendable shift towards less traditional consumption and greater energy efficiency. There is an opportunity to cultivate this through education focused on sustainability-oriented solutions, reshaping consumption relationships and fostering innovation for long-term environmental stewardship. The study highlights the importance of values linked to personal development and adaptability. Education and innovation need to promote individuals' self-improvement and ability to engage with their surroundings, manage their personal growth, think critically and adapt to change.

Robust and Sustainable Public Finances   The public's backing for sustainability initiatives across income groups provides a mandate for the implementation of green taxes and incentives. These fiscal measures should be carefully designed to fund substantial sustainability plans, with a focus on addressing the specific needs of different socioeconomic backgrounds.

Regional Economic Activities and Low-Emission Transportation   Mobility patterns signal a clear preference for sustainable transportation options, yet there is a gap in supply, especially in cross-border contexts. Recognising the divergent needs of urban versus rural populations is essential in planning regional economic and transport infrastructures that support low-emission transportation and contribute to the economic vitality of the region.

   These policy recommendations, informed by the report's findings, align with the Luxembourg Strategy's commitment to sustainable development. They contribute to a vision that integrates

economic, social, and environmental objectives, paving the way for Luxembourg to lead by example in the transition to a more sustainable future.

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Appendices

Appendix A   Demographic profile of study participants

A.1   Study participants

In November 2022, 3700 people have been invited by email to participate in the SOC2050 study. The email was sent to Luxembourg residents and cross-border workers (i) who had been randomly sampled to participate in a survey conducted by LISER in the last 3 years, and (ii) who had agreed then to be recontacted for potential participation in future online surveys. The invitation email involved limited framing information about the topic of the study – see Figure A–1.

Figure A–1. Framing of the study: Wave 1 cover page

In total, 1,292 individuals completed the first wave of the study. All wave-1 participants were invited to participate in wave 2 – 1,026 individuals completed wave 2 (a retention rate of 79 percent). Finally all participants in wave 2 were invited to participate in wave 3 and 912 individuals completed wave 3 (for a cumulative retention rate from Wave 1 of 71 percent). Figure A–2 illustrates this flow.

Figure A–2. Study flowchart and number of participants at each wave
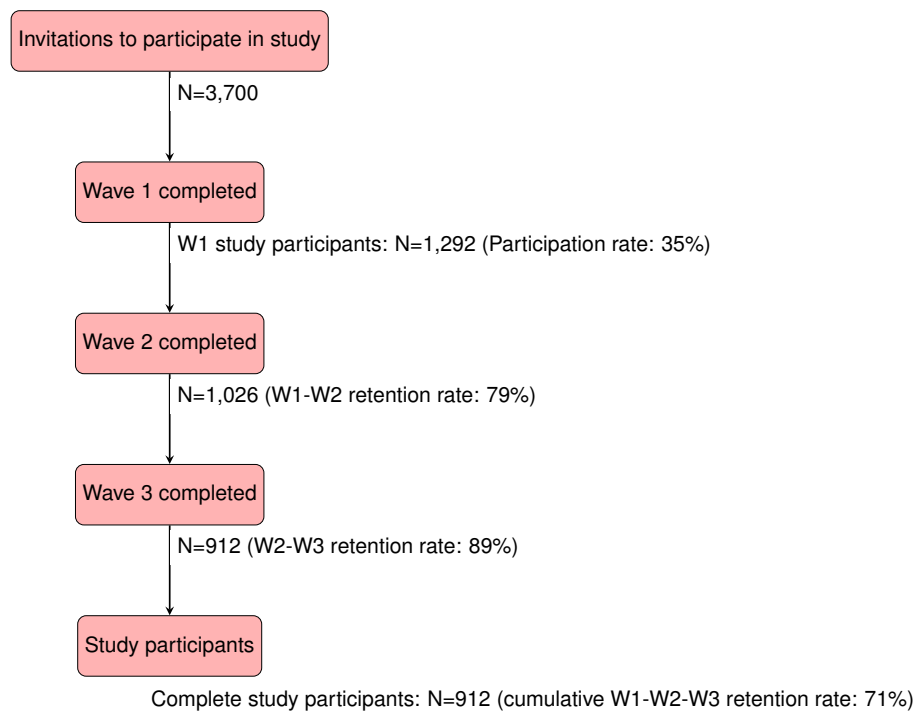
A.2   Demographic characteristics

The demographic characteristics of the study participants are described in Table A–1. The characteristics are as reported by the participants in wave 1.[18] The first two columns describe the characteristics of participants to wave 1 and to the full study, respectively. Participants were predominantly of middle age with just under 20 percent of participants aged below 35 and 7 percent aged above 65. Forty percent have children. Just above two-thirds of participants were residing in Luxembourg and half of the participants report residing in urban areas. With only 37 percent of women in wave 1 (and 34 percent in the entire study), the participants are predominantly male.

To attenuate potential biases in our study results due to imbalance in the respondent population – notably by gender –, we calculated calibration weights such that the calibrated sample composition is close to some target population totals. Specifically, we calibrated the wave 1 sample so that weighted totals match the proportions of Luxembourg residents by age and gender obtained from IGSS estimates. After calibration, men and women are in equal proportions, one third of participants is aged below 35, and 16 percent of participants are aged above 65 (see Table A–1 column 3).

Finally, to account for differences in retention rates from wave 1 to wave 3 according to the characteristics of respondents and preserve wave 1 (calibrated) composition, we adjusted calibration weights for differential attrition. The adjustment corrected for differential retention according to age, gender, education, employment and country of residence. The last column of Table A–1 reports the composition of the Wave 1-2-3 participants after application of the 'retention-adjusted calibration weights'.

Throughout the report, and unless otherwise mentioned, the calibration weights are applied to statistics based on the full set of wave-1 participants and retention-adjusted calibration weights are applied to statistics based on the participants to the full Wave 1-2-3 study.

Table A–1. Demographic composition of study participants – proportion of participants with characteristic reported in column 1

	No calib.		Base calib.	Adjusted Calib.
	Wave 1 resp.	Wave 1-2-3 resp.	Wave 1 resp.	Wave 1-2-3 resp.
Female	0.37	0.34	0.49	0.49
Aged below 35	0.19	0.18	0.33	0.32
Aged between 36 and 65	0.74	0.75	0.52	0.52
Aged above 65	0.07	0.07	0.16	0.15
Higher education	0.68	0.71	0.65	0.65
Low income	0.41	0.39	0.45	0.43
Middle income	0.25	0.27	0.24	0.26
High income	0.31	0.31	0.28	0.28
Luxembourg resident	0.68	0.67	0.73	0.73
Born in Luxembourg		0.34		0.40
Employed	0.80	0.80	0.73	0.73
Living in urban area	0.48	0.48	0.48	0.48
Children (<18)	0.41	0.39	0.33	0.32

Wave 1 participants are the 1,292 participants to the first wave. Wave 1-2-3 participants are the 912 participants to all three waves.

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[18]By exception, the country of birth was asked in wave 2.

A.3   Two dimensional representation of demographic profiles

For the sake of visualisation, we have mapped all study participants onto a two-dimensional representation of their demographic profile. To do so, we applied multiple correspondence analysis – an analogue to principal components analysis for multiple categorical variables (see, e.g., Greenacre, 2007). Each respondent is thereby attributed two scores reflecting their position in two dimensions, typically represented horizontally (first score) and vertically (second score). Each score is a weighted combination of the demographic characteristics of the respondents (based on gender, age, activity status, educational level, income, financial situation, country of birth, and the presence of a child in their household). The scores are constructed such that they capture as much variation in these characteristics as possible. In the first dimension, the variables with largest weights are age, employment status and the presence of children: respondents aged 51+, inactive and living without children are given a low score (so plotted left along the horizontal dimension) whereas respondents aged 36-50, employed, with post-secondary education and living with children are given a high score (so plotted right along the horizontal dimension). The score in the second dimension is primarily driven by income and financial situation with respondents living comfortably being given a high score (top of the vertical dimension) and respondents reporting low income and financial difficulties given a low score (bottom of the vertical dimension).

Figure A–3. Two-dimensional representation of the demographic profiles of W1-W2-W3 study participants
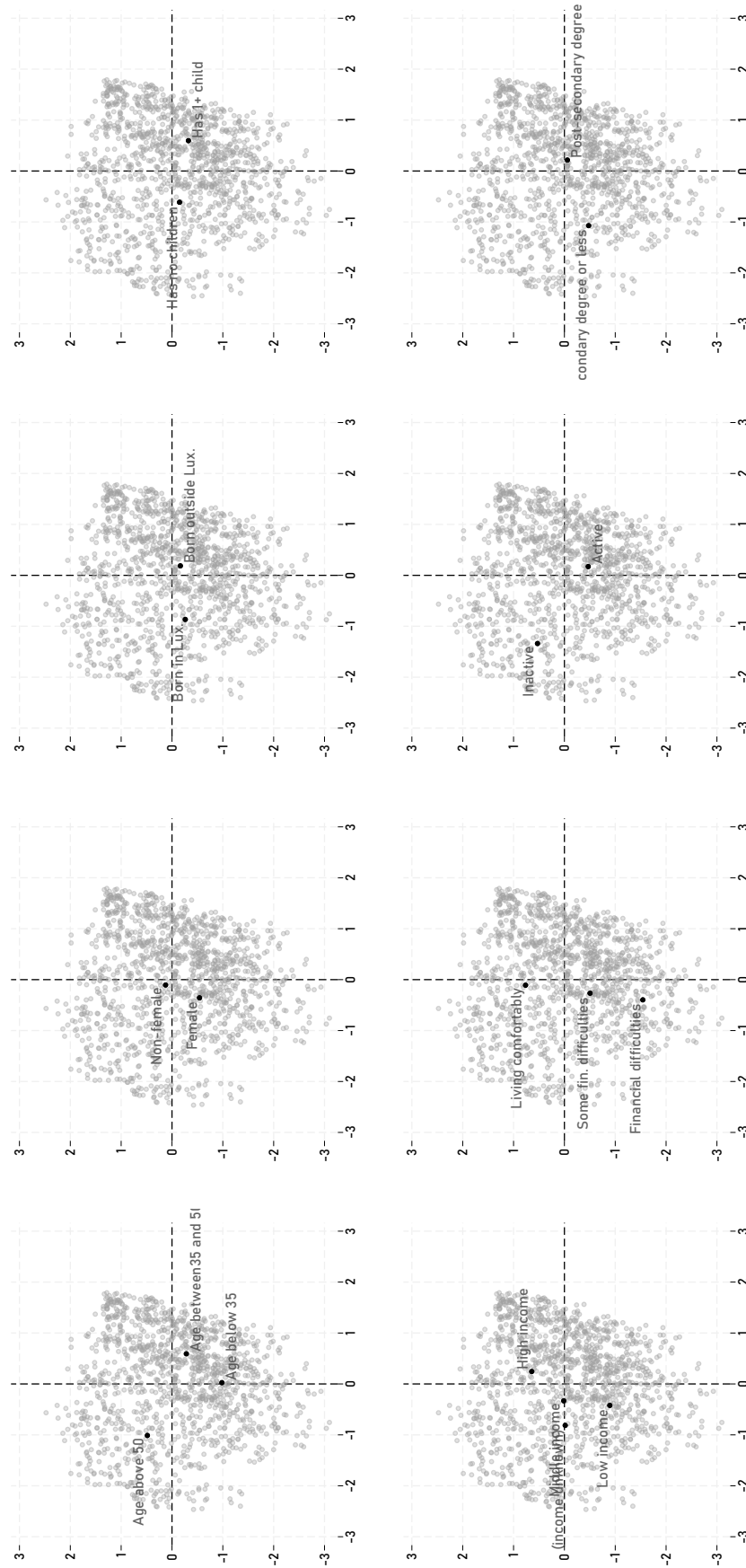
Each panel shows the average scores of respondents according to each demographic factors. The light gray markers represent individual respondents to the full W1-W2-W3 study.

Appendix B   Regression results of the sociodemographic determinants of sustainable behaviours and attitudes

Table B–1. Main behaviours and sociodemographic characteristics

	(1) Animal proteins	(2) Home temperature	(3) Home investments	(4) Mobility: hypothetical extra time	(5) Weekly public transport use	(6) Base earnings donation	(7) Lottery donation
Low income	0.111 (0.32)	-0.161 (-1.09)	-0.0290 (-0.74)	**5.035***** (2.81)	-0.00793 (-0.19)	-0.0464 (-1.03)	**-6.179*** (-1.76)
High income	**0.664*** (1.88)	0.144 (1.01)	-0.000233 (-0.01)	**3.005**** (2.00)	-0.0480 (-1.08)	**0.161***** (3.58)	**7.460*** (1.94)
Higher education	**-0.605*** (-1.79)	-0.189 (-1.34)	0.0363 (1.02)	1.372 (0.75)	**0.107***** (2.79)	0.0176 (0.39)	**6.294*** (1.85)
Aged below 35	**0.663*** (1.78)	-0.161 (-1.10)	**-0.0695**** (-2.03)	-0.753 (-0.49)	0.0483 (1.20)	**-0.115***** (-3.21)	**-6.127**** (-2.11)
Aged above 65	-0.880 (-1.51)	**0.544**** (2.39)	-0.103 (-1.47)	3.055 (0.92)	-0.0953 (-1.55)	**0.248***** (2.94)	**14.95**** (2.21)
Born in Luxembourg	**-1.186***** (-3.44)	**0.249*** (1.78)	-0.0359 (-0.98)	-1.225 (-0.63)	-0.0450 (-1.21)	0.0218 (0.50)	3.825 (1.11)
Employed	0.456 (1.05)	0.0856 (0.55)	-0.0629 (-1.41)	-2.619 (-1.55)	-0.00227 (-0.04)	-0.0763 (-1.49)	**-8.472**** (-2.02)
Living in urban area	0.358 (1.22)	0.0239 (0.20)	**-0.0781**** (-2.39)	-1.389 (-0.96)	**0.191***** (5.53)	0.0169 (0.47)	1.371 (0.48)
Children (<18)	-0.407 (-1.22)	**0.218*** (1.82)	-0.0133 (-0.39)	**-2.251*** (-1.69)	-0.0371 (-1.02)	**-0.0666*** (-1.92)	**-5.070*** (-1.71)
Female	**-1.239***** (-4.13)	**0.254**** (2.14)	-0.0223 (-0.68)	2.094 (1.39)	0.00337 (0.10)	0.0537 (1.55)	**6.504**** (2.34)
Constant	**7.108***** (13.21)	**19.89***** (100.18)	**0.358***** (5.86)	**14.41***** (6.19)	**0.173***** (2.74)	**0.302***** (4.09)	**28.80***** (5.10)
Observations	912	912	912	912	912	912	912

* p<0.10, ** p<0.05, *** p<0.01

The explanatory factors, displayed in the left column, are defined in Section 2. For each of the numbered columns, the constant term represents the average behaviour of the reference group, which represents middle-income men, without higher education, aged between 35 and 65, born outside of Luxembourg, inactive, and living in a rural area without children. Column (1) concerns the number of meals containing animal proteins consumed per week. (2) is the home temperature in Celsius degrees when it is less than 10 degrees outside. (3) is a binary variable equal to 1 for respondents who made insulation or renewable energy investments in their home in the 2 years preceding November 2022. (4) concerns the number of minutes participants are willing to sacrifice on top of 30 minutes to replace the car by sustainable transport. (5) is a binary variable equal to 1 for respondents who use public transport at least once a week. (6) is a binary variable equal to 1 for respondents who donate the base compensation to the purchase of carbon credits. (7) is the proportion of the lottery prize (250€) that respondents commit to donate for the purchase of carbon credits if they win the lottery.

	(1) Avoid taking the plane	(2) Carpooling	(3) Buy organic	(4) Buy local	(5) Buy second-hand
Low income	-0.0609	0.0117	-0.0674	**-0.105****	0.0336
	(-1.26)	(0.36)	(-1.38)	(-2.39)	(0.82)
High income	0.00455	-0.0236	**0.109****	0.0199	0.00334
	(0.09)	(-0.78)	(2.23)	(0.48)	(0.07)
Higher education	0.0111	0.0132	**0.191*****	0.0295	0.0600
	(0.22)	(0.47)	(3.95)	(0.68)	(1.44)
Aged below 35	**-0.0721***	0.0425	**-0.105****	**-0.210*****	**0.0797***
	(-1.76)	(1.35)	(-2.38)	(-4.69)	(1.84)
Aged above 65	0.112	-0.0169	0.0789	0.0650	**-0.167*****
	(1.24)	(-0.35)	(0.92)	(1.02)	(-2.67)
Born in Luxembourg	-0.0695	-0.0137	0.0396	0.0410	**-0.0788****
	(-1.48)	(-0.52)	(0.87)	(1.00)	(-2.01)
Employed	0.0637	0.0411	-0.0398	-0.0181	0.00519
	(1.14)	(1.28)	(-0.69)	(-0.37)	(0.10)
Living in urban area	0.0409	-0.0240	**-0.0819****	**-0.0679***	-0.0109
	(1.05)	(-0.99)	(-2.08)	(-1.89)	(-0.31)
Children (<18)	-0.0392	-0.0187	0.0441	-0.0552	**0.128*****
	(-0.97)	(-0.70)	(1.07)	(-1.42)	(3.24)
Female	0.0266	0.00377	**0.0780****	-0.00347	**0.173*****
	(0.69)	(0.15)	(2.04)	(-0.10)	(4.94)
Constant	**0.311*****	**0.0847****	**0.385*****	**0.810*****	**0.161****
	(4.26)	(2.24)	(5.38)	(13.16)	(2.54)
Observations	912	912	912	912	912

t statistics in parentheses

* p<0.10, ** p<0.05, *** p<0.01

B–3

	(1) Turn off the lights	(2) Unplug electrical devices	(3) Hang the laundry	(4) Buy in bulk	(5) Eat game
Low income	-0.00863	0.0176	-0.0222	0.0715	-0.0462
	(-0.42)	(0.41)	(-0.48)	(1.52)	(-1.33)
High income	-0.0112	**-0.0822***	**-0.0877***	0.0619	0.0512
	(-0.57)	(-1.80)	(-1.79)	(1.26)	(1.15)
Higher education	0.0220	**0.0862***	0.0794	0.00249	-0.00912
	(1.20)	(1.88)	(1.61)	(0.05)	(-0.24)
Aged below 35	0.00515	-0.00434	-0.0384	0.0378	**-0.0729****
	(0.22)	(-0.10)	(-0.88)	(0.87)	(-2.28)
Aged above 65	**0.0532****	**0.172****	-0.0436	-0.0662	-0.0166
	(2.24)	(2.39)	(-0.48)	(-0.76)	(-0.26)
Born in Luxembourg	-0.0162	-0.0355	-0.0454	-0.000594	0.0304
	(-0.89)	(-0.79)	(-0.98)	(-0.01)	(0.84)
Employed	-0.00129	-0.00530	-0.0583	-0.0674	0.0245
	(-0.04)	(-0.10)	(-0.92)	(-1.23)	(0.59)
Living in urban area	0.00980	-0.0155	-0.0471	0.0591	-0.0359
	(0.62)	(-0.44)	(-1.23)	(1.57)	(-1.16)
Children (<18)	0.00690	**0.0804****	-0.00793	0.0175	**-0.0862*****
	(0.37)	(2.18)	(-0.20)	(0.40)	(-2.85)
Female	0.0258	**0.0703***	0.0475	0.0583	**-0.0694****
	(1.62)	(1.96)	(1.27)	(1.54)	(-2.27)
Constant	**0.924*****	**0.598*****	**0.746*****	**0.245*****	**0.260*****
	(28.48)	(8.54)	(10.05)	(3.17)	(4.61)
Observations	912	912	912	912	912

t statistics in parentheses

* p<0.10, ** p<0.05, *** p<0.01

	(1) E.P.C	(2) Use of public or soft mobility	(3) Owns electric or hydrogen car	(4) Sufficiency index
Low income	-0.0289	-0.0367	0.0149	0.0217
	(-0.83)	(-0.75)	(0.42)	(1.36)
High income	**0.105****	-0.0326	-0.00413	-0.00200
	(2.28)	(-0.64)	(-0.10)	(-0.12)
Higher education	0.0479	0.0522	0.00639	-0.00448
	(1.24)	(1.08)	(0.18)	(-0.24)
Aged below 35	**0.0760***	0.0662	0.0224	-0.0146
	(1.94)	(1.48)	(0.64)	(-0.97)
Aged above 65	-0.0119	0.0188	-0.0657	0.00305
	(-0.21)	(0.22)	(-1.12)	(0.09)
Born in Luxembourg	-0.00113	**-0.0907***	-0.0158	**-0.0372****
	(-0.03)	(-1.94)	(-0.45)	(-2.23)
Employed	0.0499	-0.0841	-0.0317	**-0.0437***
	(1.19)	(-1.46)	(-0.72)	(-1.85)
Living in urban area	-0.00413	**0.0709***	**0.0497***	-0.00349
	(-0.12)	(1.76)	(1.72)	(-0.25)
Children (<18)	0.0570	0.0345	**-0.0703****	**0.0336****
	(1.56)	(0.80)	(-2.48)	(2.37)
Female	-0.0239	-0.0107	0.0130	**0.0648*****
	(-0.75)	(-0.27)	(0.43)	(4.85)
Constant	**0.114***	**0.416*****	**0.174*****	**0.563*****
	(1.87)	(5.54)	(3.06)	(20.44)
Observations	912	912	912	912

t statistics in parentheses

* p<0.10, ** p<0.05, *** p<0.01

E.P.C: Energy Performance Certificate A, B or C

Table B–2. Policy support and sociodemographic characteristics

	(1) Car ban in city center	(2) Highway toll	(3) Red meat regulation	(4) 17% VAT on meat	(5) Fossil fuel rationing	(6) Rental tax
Low income	-0.0163	**-0.0756***	-0.0142	-0.0622	-0.000271	-0.0192
	(-0.32)	(-1.86)	(-0.28)	(-1.27)	(-0.01)	(-0.41)
High income	0.0705	0.0153	0.0703	**0.0928***	0.0833	0.0180
	(1.34)	(0.34)	(1.46)	(1.77)	(1.58)	(0.39)
Higher education	-0.0205	**0.0794****	0.0687	**0.137*****	-0.0466	0.0507
	(-0.40)	(1.98)	(1.43)	(2.86)	(-0.91)	(1.13)
Aged below 35	-0.0369	**-0.0777****	0.0224	-0.00871	**0.0771***	-0.00280
	(-0.80)	(-2.36)	(0.53)	(-0.20)	(1.68)	(-0.06)
Aged above 65	0.00525	0.0563	-0.0863	0.0887	-0.0765	0.0931
	(0.06)	(0.67)	(-1.00)	(0.95)	(-0.81)	(1.23)
Born in Luxembourg	-0.0425	-0.0306	-0.0616	0.0609	-0.0671	**-0.149*****
	(-0.87)	(-0.73)	(-1.33)	(1.29)	(-1.38)	(-3.46)
Employed	0.0430	**-0.151*****	-0.0454	-0.0185	-0.0492	-0.0407
	(0.72)	(-2.86)	(-0.87)	(-0.31)	(-0.78)	(-0.74)
Living in urban area	-0.0105	0.0464	-0.0446	-0.0598	**0.0917****	-0.0240
	(-0.25)	(1.30)	(-1.11)	(-1.49)	(2.23)	(-0.63)
Children (<18)	-0.0356	-0.00565	0.00302	0.0431	-0.00945	0.0308
	(-0.82)	(-0.16)	(0.08)	(1.02)	(-0.21)	(0.77)
Female	-0.00715	-0.000360	**0.162*****	0.0207	0.0365	0.00287
	(-0.18)	(-0.01)	(4.24)	(0.54)	(0.91)	(0.08)
Constant	**0.520*****	**0.324*****	**0.584*****	**0.264*****	**0.521*****	**0.698*****
	(6.71)	(4.69)	(7.87)	(3.47)	(6.69)	(9.81)
Observations	912	912	912	912	912	912

* $p<0.10$, ** $p<0.05$, *** $p<0.01$

Additional notes or comments about the table can go here.

Appendix C   Personality traits and behaviours

Each of these traits described in this Subsection are based on well-established psychological scales or laboratory-validated questions.

C.1   Personality traits

C.1.1   The Big Five

The 10-item Big Five Personality Test (Rammstedt and John (2007)) categorises personality traits into five dimensions: openness, conscientiousness, extraversion, agreeableness, and neuroticism (OCEAN). These traits are fundamental to an individual's personality and can influence their attitudes and actions in sustainable behaviour (Hirsh (2010), Luchs and Mooradian (2012)).

Conscientiousness is associated with responsibility and organisation, leading individuals to engage in eco-friendly practices due to their sense of duty (Brick and Lewis, 2016). Openness can drive exploration of innovative sustainability practices and support for novel approaches (Soutter et al., 2020). Agreeableness, marked by compassion and cooperation, may lead to community-based environmental efforts.

The 10-item Big Five Inventory, or BFI-10, measures the five major dimensions of personality through a short questionnaire with two items for each personality trait. One item for each trait is positively keyed, meaning a higher score shows a higher level of that trait. The other item is negatively keyed, where a higher score indicates a lower level of the trait.

People respond to each item using a 5-point Likert scale, ranging from "Disagree strongly" to "Agree strongly." To calculate the score for each trait, one looks at both the positively and negatively keyed items. For the positively keyed items, the score given is taken as is. For the negatively keyed items, the score is reversed. So, if someone scores a 1 (Disagree strongly), it's recoded as a 5 for scoring purposes, and a 5 (Agree strongly) becomes a 1.

The final score for each trait is the average of these two item scores. Higher scores indicate a stronger presence of that trait in the individual's personality. It's important to remember that these scores aren't about good or bad traits; they simply reflect a person's tendencies in different areas of their personality.

C.1.2   Assertiveness & Warmth

Assertiveness and Warmth were computed based on the agency-communion framework (Abele et al., 2016), which divides fundamental dimensions of personality into agency (assertiveness, competence) and communion (warmth, morality). This model was tested across cultures, showing that these facets are stable and can be distinguished within the broader dimensions. Assertiveness (agency assertiveness; AA) relates to ambition and confidence, reflecting the motivational aspect of agency. Warmth (communion warmth; CW), on the other hand, pertains to benevolence in ways that facilitate affectionate, cooperative relations, representing the interpersonal aspect of communion. The study's findings support the construct validity of these dimensions and their facets, demonstrating their usefulness in analysing self-perception across diverse cultural contexts.

Using Assertiveness (a facet of Agency) and Warmth (a facet of Communion) as proxies for Masculinity and Femininity can be justified based on historical and conceptual links between these dimensions. Assertiveness, often related to Agency, aligns with traditional views of Masculinity,

emphasising qualities like decisiveness and ambition. Warmth, connected to Communion, resonates with traditional aspects of Femininity, highlighting interpersonal warmth, empathy, and nurturing behaviours. Therefore, Assertiveness and Warmth can serve as effective proxies for exploring gender-related dimensions in social psychology.

On the relationship between gender and proenvironmental behaviour, recent research explores the connection between masculinity, femininity, and pro-environmental behaviour. Hofstede (1984) suggests that more feminine cultures tend to be more environmentally sustainable. Zhao et al. (2021) find gender differences in green consumption, shaped by societal roles and theories like the Value-Belief-Norm (VBN) and social roles theory. Pease (2019), Swim et al. (2020) discuss links between masculinity, empathy, and pro-environmental behaviour. Chwialkowska et al. (2020) examine how cultural values impact sustainability efforts, and Desrochers and Zelenski (2023) highlight gender gaps in environmental action.

C.2   Cognition

C.2.1   Rationality and the Cognitive Reflection Test (CRT)

In psychology, rationality is defined as aligning actions and beliefs with logical reasoning, critical thinking, and sound decision-making. Rationality plays a significant role in understanding sustainable behaviour. Rational individuals analyse information thoroughly, weigh pros and cons, and base decisions on evidence and logical reasoning. In sustainability, rationality encourages assessing long-term consequences on the environment, society, and the economy.

The Cognitive Reflection Test (CRT) (Frederick, 2005) measures one's ability to think reflectively, overriding intuitive responses for deliberate thinking. High CRT scorers tend to engage in reflective thinking, which may impact sustainable behaviour, in the sense that individuals with high CRT scores may be more likely to critically evaluate environmental issues, like climate change or resource depletion. They may consider multiple perspectives before making decisions, prioritising sustainability over short-term gains.

To the best of our knowledge, no study has yet directly investigated the link between CRT performance and environmental commitment trends. However, Park and Lee (2016) study on sustainable consumer behaviour has shown that green product purchasers exhibit higher levels of cognitive attitude compared to non-purchasers. This suggests a link between cognitive attitudes and proenvironmental behaviours like recycling and purchasing green products.

For the purposes of our study, we have adapted the original questions posed by Frederick in his introductory article of 2005, but in the same spirit. The score was calculated as follows: 1 additional point per correct answer, for a maximum possible of 3 points (the questionnaire comprises 3 questions).

C.2.2   Growth mindset

Growth mindset, i.e. the belief that abilities and intelligence can be developed and improved over time through effort, learning, and persistence, can significantly influence behaviours, including those related to sustainability. Research reveals a significant link between a growth mindset and pro-environmental behaviours. Pioneer work from Soliman and Wilson (2017) suggest that people's implicit beliefs about the world's changeability influence their environmental actions. Those with a growth mindset, seeing the world as dynamic and modifiable, are more likely to engage in environmental activities than those with a fixed mindset, who view the world as unchangeable.

In our sample we estimated Growth Mindset following the OECD framework in PISA 2018. The OECD conducts the triennial Programme for International Student Assessment (PISA), a global yardstick for evaluating the quality, equity and efficiency of school systems. PISA regularly measures what 15-year-old students know and can do, and relates it to a wide range of aspects. For the first time in 2018, PISA included a "growth mindset" instrument to gauge students' beliefs about intelligence malleability.

In PISA 2018, about 600 000 students from 78 countries and economies were surveyed to depict the landscape of growth mindset for 15 year-olds. PISA 2018 asked students whether they agreed ("strongly disagree", "disagree", "agree", or "strongly agree") with the following statement: "Your intelligence is something about you that you can't change very much". Disagreeing with the statement is considered a precursor of a growth mindset, as it is more likely that someone who thinks intelligence can change will challenge him/herself to improve it.

C.3 Risk and losses

C.3.1 Risk propensity

In behavioural economics, risk preferences refer to an individual's propensity to take or avoid risks. This concept considers how people perceive and react to situations involving uncertainty, particularly those with potential for loss or gain. Traditional economic theories often assume individuals are rational and risk-averse, meaning they prefer a certain outcome over a gamble with a higher expected value. However, behavioural economics recognises that real-world decision-making is more complex, with individuals sometimes displaying risk-seeking behaviour in losses and risk-averse behavior in gains, as explained by theories like prospect theory.

Risk propensity also play a role in proenvironmental behaviours, with risk-takers more inclined to adopt energy-efficient technologies (He et al. (2019); Qiu et al. (2014)), potentially due to their openness to uncertain future benefits.

For risk propensity, participants rate their willingness to take risks on a scale from 0 to 10, using the qualitative item of the streamlined module of the Global Preference Survey (GPS)

C.3.2 Loss aversion & Endowment effect

Research highlights a strong link between loss aversion and pro-environmental behaviour. Loss aversion, a concept from prospect theory, is the inclination to avoid losses rather than seeking equivalent gains, and it can be harnessed to encourage environmentally friendly actions (Homar and Cvelbar, 2021).

Environmental policies, driven by the urgency of climate change, increasingly employ loss framing to emphasise the negative outcomes of inaction, motivating green behaviour. This approach is especially relevant for addressing complex and delayed consequences, such as climate change.

In our study, we measured participants' loss aversion through a real-stakes bet involving potential gains and losses. We quantified loss aversion using the approach of Gächter et al. (2022), focusing on the difference (instead of the ratio) between potential gain (G) to potential loss (L), denoted as Λ^{risky}. Additionally, we used Willingness to Pay (WTP) and Willingness to Accept (WTA) to further assess endowment effect among participants, common measures in economic and behavioural studies. (Beermann et al., 2022).

C.4   Time preferences

C.4.1   Procrastination

Procrastination, the act of delaying tasks, has potential implications for sustainable behaviours. Previous research explored its impact on decision-making, but its relation to pro-environmental actions, especially in energy efficiency and savings, was less studied until recent works by Lillemo (2014) and Shen et al. (2023).

The first study found that higher procrastination tendencies correlated with lower engagement in energy-saving activities in Norway, particularly those requiring effort or investment. The second studied upgrading to energy-efficient appliances in Singapore, discovering that information about the costs of delayed purchases reduced procrastination-induced delays.

In the questionnaire, procrastination ex-ante (before the event) is measured by asking participants when they would tend to start a tedious task with a three-day deadline. They are given three options to choose from, indicating whether they would start immediately, start tomorrow, or start on the last day. Procrastination ex-post (after the event) is assessed by inquiring how often they find themselves unable to complete a task on the planned day despite having made a promise to themselves to do so. Participants could choose from options indicating a range of frequencies: always/almost always, often, occasionally, or never/almost never. This approach captures both the intention to delay a task and the actual delay behaviour.

C.4.2   Patience

Time preferences, such as patience and present bias, are crucial for understanding behaviours related to long-term investments. Those who exhibit patience are more likely to invest in energy-efficient technologies, as they are willing to make present sacrifices for future benefits (Fuerst and Singh (2018); Newell and Siikamäki (2015)).

Patience is assessed by how much they prioritise the future over the present, on a scale from 0 to 10, using the item of the streamlined module of the Global Preference Survey (GPS).

C.5   Social preferences

C.5.1   Empathy

Empathy is a crucial factor influencing human-environment relations, encompassing empathy for both people and nature. It can be measured and stimulated through various methods, such as experiments and games (Brown et al., 2019). Empathy enables individuals to consider the needs and experiences of others, leading to pro-environmental actions like reducing carbon footprints and supporting sustainability (Berenguer, 2007).

Research indicates a connection between empathy towards humans and helping behaviours. This has led to the proposition that empathy towards nature is similarly linked to conservation behaviours. Additionally, it was observed that females tend to exhibit more empathy towards people, and therefore been more inclined to make pro-environmental choices (Tam, 2013).

In our study, we assessed empathy using a shortened version of the Interpersonal Reactivity Index (IRI) (Davis, 1980). The original Interpersonal Reactivity Index (IRI) assesses empathy through four distinct dimensions: Empathic Concern (EC), Perspective Taking (PT), Personal Distress (PD), and Fantasy (FS). Each dimension is measured by a subscale comprising several

items. Participants rate each item on a 5-point Likert scale, where 1 indicates "Does not describe me well" and 5 means "Describes me very well". Some items are reverse-scored to ensure accurate interpretation. The scores for each subscale are calculated by averaging the ratings for the respective items, providing separate scores for each empathy dimension rather than an overall empathy score. This nuanced approach allows for a more detailed understanding of an individual's empathic tendencies across different contexts and scenarios.

For the sake of conciseness in our study, we streamlined the IRI by only focusing on Empathy Concern (EC) and Perspective Taking (PT) scales of the Interpersonal Reactivity Index (IRI), selecting only two items from each. Additionally, to provide a more consolidated view of empathy, we introduced an average Empathy score. This score is calculated as the mean of the total scores obtained from the chosen items in the EC and PT scales, offering a simplified yet effective measure of empathy in our analysis.

Konrath (2013) emphasises the unique nature of the Interpersonal Reactivity Index (IRI) subscales, noting that they are designed to function independently and are not intended to measure overall empathy. However, they specify that Empathic Concern (EC), Perspective Taking (PT), and Personal Distress (PD) are the most relevant to medical settings. The first two, EC and PT, which are other-oriented, are associated with better interpersonal (e.g., prosocial behaviour) and intrapersonal (e.g., mental well-being) outcomes compared to the self-oriented PD subscale. This led us to discard both PT and FS subscales.

C.5.2 Positive & Negative reciprocity, Altruism

Social preferences encompass positive reciprocity, negative reciprocity, and altruism. Positive reciprocity is linked to actions like charitable giving and has been associated with green electricity participation and conservation donations (Alpizar et al. (2008); Clark et al. (2003); Kotchen and Moore (2007)). Negative reciprocity's impact on PEB is less studied but may be significant, given its effects in other domains (Dohmen et al., 2009). Altruism, characterised by selfless concern for others, is closely tied to pro-environmental actions, as altruistic individuals are more likely to engage in behaviours with positive externalities on others (Handgraaf et al. (2017); Tam and Chan (2018)).

Fuhrmann-Riebel et al. (2021) and Lades et al. (2021) stand out for including a wide range of relevant preferences, which is critical as omitting relevant preferences can lead to incorrect attributions of behavioural effects. Like us, they employed the Falk et al. (2018) Global Preference Survey (GPS) to assess preferences, including altruism, and both types of reciprocity.

In our study, altruism is assessed through by gauging participants' willingness to give up money for others. Positive and negative reciprocity are measured by participants' reactions to hypothetical situations involving help or harm received from others, and whether they would reciprocate those actions. We have only used the "qualitative" questions from the GPS. They consist of self-assessment questions where respondents rate themselves on a scale from 0 to 10. For risk preferences, participants rate their willingness to take risks. Patience is assessed by how much they prioritise the future over the present. Altruism is gauged by their propensity to help others. Positive reciprocity is measured by the likelihood of returning a favour, and negative reciprocity by the tendency to retaliate when harmed.

C.6 Demographics and Personality traits

Table C–1. Impact of demographics and personaliity traits on main behaviours

	(1) Animal protein consumption	(2) Home temperature (winter)	(3) Home investments (pre-2023)	(4) Mobility: hypothetical extra time	(5) Public transport weekly	(6) Donation of base earnings	(7) Donation of lottery gains (%)
Low income	0.0475	-0.130	-0.00861	4.963***	-1.082	-0.0920**	-0.0831**
	(0.13)	(-0.79)	(-0.22)	(3.08)	(-0.24)	(-2.05)	(-2.43)
High income	0.589	0.228	-0.0156	3.026*	-3.315	0.0970**	0.0340
	(1.55)	(1.46)	(-0.36)	(1.91)	(-0.67)	(2.06)	(0.90)
Higher education	-0.895**	-0.164	0.0486	2.404	10.36**	-0.00147	0.0449
	(-2.47)	(-1.11)	(1.26)	(1.28)	(2.48)	(-0.03)	(1.34)
Aged below 35	0.598	-0.215	-0.0708*	0.134	5.489	-0.0869**	-0.0187
	(1.51)	(-1.41)	(-1.79)	(0.10)	(1.30)	(-2.17)	(-0.60)
Aged above 65	0.0556	0.475*	-0.107	0.348	-8.955	0.233***	0.147**
	(0.09)	(1.94)	(-1.47)	(0.10)	(-1.12)	(2.96)	(2.29)
Born in Luxembourg	-1.458***	0.196	-0.0340	-2.216	-3.065	0.0208	0.0583*
	(-4.08)	(1.33)	(-0.90)	(-1.08)	(-0.75)	(0.49)	(1.75)
Employed	0.435	0.0690	-0.0314	-3.150	-0.432	-0.0745	-0.0708
	(0.92)	(0.44)	(-0.64)	(-1.64)	(-0.08)	(-1.41)	(-1.54)
Living in urban area	0.217	-0.0681	-0.0865**	-0.971	21.52***	0.0188	0.0128
	(0.68)	(-0.58)	(-2.42)	(-0.70)	(5.66)	(0.55)	(0.46)
Children (<18)	-0.140	0.184	0.0115	-3.020**	-7.124*	-0.0629*	-0.0251
	(-0.39)	(1.44)	(0.32)	(-2.05)	(-1.87)	(-1.74)	(-0.87)
Female	-0.942***	0.171	-0.0482	-0.570	1.045	0.00920	0.0114
	(-2.77)	(1.27)	(-1.33)	(-0.39)	(0.25)	(0.24)	(0.38)
Openness	0.134	-0.0107	0.0224	-0.0275	1.395	0.0117	0.0304*
	(0.71)	(-0.15)	(1.11)	(-0.03)	(0.66)	(0.57)	(1.90)
Conscientiousness	-0.154	-0.0886	0.0199	0.373	0.376	0.0371	0.0210
	(-0.65)	(-0.98)	(0.84)	(0.41)	(0.14)	(1.50)	(1.04)
Extraversion	0.237	0.144**	0.0228	-0.311	1.501	-0.0171	-0.0213
	(1.16)	(2.14)	(1.18)	(-0.45)	(0.74)	(-0.87)	(-1.28)
Agreeableness	-0.115	0.222**	-0.0616**	0.310	3.263	0.0120	0.00631
	(-0.46)	(2.25)	(-2.23)	(0.31)	(1.19)	(0.43)	(0.29)
Neuroticism	-0.294	-0.121	-0.0225	0.377	3.230	0.0153	0.0230
	(-1.40)	(-1.38)	(-0.95)	(0.32)	(1.41)	(0.69)	(1.30)
Assertiveness	-0.317	-0.0211	-0.0475	-0.851	5.649*	-0.0465	-0.0389
	(-1.10)	(-0.21)	(-1.31)	(-0.74)	(1.76)	(-1.44)	(-1.49)
Warmth	0.135	0.0347	0.0268	-0.375	-2.352	-0.0414*	-0.00875
	(0.59)	(0.34)	(1.12)	(-0.40)	(-0.84)	(-1.68)	(-0.44)
Rationality	0.381**	-0.0102	0.00471	-0.162	2.826	0.0132	0.0130
	(2.10)	(-0.15)	(0.25)	(-0.18)	(1.30)	(0.66)	(0.84)
Growth mindset	0.521***	-0.00951	0.0379**	-0.00511	-4.726**	0.0212	-0.0109
	(2.67)	(-0.13)	(1.96)	(-0.01)	(-2.08)	(1.08)	(-0.71)
Risk propensity	0.0573	-0.0325	-0.00128	-1.095***	-1.970**	-0.0130	-0.00638
	(0.78)	(-1.13)	(-0.18)	(-2.80)	(-2.31)	(-1.64)	(-0.98)
Loss aversion	-0.0125	0.00991	0.00138	-0.119	0.135	-0.00368*	-0.00301
	(-0.66)	(1.38)	(0.72)	(-0.99)	(0.64)	(-1.69)	(-1.63)
Endowment effect	0.00390	-0.00184	-0.000274	-0.00656	-0.0764*	0.000261	0.000497
	(0.81)	(-1.18)	(-0.56)	(-0.34)	(-1.72)	(0.60)	(1.24)
Procrastination	-0.333	0.0144	0.0187	1.355	1.053	0.100***	0.0502**
	(-1.20)	(0.14)	(0.63)	(1.21)	(0.34)	(3.07)	(2.01)
Patience	-0.0572	-0.0396	-0.0123	-0.413	0.0424	0.00482	0.00651
	(-0.72)	(-1.25)	(-1.48)	(-0.90)	(0.05)	(0.60)	(1.01)
Self-consciousness	0.359	0.159*	-0.00303	-1.899	0.00156	-0.0251	-0.0387*
	(1.44)	(1.65)	(-0.12)	(-1.53)	(0.00)	(-0.97)	(-1.81)
Empathy	-0.584**	-0.135	-0.00507	3.733***	1.634	0.0447	0.0393*
	(-2.09)	(-1.20)	(-0.19)	(3.49)	(0.51)	(1.54)	(1.66)
Positive reciprocity	0.114	0.0118	-0.00675	0.250	1.092	-0.00696	-0.00736
	(1.03)	(0.21)	(-0.60)	(0.52)	(0.98)	(-0.63)	(-0.85)
Negative reciprocity	0.0000127	-0.0229	0.00855	-0.275	0.820	0.0155*	0.00394
	(0.00)	(-0.76)	(1.30)	(-0.60)	(1.06)	(1.90)	(0.68)
Altruism	-0.105	-0.0166	0.00585	0.548	0.0890	0.0326***	0.0314***
	(-1.60)	(-0.58)	(0.83)	(1.44)	(0.11)	(4.45)	(6.03)
Constant	7.664***	19.84***	0.380	13.59	-31.63	-0.0225	0.0231
	(3.71)	(21.41)	(1.55)	(1.26)	(-1.27)	(-0.09)	(0.11)
Observations	784	784	784	784	784	784	784

t statistics in parentheses

* p<0.10, ** p<0.05, *** p<0.01

The explanatory factors, displayed in the left column, are defined in Section 2 and 5. For each of the numbered columns, the constant term, while a standard component of the regression equation, does not hold a practical interpretability in this specific context. This lack of interpretability arises because many of the explanatory facors in the model are continuous and, crucially, cannot realistically assume a value of zero. Continuous variables, especially those measuring complex constructs like the Big Five personality traits rated on a Likert scale, inherently carry minimum values that are above zero and are meaningful within their specific range of measurement. Consequently, the scenario in which all independent variables would simultaneously equal zero is not just unlikely but outside the meaningful bounds of our data's context. Column (1) concerns the number of meals containing animal proteins consumed per week. (2) is the home temperature in Celsius degrees when it is less than 10 degrees outside. (3) is a binary variable equal to 1 for respondents who made insulation or renewable energy investments in their home in the 2 years preceding November 2022. (4) concerns the number of minutes participants are willing to sacrifice on top of 30 minutes to replace the car by sustainable transport. (5) is a binary variable equal to 1 for respondents who use public transport at least once a week. (6) is a binary variable equal to 1 for respondents who donate the base compensation to the purchase of carbon credits. (7) is the proportion of the lottery prize (250€) that respondents commit to donate for the purchase of carbon credits if they win the lottery.

Table C–2. Impact of demographics and personality traits on main sustainable behaviours

	(1) Avoid taking the plane	(2) Carpooling	(3) Buy organic	(4) Buy local	(5) Buy second-hand
Low income	-0.0394 (-0.79)	-0.0154 (-0.48)	**-0.0958**** (-2.00)	**-0.109**** (-2.38)	0.0166 (0.37)
High income	0.00489 (0.09)	-0.0360 (-1.06)	**0.101**** (2.04)	-0.00105 (-0.02)	-0.0447 (-0.92)
Higher education	-0.0160 (-0.31)	0.0140 (0.46)	**0.141***** (2.93)	0.0508 (1.10)	**0.0764*** (1.71)
Aged below 35	**-0.0752*** (-1.70)	0.0314 (0.98)	-0.0223 (-0.47)	**-0.159***** (-3.41)	**0.101**** (2.17)
Aged above 65	0.103 (1.08)	-0.0173 (-0.33)	0.0418 (0.48)	-0.0260 (-0.37)	**-0.243***** (-3.73)
Born in Luxembourg	-0.0748 (-1.56)	-0.0369 (-1.35)	0.0552 (1.21)	0.0560 (1.35)	-0.0473 (-1.13)
Employed	0.0746 (1.23)	0.0505 (1.51)	-0.0551 (-0.95)	-0.0299 (-0.55)	0.0131 (0.23)
Living in urban area	0.0480 (1.20)	-0.0418 (-1.60)	-0.0587 (-1.45)	**-0.0859**** (-2.26)	-0.0193 (-0.53)
Children (<18)	-0.0465 (-1.10)	-0.0198 (-0.72)	0.0632 (1.50)	-0.0525 (-1.28)	**0.108**** (2.48)
Female	0.0284 (0.66)	-0.0133 (-0.51)	0.0418 (0.96)	-0.0479 (-1.16)	**0.170***** (4.20)
Openness	0.0272 (1.12)	0.00322 (0.21)	**0.0861***** (3.64)	0.0290 (1.25)	**0.0476**** (2.24)
Conscientiousness	-0.0411 (-1.46)	0.0132 (0.62)	0.0380 (1.31)	-0.0176 (-0.76)	-0.0201 (-0.76)
Extraversion	0.0281 (1.23)	**0.0400**** (2.46)	-0.00213 (-0.09)	-0.0205 (-0.95)	0.0303 (1.36)
Agreeableness	0.0422 (1.45)	-0.0266 (-1.19)	-0.00696 (-0.23)	0.00634 (0.23)	-0.0283 (-0.96)
Neuroticism	-0.0247 (-0.94)	0.00299 (0.16)	**0.0585**** (2.26)	0.00755 (0.31)	-0.0294 (-1.22)
Assertiveness	0.0212 (0.59)	-0.0295 (-0.97)	0.000414 (0.01)	0.0231 (0.62)	0.0170 (0.49)
Warmth	**0.0681**** (2.31)	0.0260 (1.48)	-0.000888 (-0.03)	0.0313 (1.06)	0.00726 (0.24)
Rationality	0.0300 (1.23)	0.000878 (0.06)	**0.0452**** (2.09)	0.0158 (0.73)	0.00164 (0.08)
Growth mindset	-0.0139 (-0.61)	**0.0618***** (4.01)	0.00709 (0.30)	0.00567 (0.26)	0.00208 (0.10)
Risk propensity	-0.00942 (-1.00)	-0.000778 (-0.13)	-0.0105 (-1.19)	-0.00469 (-0.56)	**-0.0159*** (-1.88)
Loss aversion	0.0000406 (0.02)	-0.00234 (-1.26)	-0.00203 (-0.81)	-0.000213 (-0.09)	0.000257 (0.12)
Endowment effect	0.0000882 (0.18)	0.0000220 (0.06)	**0.000954*** (1.68)	0.000447 (0.85)	0.000209 (0.43)
Procrastination	-0.0144 (-0.40)	0.0256 (1.07)	0.0388 (0.99)	0.0147 (0.40)	**0.0565*** (1.70)
Patience	0.00229 (0.24)	0.000980 (0.15)	0.00229 (0.26)	0.000595 (0.07)	**0.0244***** (2.78)
Self-consciousness	0.0423 (1.39)	-0.0175 (-0.85)	**-0.0784***** (-2.73)	-0.0224 (-0.86)	0.000453 (0.02)
Empathy	0.00373 (0.11)	**0.0447**** (2.04)	0.0218 (0.66)	0.0418 (1.33)	0.0510 (1.51)
Positive reciprocity	-0.0113 (-0.83)	-0.00361 (-0.35)	-0.00450 (-0.35)	-0.0179 (-1.60)	-0.0156 (-1.20)
Negative reciprocity	**-0.0228**** (-2.44)	-0.00602 (-1.19)	-0.00221 (-0.24)	0.00396 (0.45)	0.000741 (0.09)
Altruism	-0.00235 (-0.26)	0.00261 (0.46)	**0.0401***** (4.88)	**0.0276***** (3.38)	-0.00678 (-0.81)
Constant	-0.0321 (-0.11)	-0.241 (-1.19)	-0.319 (-1.14)	**0.431*** (1.66)	-0.138 (-0.50)
Observations	784	784	784	784	784

t statistics in parentheses
* p<0.10, ** p<0.05, *** p<0.01

Table C–3. Impact of demographics and personality traits on other sustainable behaviours

	(1) Turn off the lights	(2) Unplug electrical devices	(3) Hang the laundry	(4) Buy in bulk	(5) Eat game
Low income	-0.0151	0.0255	-0.0377	0.0569	-0.0159
	(-0.68)	(0.54)	(-0.76)	(1.16)	(-0.43)
High income	-0.0196	**-0.102****	**-0.117****	0.0251	0.0624
	(-0.92)	(-2.05)	(-2.26)	(0.52)	(1.54)
Higher education	0.0144	**0.0974****	0.0407	-0.0259	-0.0622
	(0.78)	(1.98)	(0.76)	(-0.53)	(-1.62)
Aged below 35	-0.0000950	-0.0234	-0.0506	0.0743	**-0.0720****
	(-0.00)	(-0.50)	(-1.05)	(1.59)	(-1.98)
Aged above 65	0.0416	0.102	-0.0332	**-0.161****	-0.0392
	(1.18)	(1.26)	(-0.32)	(-1.99)	(-0.64)
Born in Luxembourg	-0.0214	-0.0435	-0.0528	0.0329	0.0365
	(-1.00)	(-0.88)	(-1.03)	(0.68)	(1.06)
Employed	-0.00885	0.000533	-0.0535	-0.0713	**0.0710***
	(-0.26)	(0.01)	(-0.83)	(-1.25)	(1.71)
Living in urban area	0.0209	-0.0278	-0.0625	**0.0637***	**-0.0491***
	(1.19)	(-0.72)	(-1.54)	(1.66)	(-1.67)
Children (<18)	0.0101	**0.0884****	-0.0126	0.0539	**-0.0825*****
	(0.51)	(2.21)	(-0.28)	(1.27)	(-2.70)
Female	0.0128	**0.0709***	0.0449	0.0476	**-0.0607***
	(0.72)	(1.66)	(0.98)	(1.11)	(-1.78)
Openness	-0.00451	-0.00172	0.0148	**0.0596*****	**0.0640*****
	(-0.39)	(-0.08)	(0.62)	(2.77)	(3.66)
Conscientiousness	0.0199	**0.0591****	0.0189	-0.00573	-0.0292
	(1.35)	(2.04)	(0.61)	(-0.20)	(-1.39)
Extraversion	**0.0230***	0.0203	0.0230	-0.0166	0.0115
	(1.71)	(0.92)	(0.91)	(-0.68)	(0.70)
Agreeableness	0.0238	-0.000796	-0.00774	**0.0732****	0.00341
	(1.56)	(-0.03)	(-0.25)	(2.51)	(0.16)
Neuroticism	**0.0304****	-0.0111	-0.0341	0.00719	0.00411
	(2.31)	(-0.40)	(-1.23)	(0.27)	(0.22)
Assertiveness	0.00641	0.00385	-0.0500	0.0120	0.0212
	(0.50)	(0.12)	(-1.47)	(0.32)	(0.97)
Warmth	-0.0171	0.0299	-0.0187	-0.00475	0.00128
	(-1.26)	(0.98)	(-0.64)	(-0.16)	(0.06)
Rationality	0.00444	-0.00377	0.00133	0.00814	0.00201
	(0.54)	(-0.17)	(0.05)	(0.36)	(0.12)
Growth mindset	0.00404	0.0152	0.0160	0.00714	-0.0263
	(0.37)	(0.67)	(0.67)	(0.33)	(-1.43)
Risk propensity	**-0.00686***	0.00205	-0.000286	-0.0129	0.0108
	(-1.73)	(0.22)	(-0.03)	(-1.41)	(1.51)
Loss aversion	**0.00307****	-0.00132	-0.00164	-0.0000935	0.00150
	(2.33)	(-0.57)	(-0.67)	(-0.04)	(0.87)
Endowment effect	0.0000328	0.000204	0.000177	0.000216	-0.000469
	(0.16)	(0.34)	(0.32)	(0.41)	(-1.41)
Procrastination	0.0149	0.0162	-0.0112	0.00178	-0.0299
	(0.96)	(0.50)	(-0.31)	(0.05)	(-1.13)
Patience	-0.00274	0.00764	0.00773	**0.0241*****	0.000606
	(-0.63)	(0.81)	(0.79)	(2.59)	(0.09)
Self-consciousness	0.0139	0.0340	**0.0607***	-0.00779	0.0223
	(0.72)	(1.11)	(1.94)	(-0.26)	(1.03)
Empathy	-0.00713	0.0294	-0.0129	0.0541	0.00910
	(-0.35)	(0.84)	(-0.36)	(1.53)	(0.35)
Positive reciprocity	0.00640	-0.00336	-0.00955	-0.00750	0.00640
	(0.84)	(-0.26)	(-0.76)	(-0.54)	(0.79)
Negative reciprocity	-0.00373	-0.0000490	-0.00238	**-0.0190****	**-0.0156*****
	(-0.87)	(-0.01)	(-0.25)	(-2.07)	(-2.75)
Altruism	0.00507	0.00683	-0.000192	0.00843	-0.00473
	(1.19)	(0.79)	(-0.02)	(0.97)	(-0.80)
Constant	**0.580*****	-0.136	**0.859****	-0.382	-0.0196
	(3.38)	(-0.44)	(2.58)	(-1.32)	(-0.11)
Observations	784	784	784	784	784

t statistics in parentheses
* p<0.10, ** p<0.05, *** p<0.01

Table C–4. Impact of demographics and personality traits on policy support

	(1) Ban on cars in city center	(2) Toll on highways	(3) Regulation on red meat	(4) VAT on meat	(5) Fossil fuel rationing	(6) Rental tax on poor insulation
Low income	-0.0398	**-0.0991****	-0.0333	-0.0754	-0.00519	-0.0313
	(-0.73)	(-2.34)	(-0.67)	(-1.56)	(-0.10)	(-0.64)
High income	0.0391	-0.00331	0.0357	0.0761	**0.110****	0.00614
	(0.71)	(-0.07)	(0.71)	(1.46)	(2.04)	(0.13)
Higher education	-0.0317	**0.0772***	0.0599	**0.121****	-0.0807	0.0175
	(-0.60)	(1.81)	(1.25)	(2.28)	(-1.52)	(0.37)
Aged below 35	-0.0147	**-0.0784****	0.0107	-0.00685	0.0722	0.00101
	(-0.29)	(-2.03)	(0.23)	(-0.15)	(1.45)	(0.02)
Aged above 65	0.0140	0.0594	**-0.149***	0.113	-0.0902	0.125
	(0.15)	(0.67)	(-1.70)	(1.13)	(-0.95)	(1.44)
Born in Luxembourg	-0.0371	-0.0116	-0.0367	**0.0949****	-0.0685	**-0.152*****
	(-0.76)	(-0.27)	(-0.79)	(1.98)	(-1.44)	(-3.34)
Employed	0.0677	**-0.132****	-0.0160	-0.00162	-0.00588	-0.0386
	(1.08)	(-2.29)	(-0.28)	(-0.02)	(-0.09)	(-0.68)
Living in urban area	-0.00569	0.0318	-0.0569	**-0.0686***	**0.0719***	-0.0453
	(-0.13)	(0.89)	(-1.40)	(-1.76)	(1.73)	(-1.17)
Children (<18)	-0.0338	-0.0205	0.0240	**0.102****	0.00538	0.0430
	(-0.72)	(-0.54)	(0.58)	(2.33)	(0.12)	(1.02)
Female	-0.00679	0.0177	**0.0999****	-0.00173	0.00410	-0.00332
	(-0.14)	(0.47)	(2.27)	(-0.04)	(0.09)	(-0.08)
Openness	-0.00843	0.0155	0.000506	0.0385	**0.0447***	0.0178
	(-0.35)	(0.80)	(0.02)	(1.56)	(1.81)	(0.84)
Conscientiousness	0.00659	-0.0326	0.0382	0.0107	-0.0243	0.000806
	(0.21)	(-1.35)	(1.35)	(0.35)	(-0.83)	(0.03)
Extraversion	**-0.0499***	0.000631	-0.0343	**-0.0488***	**-0.0933*****	-0.00708
	(-1.91)	(0.03)	(-1.54)	(-1.96)	(-3.86)	(-0.29)
Agreeableness	-0.0186	0.0338	-0.0225	-0.0327	-0.00729	0.00382
	(-0.55)	(1.22)	(-0.76)	(-1.03)	(-0.23)	(0.13)
Neuroticism	0.00151	0.00271	0.0401	0.0364	0.00569	**-0.0592****
	(0.05)	(0.12)	(1.55)	(1.37)	(0.21)	(-2.40)
Assertiveness	0.0459	0.0248	0.0415	-0.0143	0.0196	-0.00415
	(1.18)	(0.73)	(1.21)	(-0.40)	(0.52)	(-0.12)
Warmth	0.0234	**-0.0488***	0.0513	0.0316	**0.0674****	0.0233
	(0.68)	(-1.65)	(1.62)	(1.13)	(2.24)	(0.77)
Rationality	0.0155	-0.0258	0.0000124	0.00814	-0.0188	0.0171
	(0.63)	(-1.31)	(0.00)	(0.34)	(-0.77)	(0.77)
Growth mindset	0.0107	-0.0191	**0.0709*****	-0.0321	-0.0142	0.0196
	(0.44)	(-1.00)	(3.16)	(-1.36)	(-0.60)	(0.89)
Risk propensity	0.00575	0.00934	-0.0126	0.00663	0.00887	-0.00593
	(0.59)	(1.16)	(-1.43)	(0.71)	(0.92)	(-0.66)
Loss aversion	-0.00215	-0.00278	-0.00280	-0.00294	-0.00403	-0.00346
	(-0.86)	(-1.22)	(-1.19)	(-1.27)	(-1.58)	(-1.50)
Endowment effect	0.000322	0.0000498	0.000191	-0.000108	0.000710	0.000724
	(0.56)	(0.11)	(0.41)	(-0.22)	(1.38)	(1.48)
Procrastination	0.0554	0.000543	**0.0685***	**0.131*****	0.0476	**0.0825****
	(1.44)	(0.02)	(1.94)	(3.59)	(1.34)	(2.30)
Patience	**-0.0183***	-0.00275	0.000288	0.00850	-0.00392	0.00303
	(-1.84)	(-0.30)	(0.03)	(0.90)	(-0.39)	(0.32)
Self-consciousness	0.0321	0.00342	-0.00374	**-0.0654****	0.0270	**0.0578****
	(1.03)	(0.12)	(-0.13)	(-2.16)	(0.90)	(2.07)
Empathy	0.0309	0.0182	0.0354	0.00683	-0.0101	-0.0349
	(0.81)	(0.63)	(1.05)	(0.20)	(-0.29)	(-0.97)
Positive reciprocity	-0.00854	0.00985	-0.0140	**0.0190***	-0.00371	0.00419
	(-0.66)	(0.97)	(-1.19)	(1.66)	(-0.29)	(0.33)
Negative reciprocity	**0.0173***	0.00451	0.00475	0.0142	-0.00168	-0.00977
	(1.76)	(0.53)	(1.59)	(1.42)	(-0.19)	(-1.23)
Altruism	**0.0275*****	0.00856	**0.0344*****	**0.0309*****	**0.0387*****	**0.0250*****
	(2.94)	(1.31)	(4.07)	(3.82)	(4.33)	(2.92)
Constant	0.0222	0.236	-0.311	-0.304	0.158	0.336
	(0.07)	(0.96)	(-1.14)	(-1.02)	(0.51)	(1.08)
Observations	784	784	784	784	784	784

t statistics in parentheses
* p<0.10, ** p<0.05, *** p<0.01

Table C–5. Impact of demographics and personality traits on other outcomes

	(1) Energy Perf. Certificate A, B or C	(2) Daily use of public transport or soft mobility	(3) Owns a full electric or hydrogen car	(4) Sufficiency index
Low income	-0.0565 (-1.47)	-0.0416 (-0.83)	0.0410 (1.10)	1.305 (0.85)
High income	**0.0874*** (1.90)	-0.0485 (-0.90)	-0.0101 (-0.26)	-0.499 (-0.31)
Higher education	0.0201 (0.50)	0.0684 (1.37)	-0.00139 (-0.04)	0.376 (0.22)
Aged below 35	0.0616 (1.48)	**0.0960**** (1.98)	0.0293 (0.82)	0.685 (0.43)
Aged above 65	-0.0106 (-0.20)	-0.0123 (-0.13)	**-0.128*** (-1.95)	-4.774 (-1.56)
Born in Luxembourg	-0.0139 (-0.36)	**-0.109**** (-2.24)	0.0150 (0.42)	-2.049 (-1.29)
Employed	0.0603 (1.40)	-0.0670 (-1.03)	-0.0284 (-0.56)	**-5.865***** (-2.77)
Living in urban area	-0.0367 (-1.08)	0.0680 (1.62)	**0.0636**** (2.02)	1.222 (0.96)
Children (<18)	0.0529 (1.41)	0.0315 (0.69)	**-0.0709**** (-2.30)	**2.950**** (2.06)
Female	-0.0320 (-0.90)	-0.0263 (-0.59)	0.0547 (1.56)	**4.448***** (3.04)
Openness	0.0115 (0.63)	0.0161 (0.66)	-0.00393 (-0.24)	-0.0731 (-0.10)
Conscientiousness	**0.0382*** (1.65)	-0.0276 (-0.87)	-0.0351 (-1.48)	**2.847***** (2.94)
Extraversion	**0.0327*** (1.77)	0.0142 (0.54)	-0.0259 (-1.39)	-0.354 (-0.45)
Agreeableness	-0.0403 (-1.54)	0.0338 (0.99)	-0.00800 (-0.30)	1.622 (1.38)
Neuroticism	0.00152 (0.07)	**0.0483*** (1.74)	0.0148 (0.77)	0.885 (1.00)
Assertiveness	-0.0495 (-1.54)	**0.0753*** (1.87)	**0.0570**** (2.07)	**3.807***** (2.99)
Warmth	-0.0161 (-0.66)	0.0326 (0.99)	-0.0101 (-0.45)	1.875 (1.64)
Rationality	-0.00278 (-0.14)	**-0.0447*** (-1.84)	-0.00611 (-0.33)	-0.414 (-0.51)
Growth mindset	0.0203 (1.05)	-0.0126 (-0.50)	**-0.0424**** (-1.98)	0.619 (0.81)
Risk propensity	**0.0130*** (1.78)	-0.00319 (-0.33)	**0.0164**** (2.03)	**-0.978***** (-3.04)
Loss aversion	-0.00253 (-1.27)	-0.00407 (-1.55)	**0.00328**** (2.08)	0.0971 (1.17)
Endowment effect	0.000456 (1.11)	-0.000607 (-1.19)	0.000112 (0.29)	0.0139 (0.66)
Procrastination	**-0.0546*** (-1.86)	**-0.0629*** (-1.73)	-0.00723 (-0.27)	0.959 (0.75)
Patience	0.00660 (0.87)	-0.0147 (-1.43)	0.0104 (1.44)	**0.907***** (2.91)
Self-consciousness	0.00972 (0.39)	0.00215 (0.07)	**-0.0504*** (-1.93)	**-2.365**** (-2.35)
Empathy	-0.0105 (-0.36)	0.0145 (0.40)	0.0370 (1.32)	1.172 (0.95)
Positive reciprocity	-0.00259 (-0.29)	-0.000600 (-0.05)	-0.000639 (-0.07)	-0.0676 (-0.17)
Negative reciprocity	-0.000211 (-0.03)	-0.00949 (-1.02)	0.00780 (1.22)	-0.119 (-0.37)
Altruism	-0.00794 (-1.09)	**0.0145*** (1.65)	-0.00799 (-1.27)	**0.552**** (2.02)
Constant	0.298 (1.35)	0.0471 (0.16)	0.202 (0.97)	13.54 (1.50)
Observations	784	784	784	784

t statistics in parentheses
* p<0.10, ** p<0.05, *** p<0.01

C.7 Correlation matrices

In this part of the Appendix, we provide correlation measures between traits and outcome variables using Spearman correlations. Spearman correlations are often considered significant when the p-value is less than 0.05 (5%). This means there's less than a 5% probability that the observed correlation occurred due to random variation in the data, suggesting a real underlying relationship between the variables. This is the threshold we applied in the study.

The Spearman correlation coefficient can range from -1 to 1. A value of 1 indicates a perfect positive correlation, meaning as one variable increases, the other also increases consistently. A value of -1 indicates a perfect negative correlation, where one variable increases as the other

decreases. A value of 0 suggests no correlation, meaning there is no linear relationship between the variables. Values between these extremes indicate varying degrees of positive or negative correlation. The closer the coefficient is to -1 or 1, the stronger the correlation.

	Animal protein consumption	Home temperature (winter)	Home investments (pre-2023)	Mobility: hypothetical extra time	Public transport weekly	Donation of base earnings	Donation of lottery gains (%)
Openness	-.01683008	-.03207221	.02355811	-.03321394	.00066289	.0164156	.0664191
Conscientiousness	-.06212504	.04226068	.00530883	.02323078	.0353797	.01935504	.02669218
Extraversion	.03405868	**.07786949**	.02730045	-.02493833	.03506076	-.02148257	-.00139226
Agreeableness	-.02443428	**.08126853**	-.05341738	**.07057339**	**.08837592**	.04922539	.04645697
Neuroticism	-.03001854	-.06861572	-.01037109	-.00333775	-.02014265	-.02635109	-.00508805
Assertiveness	.00947381	.06450421	.01765572	.00353547	.02701927	.00292484	-.0150329
Warmth	**-.08308291**	.04434255	.02953801	.06434375	-.02502628	-.02157429	.05157709
Rationality	**.12031282**	-.01059435	-.01239593	.02516079	**.08380802**	.0376279	.01042461
Growth mindset	**.08594427**	-.01298991	.02695305	-.01856106	-.01983372	.00583233	.02810812
Risk propensity	.04429049	-.04496649	.02332199	**-.09071077**	-.05085873	-.02388286	-.01597619
Loss aversion	-.01761381	.03981387	.04906903	-.02135906	.01943914	-.06006515	**-.0839973**
Endowment effect	-.03012231	-.05504571	.0148031	.01931437	-.01204832	.04119779	**.07143047**
Procrastination	.01122094	-.01883161	.01876292	.05727074	-.01685261	**.09666709**	**.08210353**
Patience	.06228727	-.06847769	-.00331867	.0106039	.04728006	.02984947	.04884487
Self-consciousness	.03609777	-.01498485	-.03097744	.01383119	.00329233	-.0190029	-.03041425
Empathy	**-.0948548**	-.0468986	.02097713	**.18448797**	.03223379	**.11298627**	**.1182642**
Positive reciprocity	.00847167	.00943237	-.0296314	.06333944	.01018129	-.00865936	-.00281743
Negative reciprocity	-.03962721	-.00008176	.01719918	**.08631271**	.01797881	**.13926797**	**.10574242**
Altruism	-.04976685	-.04506171	-.00983497	**.13547368**	.0358159	**.23062978**	**.25120764**

Table C–6. Correlation matrix of main behaviours (significant correlations in bold)

	Avoid taking the plane	Carpooling	Buy organic	Buy local	Buy second-hand
Openness	**.09198281**	.04705317	**.18150815**	**.10402802**	**.07752791**
Conscientiousness	-.01975559	.02421267	.03937853	-.00331228	-.00388573
Extraversion	.05454845	**.07895098**	.04570761	.02932302	.0456562
Agreeableness	.06116117	.02284446	.01866404	.06126223	-.02911808
Neuroticism	**-.07172305**	.01032679	-.00141454	**-.07027226**	-.03700651
Assertiveness	.05801188	.01440135	.06557672	**.08034438**	-.01001848
Warmth	**.07441061**	.05352317	.04235493	.04435335	.04027332
Rationality	.04883987	.03103585	**.08177472**	.03777554	-.00305024
Growth mindset	-.00873496	**.11400499**	.03930697	-.00688526	.02741618
Risk propensity	.00022676	-.00136692	.0001914	.01864756	-.0259239
Loss aversion	.0216132	-.01141952	-.00454174	-.01795758	-.00229133
Endowment effect	-.01271874	.03795558	.04749651	.02818318	.04952963
Procrastination	.00924783	.05484998	.02420759	.00416267	.05225842
Patience	.00163477	.0515591	.06192968	.02150804	**.1038437**
Self-consciousness	-.02858016	-.03084558	**-.09420098**	**-.10989572**	.00902274
Empathy	.05285771	**.07856474**	.06528059	.05767008	**.08459334**
Positive reciprocity	-.01597554	.04235265	.0018999	-.01177557	.00581425
Negative reciprocity	-.01639534	-.00745158	.02399467	.010119	-.00052899
Altruism	.03342345	.02508273	**.2064632**	**.1293394**	.05445689

Table C–7. Correlation matrix of main sustainable behaviours (significant correlations in bold)

	Turn off the lights	Unplug electrical devices	Hang the laundry	Buy in bulk	Eat game
Openness	-.02394673	.04038295	.04191507	**.11785124**	**.10567719**
Conscientiousness	.04795231	**.12142736**	.04962239	.02904749	-.02682349
Extraversion	.04579459	.02401933	-.00381037	.04984008	.04153886
Agreeableness	.04164752	.01139384	-.03795512	**.09473927**	.0113692
Neuroticism	.05704233	-.022107	.03411685	-.04057347	-.03382394
Assertiveness	.01011785	.0537564	-.04025473	.0361994	.06422689
Warmth	.01573192	**.07282203**	-.00820379	.04469184	.01359813
Rationality	.00236378	.00687307	.01309213	.01494269	.01529555
Growth mindset	.0264178	.02227219	.02466347	.0697521	.00658624
Risk propensity	-.04040248	-.01252454	-.00964968	.02671225	.06808782
Loss aversion	**.08318619**	-.03792034	-.01768825	-.02740821	.01103462
Endowment effect	-.04205669	.01027826	-.00571156	.01909263	**-.08269279**
Procrastination	.00849496	-.02157424	-.02203484	-.0212617	-.06479635
Patience	-.01716031	.04565952	.02605879	**.09191715**	.00808154
Self-consciousness	-.0303595	-.03003431	**.08235657**	-.03683438	-.02454222
Empathy	.04651304	**.10764376**	.03056088	**.11512945**	.01400157
Positive reciprocity	.01202803	.03964795	.03912251	.01538836	.05784103
Negative reciprocity	.00481399	-.02014691	.00038745	.01574637	**-.10821687**
Altruism	.0122076	**.08389469**	.02369926	**.0789883**	-.03967738

Table C–8. Correlation matrix of other sustainable behaviours (significant correlations in bold)

	Ban on cars in city center	Toll on highways	Regulation on red meat	VAT on meat	Fossil fuel rationing	Rental tax on poor insulation
Openness	.05005414	.02633388	.04904203	.05205572	.05054695	.05763447
Conscientiousness	-.00265118	-.01803264	.05078267	-.02617282	-.02686226	.01167507
Extraversion	-.03102946	.04386463	-.03050495	-.02311049	-.04719978	-.05073541
Agreeableness	.04236906	**.08801798**	-.02501855	-.0379122	-.00350556	.02728641
Neuroticism	-.02895172	**-.07002518**	.02422411	.01255085	-.00696447	**-.07032172**
Assertiveness	.00195564	.06082532	-.0160069	.01120888	-.03220774	.04867511
Warmth	.0535841	.01545183	**.10308253**	.03301258	**.08613**	.01667665
Rationality	-.00020192	-.03952599	.03110768	**.11289174**	-.00604664	**.08927182**
Growth mindset	.03256125	-.01513701	**.10234125**	-.05527343	.00912379	.03594943
Risk propensity	.0070238	**.09938449**	-.03283988	.06862637	.06278895	.02154773
Loss aversion	-.03326383	-.06013388	-.01004207	**-.0772076**	-.06187409	-.04710745
Endowment effect	.01816641	-.00250587	.06780219	-.00781247	.06889344	.05218862
Procrastination	**.09663461**	.01550773	**.07415104**	**.10617805**	.0682884	**.07469832**
Patience	.03820643	.04597479	.05126359	**.13906868**	**.08162487**	**.11460157**
Self-consciousness	.02500226	-.03324348	**.07632799**	-.02632664	**.07596197**	.03435525
Empathy	**.12142343**	.04547475	**.08856377**	.04466978	.06686604	.0295086
Positive reciprocity	.03105177	.02742524	.03627652	.05228819	.05689758	-.0049739
Negative reciprocity	**.11602903**	**.07925652**	.04981157	**.11256044**	.06439624	.03742136
Altruism	**.16944507**	**.1058999**	**.19522569**	**.19635219**	**.20426492**	**.13456508**

Table C–9. Correlation matrix of policy support (significant correlations in bold)

	Energy Perf. Certificate A, B or C	Daily use of public transport or soft mobility	Owns a full electric or hydrogen car	Sufficiency index
Openness	.006335	.04383783	.00903285	**.09197777**
Conscientiousness	.04718136	-.00942588	-.01500216	**.19015576**
Extraversion	**.07704454**	.04753717	-.03921685	**.08717631**
Agreeableness	-.06519447	.04386241	.04664949	**.16605446**
Neuroticism	-.0172609	-.00592391	.00594974	**-.10079146**
Assertiveness	.02140635	.06794757	.05484718	**.16984837**
Warmth	-.02059919	.03139554	-.02865373	**.19792688**
Rationality	.01258296	**-.07282198**	-.03422188	**-.07833247**
Growth mindset	**.07168335**	.04384496	-.02203955	.06592843
Risk propensity	**.08795798**	.01389117	**.08440784**	-.0668226
Loss aversion	-.04437573	-.01325634	.03289484	.06537018
Endowment effect	.00405153	-.02853758	.0257271	**.09477992**
Procrastination	-.03117504	**-.08984612**	.00066977	**-.08481856**
Patience	.04681646	.00161669	.05114942	**.10863657**
Self-consciousness	.02841403	-.0175979	-.02760528	**-.12453452**
Empathy	-.0021187	.02378966	.01637624	**.18691004**
Positive reciprocity	-.04941241	.00800408	-.00542954	**.12190382**
Negative reciprocity	.00963507	-.02639608	.04797709	**.0788087**
Altruism	-.02832532	.05149347	-.00519262	**.19147975**

Table C–10. Correlation matrix of other outcomes (significant correlations in bold)

C.8 Variance Inflation Factors (VIF)

In this final subsection, we provide the Variance Inflation Factors (VIF's) of our two sets of covariates. The first column only includes Demographic characteristics, providing the VIF's of the regressors used in Section 4. The second column adds the personality traits to the initial list, which corresponds to the regressors used in Section 5. To interpret this table, note that values above 5 are often taken as a sign that the variable has a significant multicollinearity with other predictors in the model. Some sources suggest a stricter threshold, using 4 or even 2.5 as a cutoff. The fact that our highest value is 2.11 suggests that no specific treatment of our regressors is required.

Variable	Demographics	Demographics + Traits
Low income	1.46	1.54
High income	1.47	1.57
Higher education	1.31	1.39
Aged below 35	1.17	1.31
Aged above 65	1.79	2.11
Born in Luxembourg	1.26	1.34
Employed	1.88	1.98
Living in urban area	1.14	1.14
Children (<18)	1.15	1.19
Female	1.03	1.28
Openness	-	1.14
Conscientiousness	-	1.34
Extraversion	-	1.36
Agreeableness	-	1.39
Neuroticism	-	1.45
Assertiveness	-	1.72
Warmth	-	1.39
Rationality	-	1.32
Growth mindset	-	1.05
Risk propensity	-	1.41
Loss aversion	-	1.08
Endowment effect	-	1.12
Procrastination	-	1.17
Patience	-	1.37
Self-consciousness	-	1.72
Empathy	-	1.27
Positive Reciprocity	-	1.16
Negative Reciprocity	-	1.21
Altruism	-	1.32

Table C–11. VIF

Appendix D　Section 6: Regression tables

Table D–1. Behaviors: Intentions (Wave 2)

	(1) Animal proteins: intentions	(2) Home temperature (winter): intentions	(3) Use of public transport: intentions	(4) Use of soft mobility: intentions
NORMS	-0.807***	-0.339**	0.127	-0.206*
POLICY	-0.278	-0.228	0.125	-0.0618
Low income	-0.449	-0.149	0.150	0.00616
High income	-0.0819	0.128	0.109	-0.0349
Higher education	0.0743	-0.326**	0.250**	0.313***
Aged below 35	0.635**	-0.245*	0.145	-0.00808
Aged above 65	-1.161***	0.309	-0.282*	-0.348*
Born in Luxembourg	-0.853***	0.332**	-0.0689	-0.0337
Active	0.108	-0.0563	-0.318***	-0.370***
Living in urban area	0.368	-0.0720	0.690***	0.320***
Hh with children (<18)	-0.322	0.0558	-0.186*	-0.158*
Woman	-1.476***	0.133	0.0620	-0.00853
Constant	6.864***	20.09***	2.564***	3.788***
Observations	912	912	912	912

* p<0.10, ** p<0.05, *** p<0.01

Table D–2. Other sustainable habits: Intentions (Wave 2)

	(1) Avoid taking the plane	(2) Carpooling	(3) Buy organic	(4) Buy local	(5) Buy second-hand
NORMS	-0.0388	0.0209	0.0535	**0.0865****	0.0227
POLICY	0.0423	**0.0592***	-0.00534	0.0196	0.00796
Low income	0.0339	0.0159	-0.0605	-0.0453	0.0390
High income	**0.0897***	-0.00787	**0.167*****	-0.0180	0.0226
Higher education	0.00689	0.0443	**0.0808***	0.00592	**0.101****
Aged below 35	0.0355	**0.0843****	-0.00300	**-0.129*****	**0.0738***
Aged above 65	0.00576	**-0.0879*****	0.0733	0.0773	**-0.130****
Born in Luxembourg	**-0.0991****	-0.0391	-0.0184	0.0288	0.0000632
Active	-0.00209	-0.0192	0.00655	-0.0282	0.0228
Living in urban area	**0.131*****	-0.0130	**-0.0766***	-0.0367	0.00616
Hh with children (<18)	-0.0130	-0.00754	0.0630	0.0306	**0.152*****
Woman	-0.0294	-0.0312	**0.0754***	0.0129	**0.158*****
Constant	**0.245*****	**0.103****	**0.347*****	**0.758*****	0.0405
Observations	912	912	912	912	912

* p<0.10, ** p<0.05, *** p<0.01

Table D–3. Other sustainable habits: Intentions (Wave 2)

	(1) Turn off the lights	(2) Unplug electrical devices	(3) Hang the laundry	(4) Buy in bulk	(5) Eat game
NORMS	-0.0321	-0.0688	0.0555	-0.0153	0.0310
POLICY	0.0183	-0.0228	-0.00797	-0.0500	0.0198
Low income	**-0.0545****	-0.0593	-0.0248	-0.0223	-0.0490
High income	-0.0309	**-0.108****	**-0.0859***	0.0664	-0.0245
Higher education	0.0210	-0.0122	0.0170	-0.00194	0.0261
Aged below 35	-0.00410	0.0402	**0.0686***	0.0640	-0.00848
Aged above 65	-0.0178	0.0930	-0.0513	-0.0865	-0.0535
Born in Luxembourg	0.0132	-0.0441	-0.0262	-0.0292	0.0151
Active	-0.0375	-0.0219	0.0297	0.0427	0.0405
Living in urban area	-0.0119	-0.00740	**-0.0866****	0.0362	0.0155
Hh with children (<18)	0.0178	0.0506	0.0198	-0.0454	**-0.113*****
Woman	0.0310	**0.0631***	**0.113*****	**0.0722***	-0.0362
Constant	**0.948*****	**0.799*****	**0.654*****	**0.331*****	**0.222*****
Observations	912	912	912	912	912

* p<0.10, ** p<0.05, *** p<0.01

Table D–4. Behaviors (Wave 3)

	(1) Animal proteins	(2) Home investments (after Wave 2)	(3) Home temperature (summer)	(4) Mobility time	(5) Use of public transport	(6) Use of soft mobility
NORMS	-0.966***	-0.0556	-0.359	0.184	-0.00764	0.0970
POLICY	-0.582	0.0304	-0.0267	-0.234	0.0293	0.170
Low income	-0.251	-0.0833**	0.143	0.657	0.0441	0.116
High income	0.149	0.0219	0.223	-0.695	0.0156	0.109
Higher education	0.0137	0.0371	0.532**	-1.515	0.517***	0.185
Aged below 35	0.835**	-0.0583*	0.358	1.392	0.102	-0.0418
Aged above 65	-0.940*	-0.0473	0.0681	-2.986	-0.346**	-0.0150
Born in Luxembourg	-0.782**	-0.00803	-0.119	1.469	-0.0620	-0.0809
Active	0.238	-0.0816*	0.0425	-5.447***	-0.294**	-0.184
Living in urban area	0.109	-0.0810***	0.404**	0.492	0.756***	0.272***
Hh with children (<18)	-0.105	0.0534*	0.0748	0.698	-0.0503	0.0107
Woman	-1.581***	-0.0557*	-0.135	2.882***	0.0334	0.0596
Constant	7.775***	0.350***	21.41***	23.08***	2.142***	3.426***
Observations	912	912	912	912	912	912

* p<0.10, ** p<0.05, *** p<0.01

Table D–5. Other sustainable habits (Wave 3)

	(1) Avoid taking the plane	(2) Carpooling	(3) Buy organic	(4) Buy local	(5) Buy second-hand
NORMS	0.00416	-0.0333	0.00477	0.0752	0.0135
POLICY	0.0279	-0.0118	-0.00408	**0.0976****	-0.0317
Low income	**-0.0603***	0.0202	-0.0440	-0.0410	0.0228
High income	0.0243	-0.00697	0.0770	0.00271	0.0392
Higher education	0.0268	-0.0138	**0.186*****	**0.101****	0.0375
Aged below 35	0.0244	**0.0890*****	-0.0530	-0.0306	**0.0804***
Aged above 65	0.00689	-0.0167	0.0949	0.0603	-0.114
Born in Luxembourg	**-0.0607****	0.00713	**0.0849***	0.00496	0.0171
Active	0.0419	-0.0199	-0.0617	**-0.117***	0.0115
Living in urban area	**0.0842*****	-0.0324	-0.0526	**-0.0927****	-0.00991
Hh with children (<18)	-0.0414	0.00401	0.0560	-0.00313	**0.104*****
Woman	-0.0163	0.00178	0.0434	0.00446	**0.168*****
Constant	**0.106****	**0.141*****	**0.316*****	**0.660*****	0.0770
Observations	912	912	912	912	912

* p<0.10, ** p<0.05, *** p<0.01

Table D–6. Other sustainable habits (Wave 3)

	(1) Turn off the lights	(2) Unplug electrical devices	(3) Hang the laundry	(4) Buy in bulk	(5) Eat game
NORMS	0.00690	-0.00596	-0.0165	-0.0181	0.0284
POLICY	-0.00706	-0.0306	0.00909	-0.0626	0.0242
Low income	-0.0286	-0.00277	-0.0172	0.0157	**-0.0588***
High income	0.00103	-0.0742	-0.0774	0.0734	-0.0156
Higher education	0.0375	0.0164	0.0595	0.0124	0.0155
Aged below 35	0.00879	0.0205	-0.0304	0.0547	-0.0274
Aged above 65	-0.0863	0.112	-0.0966	-0.0359	-0.0329
Born in Luxembourg	-0.00841	-0.0174	-0.0182	**0.0796***	-0.0214
Active	-0.0361	-0.0493	-0.0189	-0.0230	-0.0203
Living in urban area	-0.0392	0.0110	**-0.0694***	0.0101	-0.0134
Hh with children (<18)	-0.0119	**0.106*****	0.0301	-0.0619	-0.0410
Woman	0.0137	0.0488	**0.104*****	**0.116*****	-0.0267
Constant	**0.943*****	**0.653*****	**0.700*****	**0.273*****	**0.195*****
Observations	912	912	912	912	912

* p<0.10, ** p<0.05, *** p<0.01

Table D–7. Acceptance of financial sacrifices for the purchase of carbon credits (Wave2)

	(1) Donation of base earnings	(2) Donation of lottery gains (%)
NORMS	-0.0230	-2.589
POLICY	**-0.0763***	-2.385
Low income	-0.0541	-3.929
High income	**0.141***	**12.93***
Higher education	0.00296	5.806
Aged below 35	**-0.0993***	**-6.662**
Aged above 65	**0.264***	**13.78**
Born in Luxembourg	0.0246	1.519
Active	**-0.129**	**-10.89***
Living in urban area	**0.0773**	1.756
Hh with children (<18)	**-0.0744**	**-6.628**
Woman	**0.0567***	**6.935**
Constant	**0.353***	**28.76***
Observations	912	912

* $p<0.10$, ** $p<0.05$, *** $p<0.01$

Table D–8. Acceptance of financial sacrifices for the purchase of carbon credits (Wave 3)

	(1) Donation of base earnings	(2) Donation of lottery gains (%)
NORMS	-0.0123	-3.545
POLICY	-0.0370	-3.281
Low income	-0.0348	-2.138
High income	**0.154***	**12.50***
Higher education	0.0357	3.144
Aged below 35	**-0.0887***	**-8.859***
Aged above 65	0.134	**14.74**
Born in Luxembourg	0.0564	0.682
Active	**-0.178***	**-10.83***
Living in urban area	0.0381	2.842
Hh with children (<18)	**-0.0743**	-4.325
Woman	0.0489	**7.802***
Constant	**0.339***	**30.77***
Observations	912	912

* $p<0.10$, ** $p<0.05$, *** $p<0.01$

Table D–9. Policy support (Wave 2)

	(1) Regulation on red meat	(2) VAT on meat	(3) Fossil fuel rationing	(4) Rental tax on poor insulation	(5) Ban on cars in city center	(6) Toll on highways	(7) Carbon tax
NORMS	**0.0808***	0.00313	0.0405	0.0119	-0.0659	-0.00645	-0.175
POLICY	**0.130*****	0.0207	**0.133*****	**0.0775***	0.0218	0.0280	-0.0225
Low income	0.0561	-0.00882	0.0481	-0.0544	0.0549	-0.0137	-0.0934
High income	0.0426	0.0762	0.0837	-0.0558	0.0549	**0.0851***	**0.268****
Higher education	0.0424	**0.148*****	-0.00585	0.0679	-0.0212	-0.00277	**0.348*****
Aged below 35	**0.0920****	-0.0539	0.00634	-0.0226	**-0.0747***	-0.0387	-0.135
Aged above 65	-0.0525	-0.00848	-0.0527	0.0260	-0.0602	0.0645	-0.0941
Born in Luxembourg	-0.00214	0.0753	-0.00700	**-0.107****	**-0.106****	**0.101****	-0.0191
Active	-0.0331	0.0525	-0.0251	-0.00525	-0.0229	-0.0598	-0.193
Living in urban area	-0.0338	-0.0471	**0.110*****	**0.0660***	0.0507	0.0514	**0.169***
Hh with children (<18)	0.0319	0.0395	0.0137	0.0480	-0.0211	0.00477	-0.00364
Woman	**0.147*****	0.0268	0.0433	0.00978	-0.0153	-0.0000231	-0.0387
Constant	**0.458*****	**0.202*****	**0.400*****	**0.676*****	**0.627*****	**0.259*****	**3.108*****
Observations	912	912	912	912	912	912	912

* p<0.10, ** p<0.05, *** p<0.01

Table D–10. Policy support (Wave 3)

	(1) Regulation on red meat	(2) VAT on meat	(3) Fossil fuel rationing	(4) Rental tax on poor insulation	(5) Ban on cars in city center	(6) Toll on highways
NORMS	0.114**	-0.00836	0.0760	0.0122	0.0242	0.0265
POLICY	0.0952**	0.0224	0.120**	-0.00996	-0.00132	-0.0104
Low income	-0.0432	-0.0523	0.0379	-0.0821	-0.000176	-0.0559
High income	-0.0349	0.120**	0.0909*	0.00570	0.0310	0.0868*
Higher education	0.0102	0.0282	0.0160	0.0294	0.0292	0.0709
Aged below 35	0.0317	-0.0369	0.0185	0.0326	-0.0539	-0.0628
Aged above 65	-0.0789	0.116	-0.111	-0.00761	-0.111	0.136
Born in Luxembourg	-0.0417	0.00300	-0.0639	-0.0942*	-0.0434	0.112**
Active	-0.0924*	0.0743	-0.0230	0.0120	-0.0607	-0.0293
Living in urban area	-0.0822**	-0.0634	0.0326	0.00174	0.0757*	0.0580
Hh with children (<18)	0.0598	0.0840**	0.0102	0.0498	0.0272	-0.0208
Woman	0.0974**	0.0820**	0.0158	-0.0559	0.0149	-0.00448
Constant	0.608***	0.277***	0.371***	0.581***	0.520***	0.214***
Observations	912	912	912	912	912	912

* $p<0.10$, ** $p<0.05$, *** $p<0.01$