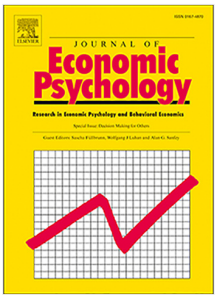
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Society might be greener than you think

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Revised manuscript Journal Pre-proof

Society might be greener than you think*

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Abstract

Misperceptions of others' concern about climate change have been identified as key barriers to climate action. We study whether people also misperceive (i) others' level of sustainable behavior, (ii) the level of sustainable behavior others deem appropriate, and (iii) others' support for policies that restrict or tax individual non-sustainable behavior. We address these questions in a pre-registered online study with 1,292 Luxembourg residents. Participants reported their own behaviors, personal norms, and policy support, and estimated the same for others across three domains with high carbon-saving potential: reducing animal protein consumption, reducing home heating, and using public transportation. In line with pluralistic ignorance, we find that a majority of participants systematically and substantially underestimate others' sustainability. Participants also underestimate how much others donate to offset carbon emissions in an incentivized donation task. Consistent with a false consensus effect, the least sustainable individuals strongly underestimate others' sustainability, while the most sustainable underestimate less and even overestimate in some domains.

Keywords: Climate change; Pro-environmental behavior; Social expectations; Misperceived norms; Pluralistic ignorance

JEL Codes: C90, D83, D90, Q50

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1 Introduction

Around the world, people tend to underestimate how much "others" care about addressing climate change. This underestimation extends to others' concern about it (Geiger and Swim 2016, Leviston et al. 2013, Sparkman et al. 2022), their willingness to contribute money to fight it (Andre et al. 2024a,b), and their support for climate policies (Sokoloski et al. 2018, Sparkman et al. 2022). There is a systematic misperception of the social norms surrounding climate change mitigation.

This misperception of others' concern about climate change has been identified as a barrier to climate action because, in the context of collective action, our expectations about others matter: both *empirical expectations* (beliefs about what others do) and *normative expectations* (beliefs about what others deem appropriate to do) influence our own behavior (Bicchieri 2005, 2016, Biel and Thøgersen 2007, Thøgersen 2008). In other words, many of our preferences are conditional, and this holds true for pro-environmental behaviors (see Cialdini and Jacobson 2021, Saracevic and Schlegelmilch 2021, for recent reviews on the topic). Misperceived social norms can therefore hinder climate change mitigation efforts, making it essential for scientists and practitioners to understand and address them (Andre et al. 2024b, Clayton et al. 2015, Geiger and Swim 2016). While many studies on misperception focused on general *concerns* and *attitudes* about climate change, very few examine misperception related to everyday sustainable *behaviors*. Similarly, research on misperception of policy support typically investigates policies that target companies or public institutions and benefit individuals (e.g., Sokoloski et al. (2018), Sparkman et al. (2022)). To the best of our knowledge, no studies have examined policies that target, and potentially constrain, individual behavior. We examine these two dimensions here, in the context of Luxembourg, a high-income country with notoriously high carbon emissions per capita.

Our study examines whether people misperceive how much others' engage in everyday sustainable behaviors, their personal norms regarding these behaviors, and their support for policies restricting non-sustainable behaviors (we use the term *sustainable behaviors* to refer to carbon-saving and pro-environmental actions, and *non-sustainable behaviors* to denote carbon-intensive practices). Studying misperception in the domain of actual behaviors is relevant for at least two reasons. First, household consumption decisions account for nearly 75% of global carbon emissions (Druckman and Jackson 2016, Dubois et al. 2019, Hertwich and Peters 2009), particularly in the areas of food, housing, and transportation. There is broad consensus that systematic and sustained behavioral change, together with climate policies targeting household consumption, can generate substantial emission reductions, especially in high-income countries. For instance, shifting to a vegetarian diet, reducing home heating needs, and using public transport instead of commuting by car can save up to 4.8 tonnes of CO_2eq per year—around 37% of the average annual emissions of a Luxembourg resident (Hitaj et al. 2022). These figures underscore the central role of individual behavior in climate mitigation. Despite this potential, behavioral change remains limited, making it essential to understand the barriers that hinder its adoption, including possible misperception surrounding both sustainable behaviors and public support for policies addressing them (Clayton et al. 2015). Second, unlike attitudes or intentions that are private and unobserved, everyday behaviors should be observable: individuals should, in principle, hold more accurate beliefs about what others do. Persistent misperception in this context therefore raises important questions about social information and norm

formation.

Attitudes towards policies that would constrain behavior are harder to observe, but most people would expect that policy proposals that restrict non-sustainable behaviors require individuals to bear personal costs or constrain lifestyle and are therefore less popular than other types of climate policies (Swim and Geiger 2021).

The extent to which this is true has not yet been researched and is therefore difficult to gauge, making it hard to predict whether misperception may arise in this context too.

Our analysis is based on a well-powered, pre-registered online survey (N = 1,292) among Luxembourg residents and cross-border workers. Luxembourg residents and workers constitute a relevant population for studying misperceptions related to sustainable social norms. A growing body of evidence shows that carbon emissions are highly unequally distributed, with the richest segments of the population contributing disproportionately to climate change. According to a recent Oxfam report, the richest 1% of the global population is responsible for more carbon emissions than the poorest 66% (Khalfan et al. 2023). Moreover, while high-income countries account for 40% of global consumption-based carbon emissions, the contribution of low-income countries is only 0.4%. Similar findings are reported by Schöngart et al. (2025), who show that the wealthiest 10% are responsible for two-thirds of emissions. Not only do high-income countries contribute disproportionately to global emissions, but they are also less willing to contribute financially to climate change mitigation (Andre et al. 2024a). In line with this pattern, Luxembourg ranks as the second-highest country in the world in terms of average annual salary (MIMCO Capital 2023) and it is the highest per-capita emitter in the European Union and ranks 20th globally (Crippa et al. 2023). The small size of the country also leads us to focus on misperception at a relatively small scale and this, in turn, reduces the risk of confounding (local) misperception from broader regional differences in norms and behaviors at higher geographies. Luxembourg can therefore be pertinent to study barriers to sustainable behavioral change and the role of norm misperceptions in shaping sustainable behaviors in rich, emission-intensive countries.

Participants in our study first provided self-reports of their behavior levels in three domains with high carbon-emission reduction potential (Hitaj et al. 2022): weekly vegetarian consumption, home heating reduction, and use of public and soft mobility. This served as our main measure of behavior. Additionally, participants could choose whether to donate a portion of a €250 lottery prize to a carbon-offset project. This allowed us to obtain an incentivized behavioral measure to complement self-reported data. Subsequently, participants reported what they believed to be the ethically appropriate behavior levels from a sustainability perspective for the previously mentioned behaviors, which served as our measure of personal norms. Finally, they indicated whether they would support six hypothetical policies that restrict and tax the associated non-sustainable behaviors in these three behavioral domains (animal protein consumption, home heating, and car usage). This was our measure of policy support.

We elicited social expectations through incentivized second-order beliefs. We asked participants to guess the most common responses given by all survey participants regarding behaviors and personal norms, which served as our measures of empirical and normative expectations, respectively. Participants also estimated, out of 100, how many other respondents supported each policy. This served as our measure of expected policy support. These social expectations were elicited in an incentive-compatible manner: participants scored points for accurate guesses and could earn

a bonus of up to €30 if they ranked among the top 30% of scorers at the end of the survey.

We examine the existence of systematic misperception both at the extensive margin and at the intensive margin. To the best of our knowledge, only one study has looked at underestimation of behaviors and personal norms related to everyday sustainable practices: Andre et al. (2024b) asked participants to estimate how many others engaged in behaviors such as restricting meat consumption or regularly using environmentally friendly alternatives to fossil-fueled cars, as well as how many others believed these behaviors ought to be done. Our study builds on and extends this work by examining misperception about the intensity of others' engagement. Even when individuals aim to adopt more sustainable practices, they may lack a clear reference point for what constitutes an appropriate frequency or intensity. A second advantage of asking about behaviors and expectations at the intensive margin is that it reduces variability in interpretation. What constitutes "regular behavior" can vary between participants. Self-image motivations may also lead individuals to interpret these terms favorably, believing they engage in sustainable behaviors often even if their actual effort is minimal (Dana et al. 2007, Momsen and Ohndorf 2022). Similarly, this variability in interpretation can also bias one's beliefs about others. In contrast, it is harder to distort beliefs about precise, objective measures of quantity or frequency. Since objective and precise measures of behavior are harder to misperceive, we can test whether misperception is robust to these more concrete indicators.

In line with our pre-registered hypotheses, we find systematic and widespread underestimation of others' sustainable behaviors, personal norms, and policy support. The magnitude of these underestimations is significant across all behavioral domains, with particularly pronounced effects in vegetarian consumption and home heating reduction. The only exception was personal norms for public mobility use, where we found an overestimation; however, behavior in this domain was underestimated, as was support for policies restricting car usage. In line with Andre et al. (2024b), we also observe that participants significantly underestimate how much others donate to reduce carbon emissions. Underestimation magnitudes (defined as the difference between social expectations and actual behaviors and personal norms) are larger for behaviors than for personal norms. Moreover, whereas 84%, 62% and 42% of participants underestimated others' vegetarian consumption, home heating reduction and use of public mobility, respectively, 52%, 57% and 18% underestimated the corresponding personal norms. In addition, 60% of participants underestimated others' donations. On average, 54% of participants in our sample underestimated others' sustainable behaviors and personal norms.

Underestimation magnitudes are also significant in policy support. On average, 79% of participants underestimated the number of supporters of a policy. Moreover, while participants believed that none of the six policies would be supported by a majority, in reality, four of them were. Although underestimations are significant across all policies, their magnitude is smaller than those reported in previous studies on misperceptions about support for climate policies (e.g., Sparkman et al. 2022). This is expected, given that the policies we examine are more personally costly to support. Consistent with this interpretation, both the overall prevalence of support and the estimated prevalence are lower than those found by Sparkman et al. (2022). Our results extend their findings by confirming that misperceptions about climate policy support persist even when the policies involve personal costs to individuals, albeit with smaller

magnitudes.

To shed light on the mechanisms behind the observed underestimations, we consider two canonical misperception mechanisms: pluralistic ignorance and the false-consensus effect. Pluralistic ignorance is a group-level bias in which individuals privately share an attitude or behavior yet mistakenly believe that relatively few others do so (Katz and Allport 1931, Leviston et al. 2013, Miller and McFarland 1987, Prentice and Miller 1993, 1996, Shamir and Shamir 1997). It arises when (i) the perceived level of the attitude or behavior in the population is lower than the actual level, and (ii) a majority of individuals share this downward misperception. Our results are consistent with pluralistic ignorance if people underestimate sustainable behaviors on average and if most respondents are underestimators. A stronger (though not necessary) condition is that a majority of both more sustainable and less sustainable individuals underestimate others' sustainable behaviors. Such a pattern is documented, for example, by Sokoloski et al. (2018), who show that both supporters and detractors underestimate public support for offshore wind energy.

The false-consensus effect, by contrast, is an individual-level egocentric projection: people overestimate the prevalence of their own stance (Marks and Miller 1987, Mullen et al. 1985, Ross et al. 1977). Unlike pluralistic ignorance, this effect implies an asymmetric pattern: the less sustainable should underestimate sustainable norms more strongly, while more sustainable individuals may show little or no underestimation, or even overestimation. Similar asymmetries in climate-related misperceptions have been documented among climate-change deniers versus believers (Leviston et al. 2013), among Republicans versus Democrats (Andre et al. 2024b, Sparkman et al. 2022), and in regions with fewer versus more environmental protests (Sparkman et al. 2022). Following Sparkman et al. (2022), we define our results as consistent with false consensus when less sustainable individuals exhibit greater underestimation than more sustainable individuals, and are more likely to underestimate. A stricter (though not necessary) condition is that less sustainable individuals underestimate others' sustainability, whereas more sustainable individuals overestimate it, as documented by Leviston et al. (2013).

To assess the empirical validity of both mechanisms, we conduct heterogeneity analyses that separate respondents whose self-reported sustainable behavior lies above the sample mean ("more sustainable") from those below it ("less sustainable"). An analogous split is made for each climate-policy item, distinguishing supporters from detractors. Our results are consistent with both pluralistic ignorance and the false consensus effect. For behaviors and norms, the overall pattern reveals a clear asymmetry consistent with the false consensus effect: a large majority of less sustainable individuals underestimate others' sustainable behaviors (79%) and personal norms (54%), whereas more sustainable individuals underestimate substantially less often (48% for behaviors, 34% for personal norms) and even overestimate in some domains such as use of public mobility and lottery donations. Yet the overall pattern is also consistent with pluralistic ignorance, as the majority of all participants (54%) are underestimators and the sample-wide prediction gap remains negative. Results on policy support are in line with the false consensus effect as well: 89% of policy detractors underestimate the proportion of supporters. This is much more than policy supporters, yet 66% of supporters also underestimate policy support. Since the underestimation of policy support is a widespread phenomenon across both supporters and detractors, this result is also clearly in line with pluralistic ignorance.

We further document how perceptions correlate with behaviors. Previous research has shown that misperceptions may affect behaviors, for instance by curbing public expression of climate concern and leading to self-silencing (Geiger and Swim 2016). Our data suggest that participants might exhibit conditional preferences in their sustainable behaviors and policy support. A one-standard-deviation increase in empirical expectations is associated with a 0.4 to 0.5 standard deviation increase in self-reported behaviors, while a one-standard-deviation increase in normative expectations is associated with a 0.2 to 0.4 standard deviation increase. Notably, a one-standard-deviation increase in the expected amount donated by others from the €250 lottery is associated with a 0.5 standard deviation increase in the amount donated, a similar effect size compared to self-reported behaviors. Finally, a one-percentage-point increase in the expected proportion of policy supporters correspond to an increase of between 0.7 and 1 percentage point in one's own likelihood of supporting the policy.

We also explore whether people's personal norms are conditional on social expectations too, or whether they operate independently. Personal norms are distinct from social norms and serve as complementary predictors of behavior (Bašić and Verrina 2024, Bertoldo and Castro 2016, De Groot et al. 2021, Thøgersen and Ölander 2002). In our study, a one-standard-deviation increase in personal norms is associated with a 0.3 to 0.6 standard deviation increase in self-reported behaviors. Given their influence on behavior, if social expectations also shape personal norms, then the effect of social expectations on behavior could operate through two pathways: a direct effect and an indirect effect via the updating of personal norms. There is evidence that empirical expectations influence the formation and updating of individuals' personal moral judgments, an effect referred to as the "common is moral" heuristic (Deutchman et al. 2024, Lindström et al. 2018). Based on this, we hypothesize that sustainable personal norms, like behaviors, may also be conditional on social expectations. Indeed, a one-standard-deviation increase in empirical expectations is associated with a 0.4 standard deviation increase in personal norms, while a one-standard-deviation increase in normative expectations is associated with a 0.6 to 0.8 standard deviation increase in personal norms. Taken together, these results suggest that participants might exhibit conditional preferences in their everyday sustainable behaviors, personal norms, and policy support. While empirical expectations are more strongly associated with behavior, normative expectations show a stronger association with personal norms.

Our results are consistent with a broad literature showing that norm-based interventions can change sustainable behavior (De Groot et al. 2013, Ferraro et al. 2011, Goldstein et al. 2007, Kormos et al. 2015, Nolan et al. 2008, Reese et al. 2014, Schultz 1999, Schultz et al. 2008, Sparkman et al. 2021). We contribute to this literature by providing evidence of a pre-existing misperception about sustainability that may be updated when norm information is provided, and by showing that people may exhibit conditional preferences based on social expectations when engaging in sustainable behavior. At the same time, although norm-based interventions are a promising policy tool, they do not always work and can even backfire (Gravert and Collentine 2021, Griesoph et al. 2021, Richter et al. 2018). As noted by Bicchieri (2016), a proper diagnosis of the causal drivers of behavior in a population is necessary before designing effective interventions to promote behavioral change. Our approach can enrich traditional norm-based interventions by identifying which domains exhibit the largest misperception and hence might be the most promising to target, the nature of that

misperception (empirical and/or normative, intensive and/or extensive), and which individuals are most prone to misperceiving.

The remainder of the paper is organized as follows: Section 2 describes the survey design, the measures collected, and the sample. Section 3 presents the pre-registered hypotheses and our main results. Section 4 concludes.

2 Study Design

Results presented in this paper are based on an online study launched in November 2022 with a pool of participants based in Luxembourg. The study was conducted in collaboration with Luxembourg's Ministry of Economy and aimed to identify determinants and constraints to sustainable behavior (Verheyden et al. 2024).

2.1 Participants

The pool of participants has been obtained from a panel of 3,700 volunteers who had previously participated in surveys conducted by the Luxembourg Institute of Socio-Economic Research (LISER) and had consented to be recontacted for future research. These volunteers were adult Luxembourg residents and cross-border workers (individuals residing in neighboring countries who work in Luxembourg). Of the panel of 3,700 volunteers, 1,292 participants responded positively to our invitation and completed the survey.

To encourage participation, respondents received a fixed reward of €10. They could also earn a bonus ranging from €10 to €30 based on their scores in questions eliciting their social expectations. Specifically, participants received €10 if they ranked among the top 400 scorers, €20 if they ranked among the top 100, and €30 if they ranked among the top 50. Finally, 10 participants were randomly selected through a lottery to receive an additional prize of €250.

Existing evidence suggests that the use of volunteer samples introduces negligible bias in the estimation of social preferences and behavioral patterns compared to full probability samples (see, for example, Abeler and Nosenzo 2015, Anderson et al. 2013, Falk et al. 2013). However, to mitigate concerns about self-selection bias and the potential over-representation of participants with strong pro-environmental preferences, we obscured the purpose of the survey when inviting participants. Specifically, we informed them only that the survey would address their perceptions and behaviors related to societal challenges facing the Grand Duchy of Luxembourg. Strong monetary incentives to participate also mitigate concerns that only individuals with strong social preferences took part in the study.

While the sample of participants is not itself a probability sample, the pool of *potential* participants was drawn from representative probability samples and covers a broad spectrum of Luxembourg residents and cross-border workers. Calibration weights were constructed using national population counts from the social security administration so that weighted sample proportions match national population totals for gender and age. The calibration weights were calculated by generalized linear regression adjustment as described in Valliant and Dever (2018) and Stata's svycal command. Calibration is based on age and gender totals only (as of November 2019). We did not incorporate additional demographic variables in the construction of the calibration

weights as comparable population data were not always readily available. Also, keeping the number of calibration margins limited avoids inflating the variance of calibration weights and the sensitivity of final estimates to observations with extreme weights (see, e.g., Kim 2025). Calibration weights are applied in all analyses reported in the paper.

The demographic characteristics of our study participants are reported in Table 1. The table also shows benchmark statistics collected from a relatively large probability sample representative of the population of Luxembourg residents. Relative to the benchmark statistics, our study sample displays some over-representation of middle-aged, tertiary educated individuals. This is somewhat unsurprising given the nature of the data collection. Calibration weights adjust the age distribution but some over-representation of tertiary education remains. Frequencies on household income data appear similar in our sample and in the EU-SILC survey, except for an apparent under-representation of individuals in the highest income bracket (however variations in definitions render comparability of income data across surveys hazardous).

Table 1: Demographic characteristics of study participants and benchmark statistics

	Study participants		Benchmark statistics
	Weighted	Unweighted	EU-SILC estimates
Aged below 35	32.6%	19.1%	27.3%
Aged above 65	15.6%	7.0%	16.2%
Female	49.4%	36.7%	49.2%
Higher education	65.3%	67.8%	44.5%
Total monthly household disposable income			
€0 – €1,250	0.5%	0.5%	1.1%
€1,250 – €2,000	1.0%	0.9%	1.0%
€2,000 – €4,000	18.0%	14.9%	12.0%
€4,000 – €6,000	25.5%	25.1%	17.9%
€6,000 – €8,000	23.6%	24.9%	17.8%
€8,000 – €12,500	22.6%	24.1%	25.7%
>€12,500	5.4%	6.6%	17.6%
Prefer not to say	3.5%	2.9%	(3.5% assumed)
Language			
German	29.2%	27.6%	
English	11.4%	11.8%	
French	57.4%	58.5%	
Portuguese	2.1%	2.1%	

Notes: The columns 'Weighted' and 'Unweighted' show the distribution of characteristics of our study participants. Weighted frequencies are after application of calibration weights based on national statistics on age and gender in 2019. See STATEC (2026) for these population totals. EU-SILC estimates are from the 2023 wave of the national EU-SILC survey based on a representative, probability-sample of the population of residents of Luxembourg. Data are as available in the Luxembourg Income Study database and proportions are for respondents aged between 18 and 89 only (approximately 8,200 individuals). Language frequencies refer to the language chosen by the user to fill in the online questionnaire.

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2.2 Main measures

After collecting demographic data from participants, we gathered our main self-reported data on behaviors, personal norms, and support for policies related to the three most carbon-saving actions: reducing animal protein consumptions, reducing home heating, and public transportation use instead of cars. Participants also completed a donation task, which served as our measure of incentivized behavior. We elicited participants' social expectations regarding all the aforementioned measures. Appendix G details a diagram of the survey design and the specific survey instructions. Note that the survey was available in four languages: English, French, German, and Portuguese. Participants could choose the preferred language.

Behaviors. We asked participants to report their current levels of animal protein consumption ("Over the last 7 days, how many meals containing meat, fish or seafood did you eat?"; scale ranging from 0 to 21), home heating ("What is the usual temperature of your dwelling when you are at home when it is less than 10 degrees outside?"; scale ranging from 15 to 30), and use of public transportation ("Compared to a 30-minute car trip, what is the maximal trip duration you would accept if you were to systematically use public transport instead?"; open-text box). We further informed participants that by "one meal containing meat, fish or seafood", we mean a meal containing at least 50 grams of it. We used a hypothetical question for public transportation because mobility patterns in Luxembourg are highly dependent on individual constraints (e.g., place of residence, workplace location, and access to reliable public transport). This standardization is particularly important when eliciting personal norms and normative expectations. Therefore, we chose to present a scenario in which all participants faced the same trade-off. To ensure consistency in the directionality of our measures, we reverse-coded responses on animal protein consumption (21 minus response) to obtain a measure of vegetarian meals per week. Similarly, we reverse-coded responses on home temperature (30 minus response) to capture "reduction from 30℃", which serves as a measure for home temperature reduction relative to the top of the scale. This does not imply that 30℃ is a typical or recommended temperature—30℃ is simply the maximum of the slider used to define the transformation. This approach ensures that higher values consistently reflect more sustainable consumption behaviors.

Additionally, we offered participants the opportunity to donate part of their potential €250 lottery prize to a carbon offset project with a slider ranging from 0 (labeled "all to myself") to 250 (labeled "all to carbon credits"). We informed them that if they won the lottery, the money would be allocated according to their decision. We also informed them that by donating the full amount, they might offset 4 months of carbon emissions. Prior to the lottery donation decision, participants were also given the opportunity to donate their survey earnings (fixed payment and bonus) to a carbon offset project (results not reported in this paper). Thus, it is important to note that the lottery donation task was the second donation decision presented in the survey. We do not observe substitution effects between donation tasks. In fact, we find the opposite pattern: participants who donated their survey earnings also donated more in the lottery (€134 more, $p < 0.001$).

Personal norms. We asked participants to report, for each of the sustainable behaviors described above, what they considered to be the ethically appropriate level

from a sustainability perspective. For example, regarding animal protein consumption, we asked: "Due to the amount of energy needed to produce them, meat, fish and seafood are not a sustainable source of proteins. With these sustainability concerns in mind, how many meals per week containing meat, fish or seafood do you think it would be ethically appropriate to eat?" (slider ranging from 0 to 21). We asked similar questions for the other two behaviors, using response scales identical to those used in the behavioral questions. For home temperature, we asked participants to indicate the maximum temperature they found ethically appropriate for well-insulated and poorly insulated dwellings separately, and then we averaged the answers to these two questions. Same as before, we reverse-coded responses on animal protein consumption and home temperature. As pre-registered, we did not ask this question for the donation decision. The donation decision was presented at the very end of the survey, after thanking participants for their previous answers.

Empirical and normative expectations. We elicited empirical and normative expectations by asking participants to estimate the responses given by all other participants in the survey, following a method similar to that used by Bicchieri et al. (2022). Specifically, for each question, we asked: "Please guess what will be the most frequent answer in the survey to the question...". An exception to this was the lottery donation, where we asked for an estimate of the average donations. Estimates of behaviors served as our measure of empirical expectations, while estimates of personal norms constituted our measure of normative expectations. These questions were incentivized: participants could earn points based on the accuracy of their estimates, which in turn determined their chances of receiving a bonus payment. The only exception was the estimation of others' donation amount, which was not incentivized. This is because, prior to the lottery donation decision, participants had already made a donation decision involving their bonus payments, and all bonus-related earning opportunities needed to be presented in advance. At the beginning of the survey, all participants were informed that we aimed to recruit a maximum of 1,500 participants residing in Luxembourg or its neighboring areas.

Policy support. Participants indicated whether they would support six hypothetical policies aimed at promoting the sustainable behaviors by restricting the associated non-sustainable ones. We presented two types of policies for each behavioral domain: a regulation and a tax. For vegetarian consumption, we proposed a reduction in the availability of red meat and an increase in VAT on meat, fish, and seafood to 17%. For home heating, we presented a rationing of fossil energy sources and a 10% tax on rental income received by landlords who rent out accommodations with insufficient energy efficiency. For public transportation, we proposed a ban on cars in densely populated areas and a €5 toll on Luxembourg's highways. All policies were described as being accompanied by measures to promote the more sustainable alternatives.

Expected policy support. We asked participants to estimate, out of 100, how many other participants supported each of the six policies. As before, these questions were incentivized, and participants could earn points depending on how accurate their estimates were, which determined their chances of receiving a bonus payment.

2.3 Social desirability bias and experimenter demand effects

To address concerns about social desirability bias, participants were informed that their responses were anonymous, and their beliefs about others were incentivized. Even if their self-reported behaviors were inflated due to social desirability, they could anticipate this bias when estimating the responses of others, thereby mitigating concerns about the validity of any detected misperceptions. Furthermore, a large-scale meta-analysis by Kormos and Gifford (2014) concluded that self-reported pro-environmental behaviors are strongly associated with objective measures. Reisinger (2022) provided evidence that anonymity in self-reports greatly reduce social desirability bias.

According to De Quidt et al. (2018), participants making incentivized and non-incentivized choices in online studies responded similarly to experimenter demand. Likewise, non-representative online samples were no more susceptible to experimenter demand than representative ones. The authors concluded that, at least in anonymized online surveys, concerns about experimenter demand effects are limited.

3 Results

We structure the presentation of results according to a set of pre-registered hypotheses and analysis plan – first documenting the extent of misperceptions of behavior, personal norms and policy support. We then conduct exploratory heterogeneity analyses and attempt to assess the false consensus effect and pluralistic ignorance mechanisms. Finally, we examine the association between social expectations and one's sustainability.

3.1 Pre-registered hypotheses and analysis plan

The study received IRB approval from the Luxembourg Institute of Socio-Economic Research (LISER). It was pre-registered at `aspredicted.org/WYP_W6F` with the following main hypotheses:

H1. Inaccurate empirical expectations: Participants will underestimate others' sustainable behaviors and monetary donations.

H2. Inaccurate normative expectations: Participants will underestimate others' personal norms concerning sustainable behaviors.

H3. Inaccurate expected policy support: Participants will underestimate others' support for policies that restrict non-sustainable behaviors.

Additionally, because we are also interested in examining whether individuals may have conditional preferences in their behaviors, personal norms and policy support, we pre-registered the following secondary hypotheses:

H4. Personal norms, empirical expectations and normative expectations positively predict sustainable behaviors and monetary donations.

H5. Expected policy support positively predicts one's own policy support.

H6. Empirical and normative expectations positively predict personal norms concerning sustainable behaviors.

We provide results pertaining to each of these pre-registered hypotheses. All our analyses were conducted using weights to adjust our sample to be calibrated to population totals for Luxembourg in terms of age and gender. In all regression analyses, we included income, age, gender, education and language as control variables.

A sensitivity analysis indicated that, with our sample size, we had over 80% power to detect effect sizes as small as Cohen's d = 0.08 with $\alpha = 0.05$ in our analyses (Cohen 1988).

Appendix A provides an overview of which analyses reported in this section are pre-registered. Appendices B and C present replications of our pre-registered analyses without weights and without controls as a robustness check. As shown in Appendix B, weighting the data has minimal impact on our measures of interest and results, with mean responses differing by only a few decimal places. The dataset and replication script are available in `https://doi.org/10.17605/OSF.IO/GVPZ5`.

3.2 Underestimation of others' sustainable behaviors, personal norms, and policy support

Result 1a. Participants significantly underestimate others' sustainable behaviors and personal norms (consistent with H1 and H2).

As shown in Table 2, our respondents misperceived what other survey participants did and considered appropriate to do. The underestimation of others' sustainability is consistent across all behavioral domains for behaviors, while personal norms were also underestimated with the exception of the use of public transportation. The magnitude of these underestimations varies considerably across domains – with absolute effect sizes (d or Modified d) ranging from 0.12 to 1.15.

Table 2: Underestimation of sustainable behaviors and norms

	Own's answer Mean (SD)	Mode	Expectation others Mean (SD)	Scaled difference ((Modified) d)
Behaviors				
Vegetarian meals	14.69 meals (3.87)	17 meals	12.82 meals (3.65)	1.15
Heating temperature reduction	9.88° (1.51)	10°	9.04° (1.46)	0.66
Public mobility time	45.79 min (19.59)	45 min	42.88 min (13.59)	0.16
Donation of lottery gains	€79.20 (91.89)		€70.41 (49.32)	0.12
Personal Norms				
Vegetarian meals	16.52 meals (2.75)	17 meals	15.75 meals (2.83)	0.44
Heating temperature reduction	9.61° (1.61)	10°	9.31° (1.55)	0.45
Public mobility time	57.45 min (17.52)	45 min	55.21 min (16.59)	-0.62

Standard deviations are reported in brackets. The 'Scaled difference (Modified d)' column is the difference between the mode of Own's answer and the mean of 'Expectation others' divided by the standard deviation of the latter. This is a modification of Cohen's d to handle comparison with the mode rather than the mean. For the Donation of lottery gains, the number is the classic Cohen's d statistic. All statistcs are weighted.

To assess whether the underestimation of others' sustainable behaviors and personal norms is statistically significant, we created an underestimation measure by calculating the gap between participants' social expectations and the actual modal responses for behaviors and personal norms across all participants. For lottery donations, the underestimation measure was calculated using mean responses instead. Since participants could only report integer values in the survey, mean responses for

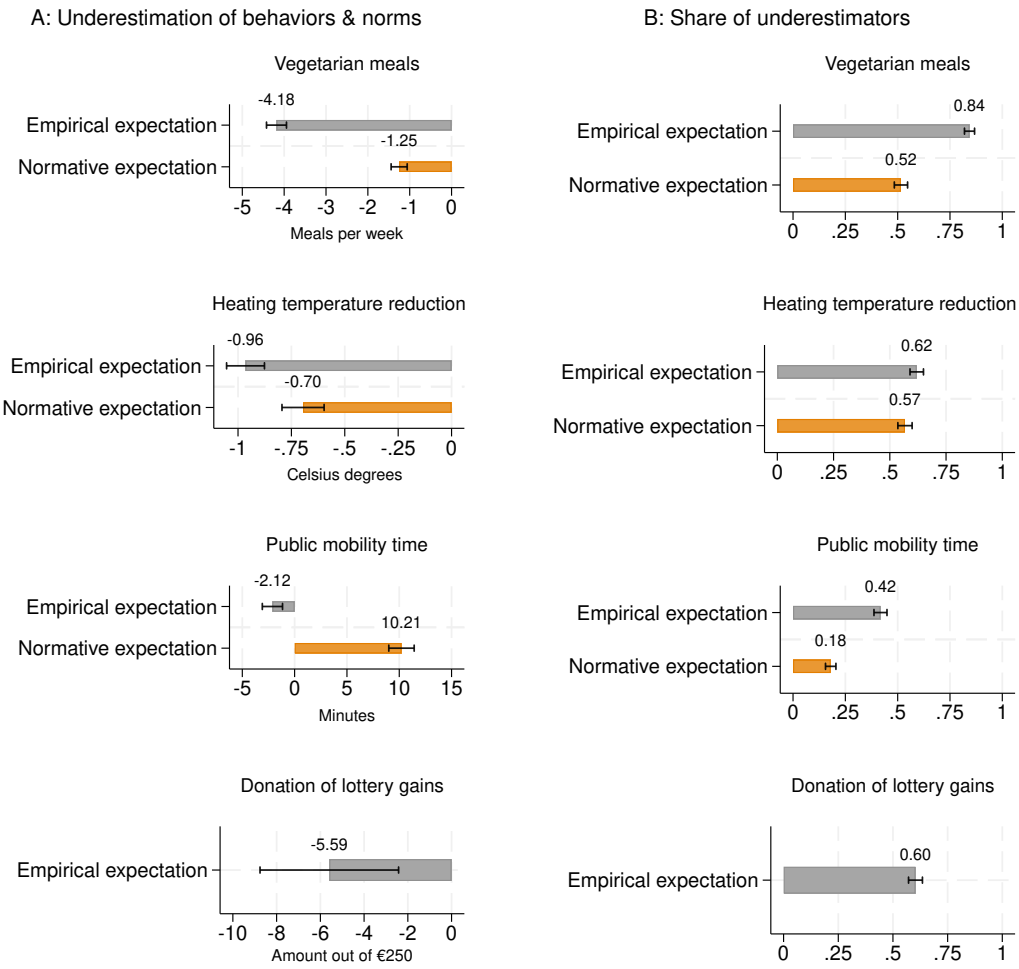


Figure 1: **Panel A** displays the underestimation of others' sustainable behaviors and personal norms (expectation minus modal or mean response). **Panel B** shows the share of underestimators for each sustainable behavior and personal norm. Confidence intervals are at the 95% level. Underestimators are respondents who believe the modal or mean value among respondents is lower than it actually is.

lottery donations were rounded to the nearest integer for this computation. As shown in Figure 1, we find that all average underestimations are statistically different from zero at the 95% confidence level. On average, participants underestimated the number of vegetarian meals others consumed per week by 4.18 meals ($p < 0.001$) and the number they deemed appropriate by 1.25 meals ($p < 0.001$). They underestimated the reduction in home temperature by 0.96℃ ($p < 0.001$) and the appropriate reduction by 0.70℃ ($p < 0.001$). They also underestimated the number of minutes others were willing to sacrifice to switch from car to public transport by 2.12 minutes ($p < 0.001$), but overestimated the number of minutes deemed appropriate by 10.21 minutes ($p < 0.001$). Finally, they underestimated the average amount of the lottery donation by €5.59 ($p = 0.001$).

We also examined the share of underestimators for each of the measures above.

As shown in Figure 1, the majority of participants were pessimistic in their predictions. Specifically, 84% and 52% of participants underestimated the number of vegetarian meals others consumed and the number they deemed appropriate to consume, respectively. Similarly, 62% and 57% underestimated others' reduction in home temperature and the appropriate reduction. 42% of participants underestimated the minutes others were willing to sacrifice to use public transport, and 18% underestimated the minutes others deemed appropriate to sacrifice. Note that although underestimators did not constitute the majority for behavior in the public mobility domain, they were still the largest group compared to those who were accurate (33%) and those who overestimated (25%). Finally, 60% underestimated the average share of lottery donations. On average, 54% of participants underestimated others' sustainable behaviors and personal norms.

Result 1b. Participants significantly underestimate others' policy support (consistent with H3).

Misperceptions also emerged in participants' support for restrictive policies: they underestimated the number of supporters for all six policies. Same as with behaviors and personal norms, effect sizes (d) vary considerably across policies and range from 0.1 to 0.8. Additionally, participants expected that none of the six policies would be supported by a majority; in reality, four of them were.

Table 3: Underestimation of support for restrictive and taxing policies

	Supporters %	Expected supporters Mean % (SD)	Cohen's d
Regulation on red meat	63.50	35.12 (18.36)	0.78
VAT on meat	36.89	24.17 (16.97)	0.35
Fossil fuel rationing	52.53	35.93 (20.87)	0.43
Rental tax on poor insulation	63.86	43.71 (23.63)	0.53
Ban on cars in city center	50.19	33.67 (22.15)	0.43
Toll on highways	21.35	19.16 (18.00)	0.07

Standard deviations are reported in brackets. All statistics are weighted.

To assess whether the underestimation of others' policy support is statistically significant, we created a measure of underestimation by calculating the gap between participants' expected share of supporters and the actual share of supporters. Since participants could only report integer values in the survey, the actual share of supporters was rounded to the nearest integer for this computation. As displayed in Figure 2, all underestimations are statistically different from zero at the 95% confidence level. On average, participants underestimated support for a regulation on red meat by 26.88 percentage points ($p < 0.001$), for an increase in VAT on meat, fish, and seafood by 12.83 percentage points ($p < 0.001$), for a rationing policy on fossil fuels by 15.07 percentage points ($p < 0.001$), for a rental tax on poorly insulated homes by 20.29 percentage points ($p < 0.001$), for a ban on cars in city centers by 16.33 percentage points ($p < 0.001$), and for a highway toll by 2.84 percentage points ($p < 0.001$).

As shown in Figure 2, the share of underestimators is significantly higher for policy support than for behaviors and personal norms. Specifically, 92% of participants underestimated support for a regulation on red meat; 80% for an increase in VAT on

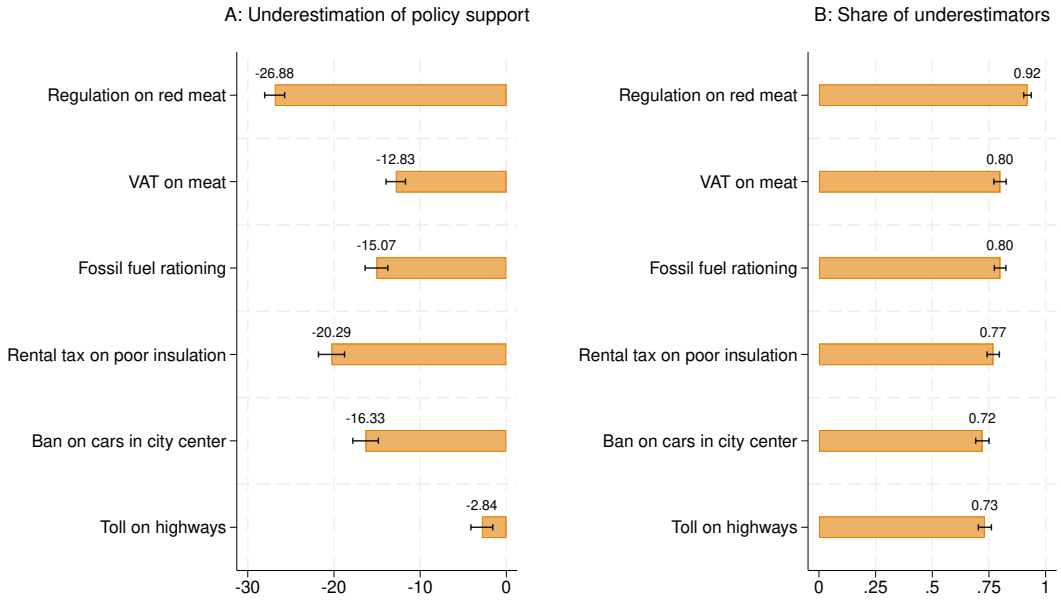


Figure 2: **Panel A** displays the underestimation of other's policy support (expected % of supporters - actual % of supporters). **Panel B** shows the share of underestimators for each policy. Confidence intervals are at the 95% level. Underestimators are respondents who believe the share of supporters among respondents is lower than it actually is.

meat, fish, and seafood; 80% for a rationing policy on fossil fuels; 77% for a rental tax on poorly insulated homes; 72% for a ban on cars in city centers; and 73% for a highway toll. On average, 79% of participants underestimated others' policy support.

3.3 Heterogeneity analyses: examining the false consensus effect and pluralistic ignorance

To study participants' heterogeneity in perceptions, we first distinguish people by their behaviors. We created a dummy variable that takes the value 1 if an individual reported a sustainable behavior level above the average (referred to as a "more sustainable" individual), and 0 if they reported a level below the average (referred to as a "less sustainable" individual). Note that we use the terms more sustainable and less sustainable only in relation to the specific behavior in question. Thus, the same participant could be classified as more sustainable in vegetarian consumption but less sustainable in home heating. We then regressed our underestimation measures on this dummy controlling for age, gender, income, education and language (regressions reported in Appendix D, as well as the share of more sustainable and less sustainable individuals for each domain). We report here predictive mean margins for both groups. This approach allows us to assess whether – in line with the false consensus effect – less sustainable individuals underestimate others' sustainable behaviors and personal norms more than the more sustainable individuals, controlling for differences in demographic characteristics. Appendix E provides robustness checks regressing our

underestimation measures on the continuous measure of our sustainable behaviors, replicating our results. We report regressions with the whole sample, and also with only those participants who reported behavior below their reported normative expectation, to mitigate social desirability bias concerns. Appendix F shows the distribution of expectations reported by the more sustainable and less sustainable individuals.

Result 2a. In terms of behaviors and personal norms, asymmetric misperceptions are consistent with the false consensus effect: less sustainable individuals underestimate others' sustainability substantially more than more sustainable individuals, who even overestimate others' sustainability in some domains. Yet pluralistic ignorance also holds, as the majority of all participants underestimate others' sustainability overall.

Figure 3 shows that less sustainable respondents starkly underestimated others' sustainable behavior in every domain, as well as others' sustainable personal norms in all domains except public mobility time. For all measures except this one, their mean misprediction is negative (Panel A), and a majority of them underestimated others (Panel B).

The asymmetry between groups is clear. For behaviors, on average, 79% of less sustainable individuals underestimated others, compared to 48% of more sustainable individuals. For personal norms, on average, 54% of less sustainable individuals underestimated others, compared to 34% of more sustainable individuals. Not only do more sustainable individuals underestimate less often, but in two domains (public transport time and lottery donations), they actually overestimate both behaviors and personal norms on average, as shown by the positive mean gaps in Panel A. In domains where more sustainable individuals do underestimate, the magnitude of their mean prediction gap is significantly smaller than that of less sustainable participants (see Columns 1–4 in Table D7 in Appendix D, all $p < 0.001$). Logistic regression analyses also confirmed that the share of underestimators is significantly higher among the less sustainable than among the more sustainable for all behaviors and personal norms (all $p < 0.001$).

Averaging across the four behavior measures and the three personal norm measures, 68% of less sustainable respondents underestimated others' sustainability, compared to 42% of more sustainable respondents.

Aggregating more sustainable and less sustainable individuals, the general trend is coherent with pluralistic ignorance: the majority (54%) of all individuals are underestimators, and the mean prediction gap is negative. This is because (i) less sustainable individuals form a substantial share of the sample and severely underestimate others' sustainability, (ii) even more sustainable individuals continue to underestimate in certain domains such as vegetarian meals and home heating, and (iii) the magnitude of underestimation among less sustainable individuals sometimes exceeds the magnitude of overestimation among more sustainable individuals.

Result 2b. In terms of policy support, both supporters and detractors underestimate others' average support, in line with pluralistic ignorance. Detractors underestimate others' policy support significantly more, consistent with the false consensus effect.

We replicated the same heterogeneity analyses for policy support, distinguishing between individuals who supported a policy (referred to as supporters) and those who did not (referred to as detractors), with regressions reported in Appendix D. As before, the same individual could be labeled a supporter of one policy and a detractor of

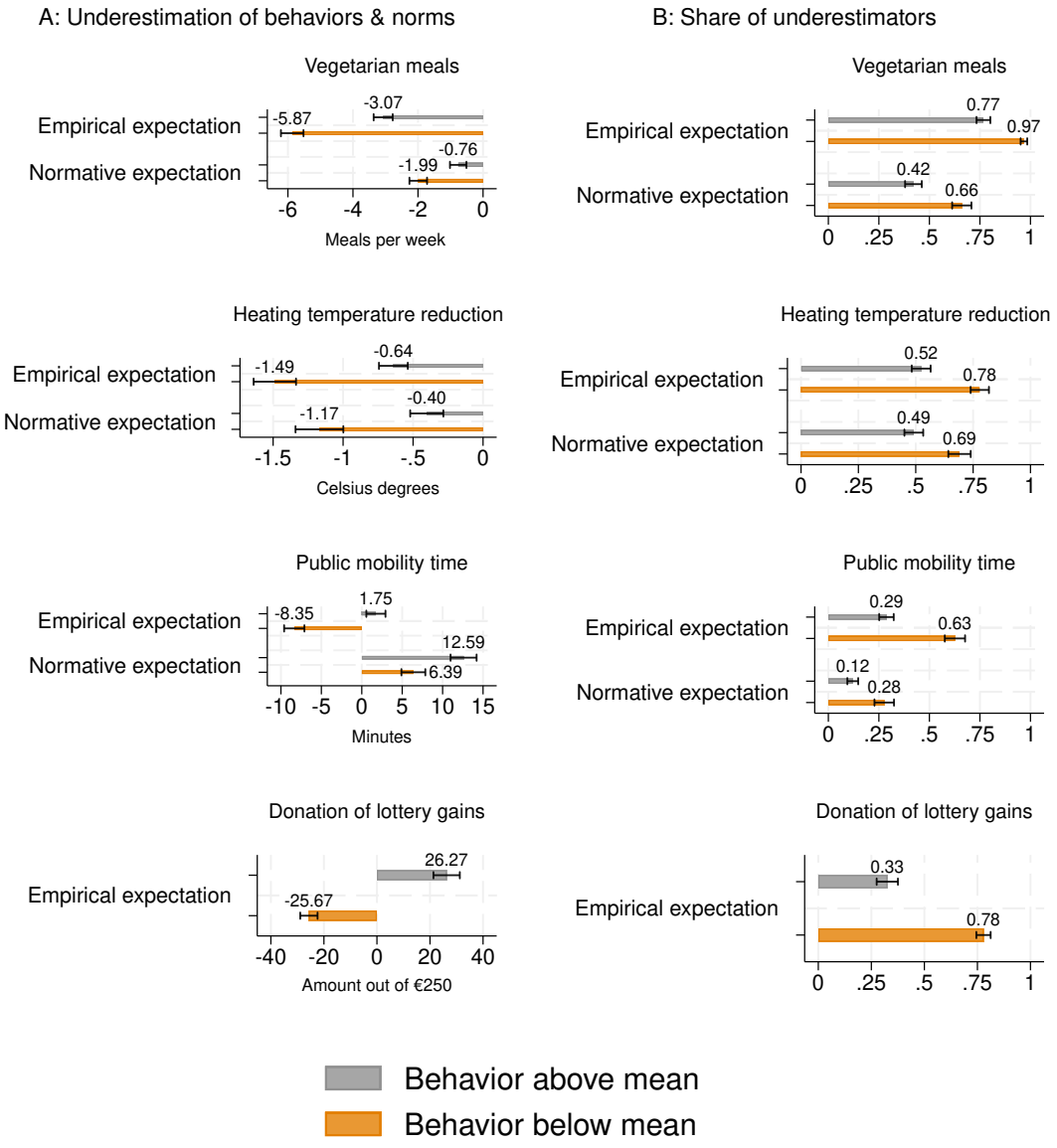


Figure 3: **Panel A** displays the underestimation of others' sustainable behaviors and personal norms (expectation minus modal or mean response). **Panel B** shows the share of underestimators for each sustainable behavior and personal norm. Both panels show predictive mean margins, controlling for age, gender, income, education, and language, and are separated by individuals whose behavior is above or below the mean. Confidence intervals are at the 95% level. Underestimators are respondents who believe the modal or mean value among respondents is lower than it actually is.

another. Appendix F shows the distribution of expectations reported by supporters and detractors.

Figure 5 reveals that detractors dramatically underestimated the share of supporters in every policy. Their misprediction magnitude is large (-23 pp on average) and on average, 89% of detractors underestimated others. Supporters also underestimated

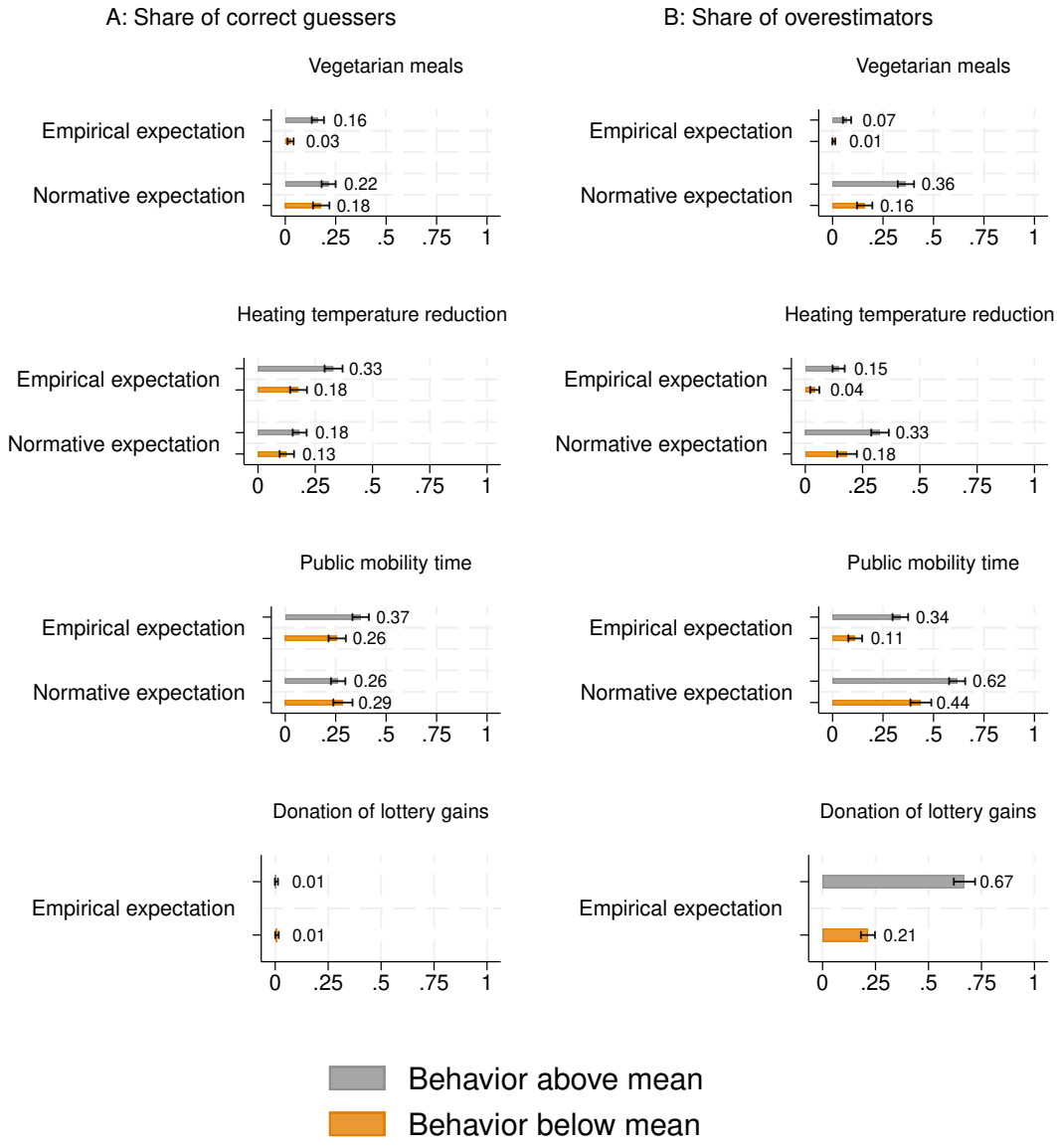


Figure 4: **Panel A** shows the share of correct guessers for each sustainable behavior and personal norm. **Panel B** shows the share of overestimators for each sustainable behavior and personal norm. Both panels show predictive mean margins, controlling for age, gender, income, education, and language, and are separated by individuals whose behavior is above or below the mean. Confidence intervals are at the 95% level. Overestimators are respondents who believe the modal or mean value among respondents is higher than it actually is.

others' support for policies, though to a significantly lesser extent than detractors. Their misprediction magnitude is roughly -8 pp, and, on average, 66% of them underestimated others. This underestimation applies to all policies, except for the highway-toll policy, whose average support is overestimated by 55% of supporters (10 pp positive misprediction magnitude on average), as can be seen in Figure 6. Again, these pat-

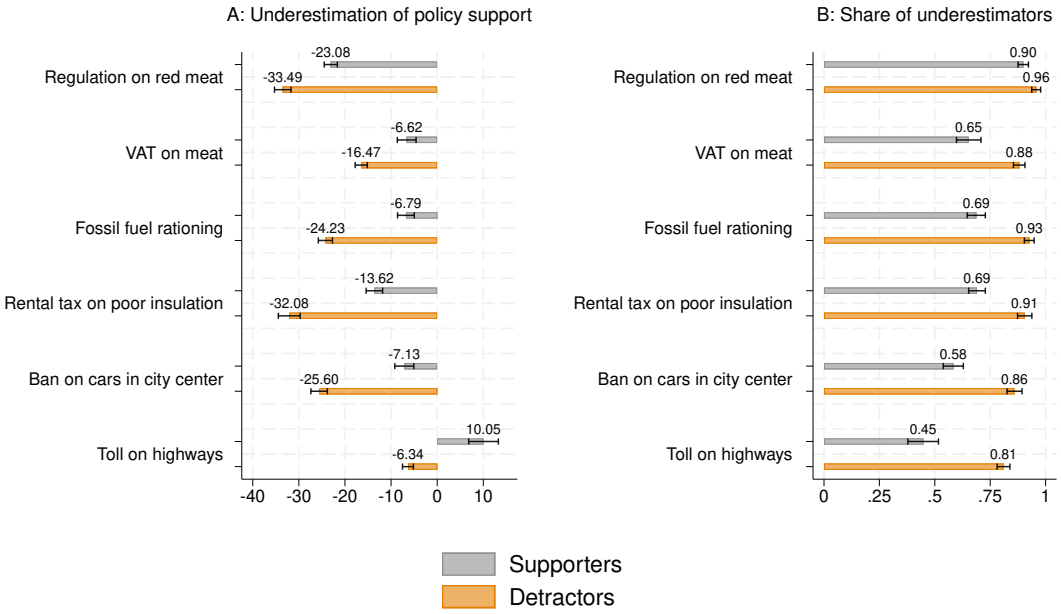


Figure 5: **Panel A** displays the underestimation of other's policy support (expected % of supporters - actual % of supporters). **Panel B** shows the share of underestimators for each policy. Both panels show predictive mean margins, controlling for age, gender, income, education, and language, and are separated by supporters or detractors of a policy. Confidence intervals are at the 95% level. Underestimators are respondents who believe the share of supporters among respondents is lower than it actually is.

terns are consistent with the false consensus effect. The difference in misperception magnitudes between the two subgroups is highly significant for each policy ($p < 0.001$; see Table D8 in Appendix D). Logistic regression analyses also confirmed that the share of underestimators is significantly higher among policy detractors than supporters for all policies (all $p \leq 0.001$).

Because a clear majority of *both* groups underestimated support for five of the six policies, there is clear pluralistic ignorance in terms of policy support: public backing for climate policy is stronger than almost anyone realizes.

3.4 Conditional preferences in behaviors, personal norms, and policy support

As pre-registered, we assessed whether individuals might exhibit conditional preferences in their sustainable behaviors and policy support by examining whether social expectations are positively associated with these outcomes. We also evaluated whether personal norms serve as significant predictors. Since empirical and normative expectations are conceptually related, we estimated separate models for each predictor. For ease of interpretation, all behavior and personal norm variables were standardized to have a mean of zero and a standard deviation of one. Policy support were not standardized, as they are expressed in percentage points, which are already easily interpretable.

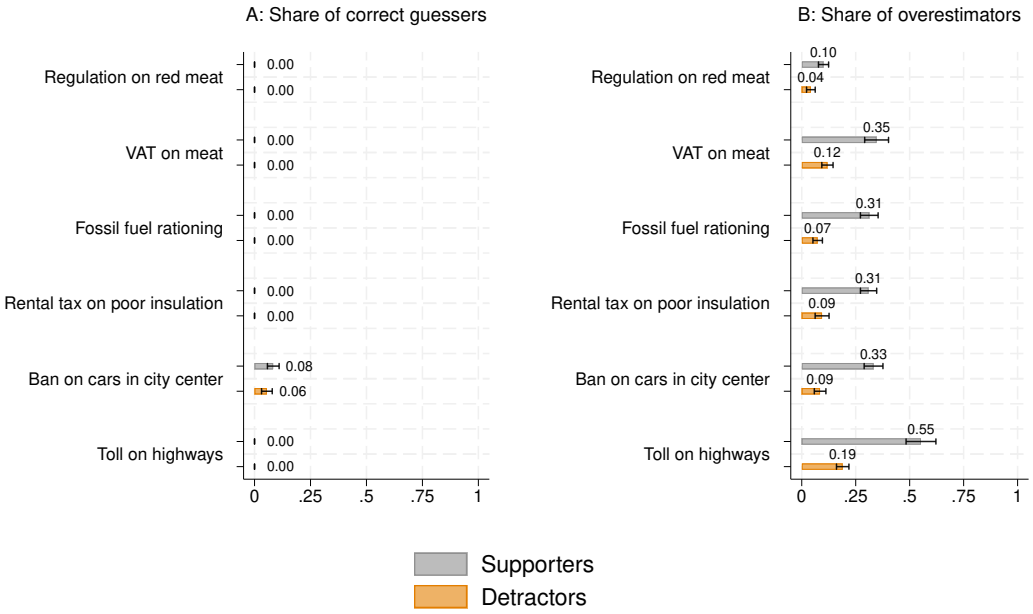


Figure 6: **Panel A** shows the share of correct guessers for each policy. **Panel B** shows the share of overestimators for each policy. Both panels show predictive mean margins, controlling for age, gender, income, education, and language, and are separated by supporters or detractors of a policy. Confidence intervals are at the 95% level. Underestimators are respondents who believe the share of supporters among respondents is lower than it actually is.

We estimated the following model for each of our independent variables:

$$y_i = \alpha + \beta N_i + \gamma x_i + e_i \tag{1}$$

where N_i is the specific social expectation or personal norm associated with y_i and x_i is a vector of controls including age, gender, income, education, and language. The association of social expectations and personal norms on y_i is captured by β.

Result 3. Social expectations and personal norms positively predict behaviors and policy support (consistent with H4 and H5).

Tables 4 and 5 show the results of our regression analyses. As expected, both social expectations and personal norms positively predicted one's behavior (all $p < 0.001$).

As shown in Panel A of Table 4, a 1-standard-deviation increase in empirical expectations is associated with an increase in self-reported behaviors of 0.4 to 0.5 standard deviations, and a 1-standard-deviation increase in normative expectations is associated with an increase in self-reported behaviors of 0.2 to 0.4 standard deviations (Panel A, Columns 1-6). We also found that a 1-standard-deviation increase in the expected amount donated by others of the €250 lottery is associated with a 0.5-standard-deviation increase in the amount one donated (Panel A, Column 7). Finally, we also found that personal norms are significantly associated with daily sustainable behaviors. A 1-standard-deviation increase in personal norms is associated with an increase in behaviors of 0.3 to 0.6 standard deviations (Panel B).

Table 4: Social expectations predict behaviors and personal norms

	Vegetarian meals		Lower home temperature		Public mobility time		Donation of lottery gains
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A: Behaviors							
Empirical expectation	0.408***		0.403***		0.495***		0.505***
	(0.037)		(0.057)		(0.041)		(0.029)
Normative expectation		0.242***		0.357***		0.239***	
		(0.039)		(0.040)		(0.050)	
R^2	0.243	0.139	0.171	0.147	0.260	0.080	0.300
Panel B: Behaviors							
Personal norm	0.561***		0.567***		0.288***		
	(0.034)		(0.042)		(0.047)		
R^2	0.368		0.343		0.106		
Panel C: Personal norms							
Empirical expectation	0.351***		0.381***		0.425***		
	(0.034)		(0.047)		(0.061)		
Normative expectation		0.554***		0.685***		0.798***	
		(0.040)		(0.032)		(0.027)	
R^2	0.183	0.368	0.168	0.461	0.194	0.665	

* p<0.05, ** p<0.01, *** p<0.001. Standard errors in parentheses.
Results from OLS regressions with weighted data. Coefficients are expressed in standard deviation units.
Panel A includes empirical expectations and normative expectations as predictors of behaviors. Panel B includes personal norms as predictors of behaviors. Panel C includes empirical expectations and normative expectations as predictors of personal norms. All OLS regressions include gender, age, income, education, and language as controls.

Table 5: Expected policy support predicts one's own support for policies

	Regulation on red meat	VAT on meat	Fossil fuel rationing	Rental tax on poor insulation	Ban on cars in city center	Toll on highways
	(1)	(2)	(3)	(4)	(5)	(6)
Expected support	0.699***	0.765***	1.032***	0.754***	0.945***	0.845***
	(0.076)	(0.101)	(0.060)	(0.056)	(0.064)	(0.100)
R^2	0.112	0.128	0.197	0.174	0.184	0.175

* p<0.05, ** p<0.01, *** p<0.001. Standard errors in parentheses.
Results from OLS regressions with weighted data. Coefficients expressed as percentage points. All OLS regressions include gender, age, income, education, and language as controls.

Journal Pre-proof

Additionally, as shown in Table 5, a 1-percentage-point-increase in the expected proportion of supporters of a policy corresponded to a minimum of 0.7-percentage-point increase and a maximum of 1-percentage-point increase in one's own likelihood to support a policy.

Result 4. Social expectations positively predict personal norms (consistent with H6).

Following our pre-registration, we also assessed whether people may have conditional personal norms by examining whether social expectations are positively associated with them. As shown in Panel C of Table 4, a 1-standard-deviation increase in empirical expectations is associated with a 0.4-standard-deviation increase in personal norms, and a 1-standard-deviation increase in normative expectations is associated with an increase in personal norms of 0.6 to 0.8 standard deviations (all $p < 0.001$).

4 Discussion and conclusion

Society might be greener than we think. Our study provides clear evidence that, overall, people *underestimate* the sustainability of their peers – at least in Luxembourg. In a rich country and one where carbon emissions per capita are among the highest world-wide, our respondents report relatively broad sustainable individual behavior and support for potentially constraining green policies. However, these are not accurately appreciated and what seems a social consensus for several sustainable behaviors and climate policies appears to be "hidden." Correcting misperceptions about this consensus may therefore offer a promising route to further accelerate individual action and policy acceptance on the path to a low-carbon society.

Our online survey in Luxembourg studied behaviors and social expectations over a wide set of self-reported (vegetarian meal consumption, home heating, use of public transport) and researcher-observed (donations for green projects) domains. Consistent with pre-registered hypotheses, we find that, overall, participants undervalue (i) how much others engage in everyday sustainable behaviors, (ii) the personal norms that peers endorse, and (iii) the level of support for policies that would restrict non-sustainable actions. Across all domains of sustainability, vegetarian-meal frequency and home-heating reduction are the most underestimated behaviors. Actual support for green policies is high and more frequently underestimated (79% of underestimators on average) than behaviors and personal norms (54% of underestimators on average across both). In addition to studying misperceptions at the extensive margin, as in previous studies, we also examine them at the intensive margin. This approach offers the additional advantage of helping to quantify the extent to which misperceptions may affect individual behavior. For instance, on average, participants underestimated others' home temperature reductions by approximately 1℃. Even turning down the thermostat by 1℃ can save 7% of the energy used for heating (European Commission 2022). Similarly, participants overestimated others' weekly consumption of animal protein by about four meals, which may correspond to an overestimation of at least 200 grams of animal protein consumed per week (we defined meals with animal proteins as meals containing at least 50 grams of meat, fish, or seafood). A reduction of 200 grams of meat, fish, or seafood per week can result in carbon emission savings of 5% to 40% (Hitaj et al. 2022, Poore and Nemecek 2018).

Beyond these general results, we study the heterogeneity of misperceptions based on respondents' own stance. We compare average prediction gaps and proportions of underestimators between "more sustainable" (with above-average sustainable behaviors) and "less sustainable" (with below-average sustainable behaviors) individuals, and between policy supporters and detractors. For every behavioral domain, the average levels of underestimation and the shares of underestimators are systematically larger for less sustainable individuals and policy detractors than for more sustainable individuals and supporters. Interestingly, for behaviors and personal norms, there is a clear asymmetry between groups: whereas, on average, 79% of less sustainable individuals underestimate others' behaviors and 54% underestimate others' personal norms, more sustainable individuals underestimate substantially less (48% for behaviors, 34% for norms) and even tend to overestimate behaviors in domains such as public mobility time and lottery donations. This asymmetry is consistent with the false-consensus effect, whereby individuals project their own stance into their perception of their peers' behaviors. Still, because the less sustainable subgroup's underestimation is severe and because more sustainable individuals continue to underestimate in some domains, the sample-wide mean is still an underestimation and the majority of our participants are underestimators. This also makes our results consistent with pluralistic ignorance.

In terms of policy support, both supporters and detractors underestimate public support, consistent with pluralistic ignorance. Additionally, detractors' underestimation (mean prediction gap $\approx$-23 pp; 89% underestimators) is far more pronounced than supporters' (mean prediction gap $\approx$-8 pp; 66% underestimators), consistent with the false consensus effect.

We also find that social expectations matter: a one-SD increase in empirical expectations (expectations about others' behaviors) is associated with a 0.4 to 0.5 SD higher sustainable behavior, a one-SD increase in normative expectations (expectations about others' personal norms) is associated with a 0.2 to 0.4 SD higher sustainable behavior, and each additional percentage point of expected policy support is associated with a higher likelihood of personal support by up to one percentage point. Both empirical and normative expectations are strongly associated with personal norms, which in turn predict behavior, suggesting both direct and indirect channels from beliefs to action.

These results can be further combined with our misperception findings to gauge their potential impact. Replicating our analysis with unstandardized variables, we find that one additional weekly vegetarian meal in empirical expectations is associated with 0.437 more actual weekly vegetarian meals, and a one-degree-Celsius increase in expected home temperature reduction is associated with a 0.39℃ reduction in actual home temperature. Combined with the misperception gaps documented above, this implies that fully correcting these misperceptions could translate into roughly 1.7 additional vegetarian meals per week (about 87 grams less animal protein) and an additional 0.39℃ reduction in home temperature. Applying the carbon and energy intensities discussed above, these shifts would correspond to approximately 2-17% lower emissions from animal protein consumption and roughly 2.7% savings in heating energy use.

Our evidence indicates that perceptual factors are at least as important as attitudinal factors to a low-carbon transition. Although significant shares of respondents personally endorse sustainable behaviors and climate-mitigation policies, dominant

misperceptions of social norms (also defined as pluralistic ignorance) lead them to underestimate the prevalence and social approval of these actions in the wider population. This is particularly true for policy support: supporters are not aware that they are the majority in most cases, while the detractor minority believes its position is widespread. Since social expectations are associated with actual behaviors, interventions that reveal the true prevalence of policy support and engagement levels in sustainable behaviors could therefore unlock behavioral change at both the extensive and intensive margins. Making social norms visible is a strategy that is low-cost, high-leverage, and particularly salient in high-income, high-emission countries such as Luxembourg.

Given the cross-sectional, observational nature of our data, the positive associations between social expectations and own behavior cannot be attributed unambiguously to norm-driven updating. Disentangling the causal effect of norms from egocentric projections (such as the false consensus effect) would require exogenous variation in social expectations. Experimental norm-correction and longitudinal data, planned for future research, will clarify these mechanisms. Also, beliefs about others' behaviors and personal norms were elicited after participants reported their own behaviors and personal norms. This ordering could have increased the salience of respondents' own choices when forming social expectations, potentially amplifying projection from the self. Future work could randomize the order of self-reports and norm elicitation to mitigate ordering effects. Finally, our results are based on a survey in the small and relatively peculiar setting of Luxembourg and – despite our best efforts – our study participants might be selective. Future research will tell if our findings replicate to scale and generalize to other social and economic settings.

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