

The benefits of less: The effect of sufficiency gain framing on consumption reduction

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Abstract

Sufficiency strategies aimed at reduced production and consumption levels have a high potential to help combat environmental issues. There is limited knowledge on how to promote voluntary sufficiency behaviors at the individual level. In an online experiment with participants from the United States ($n = 1,317$), we examine the effect of providing information about different sufficiency benefits to nature, society, or the individual on sufficiency behavior. Sufficiency behavior was measured by participants' consumption level in an incentivized task. The results show that only the individual sufficiency gain framing leads to significantly less consumption compared to a neutral control group. Informing about individual sufficiency benefits, such as more free time and better mental health, may be fruitful in promoting sufficiency behavior.

Keywords: *Sufficiency; Consumption reduction; Pro-environmental behavior; Laboratory experiment, Sufficiency gain framing*

JEL Codes: C91, D91, Q50

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1 Introduction

Human activity leads to global warming, the degradation of ecosystems, and the mass extinction of species, thereby risking to destroy the livelihood of present and future generations (IPBES, 2019; IPCC, 2022; O'Neill et al., 2018; Rockström et al., 2009). The consumption of goods and services is one of the main drivers of natural resource use and the associated negative environmental impacts (Ivanova et al., 2016; Wiedmann et al., 2020). Current sustainability endeavors largely rely on efficiency strategies which aim to reduce resource use and emissions per product unit. Due to rebound effects, increased efficiency often does not lead to the expected absolute reductions in resource use and emissions, and thus may be inadequate in adhering to the boundaries set by our planet (Alexander & Rutherford, 2019; Brockway et al., 2021; Haberl et al., 2020). Consequently, significantly reducing environmental impacts requires a change in consumption patterns.

Sustainability strategies that focus on sufficiency may serve as a complementary approach to efficiency. Sufficiency is about a reduction in production and consumption to lessen negative environmental impact and aims to shift human behavior (Princen, 2005). It is discussed as a means to bring human activities within ecological limits and as an end in itself, promising a more satisfying life (Jungell-Michelsson & Heikkurinen, 2022). The idea of sufficiency fundamentally questions the prevailing notion that economic growth, which is strongly related to increasing the production and consumption of goods, leads to more well-being. This makes sufficiency a sensitive topic that may provoke negative reactions, which makes an appropriate communication important (Kurz, 2019; Sandberg, 2021). So far, policy campaigns by governments and non-profit organizations have had little success in changing consumer behavior toward sufficiency (Tröger & Reese, 2021; Zell-Ziegler et al., 2021). Therefore, a

better understanding of how to promote a sufficiency lifestyle can help address environmental challenges. In this paper, we experimentally examine whether information about sufficiency benefits affects voluntary reduction in consumption measured by an incentivized decision task.

Most experimental studies promoting behaviors that lead to direct reductions in resource use have focused on household energy conservation behavior (Andor & Fels, 2018). Research on other consumption categories such as product consumption has mostly been limited to qualitative studies focusing on barriers to sufficiency transitions and how to overcome them (e.g., Sandberg, 2021; Tröger & Reese, 2021). The few experimental studies on the reduction of product consumption mainly rely on self-reports (e.g., Frick et al., 2021). Also, the two studies most closely related to our research use self-reports for experimentally examining how sufficiency benefits affect intentions or willingness to reduce consumption: Balderjahn and Appenfeller (2023) show that a social norm with regard to personal benefits (i.e., “Increasingly more people say they are happy and satisfied with consuming less.”) significantly reduces consumption intentions while a social norm based on environmental benefits does not (i.e., “Increasingly more people say they consume less to protect the environment.”). Similarly, Herziger et al. (2020) show that a biospheric appeal (e.g., reducing carbon emissions) has no significant effect to reduce consumption, while an egostic appeal (e.g., reducing stress) increases individuals’ willingness to limit consumption. While both of these studies suggest that self-interested motives might have a more powerful behavioral impact than environmental arguments, Tomaselli et al. (2021) find no effect of different messages about the environmental gains and individual gains of transitioning to a post-growth economy on attitudes toward economic growth. Due to the small number of experimental studies on the reduction of product consumption, the inconclusive results on sufficiency gain frames and the lack of studies

measuring actual, incentivized behavior, more research is needed to investigate the effect of communicating different sufficiency benefits on voluntary consumption reduction.

In a between-subject online experiment with participants from the United States ($n = 1,317$), we examine the effect of communicating different sufficiency benefits to nature, society, and the individual on voluntarily waiving consumption measured by an incentivized decision task. The experiment consists of three experimental treatments and one control condition. In the NATURE treatment participants received a text that informed about benefits of sufficiency behavior to nature (e.g., "Forests and moors could be protected, which would save more plant and animal species from extinction."). The SOCIETY treatment focused on sufficiency benefits to society (e.g., "We could focus more on the well-being of those around us and look out for each other, leading to a more balanced and caring society."), while the INDIVIDUAL treatment concentrated on sufficiency benefits to the individual (e.g., "You could focus on non-material things such as taking a walk in nature, cultivating social contacts or a sense of purpose, that make you happy in the long run."). In the CONTROL condition, participants received a neutral text. Our main outcome variable is the individual consumption level which was measured by an incentivized decision task. In particular, participants were offered a 1.50 USD Amazon voucher and had to decide whether to keep it or refrain from all or parts of it by donating to a project fostering reduced consumption. Therefore, this incentivized decision task represents a trade-off between a consumption option and the promotion of a sufficiency lifestyle. In addition, we assessed green behavioral intentions and sufficiency policy support as secondary outcome variables.

The results suggest that communicating benefits of sufficiency behavior for the individual leads to significantly less consumption than in the neutral control group. We find no significant

differences between the control group and the experimental groups that provide information about the benefits of sufficiency for nature and society. Furthermore, none of the treatments have a significant effect on green behavioral intentions or sufficiency policy support. According to these results, informing about benefits of sufficiency lifestyles for individual well-being such as more free time and better mental health may prove fruitful in promoting sufficiency behavior. This finding is relevant for organizations and policy makers who seek to foster sufficiency behavior.

We argue that the value of our paper is threefold: First, experimental research on sufficiency behaviors aimed at directly reducing resource use has mainly focused on household energy and water conservation behavior in the field (Andor & Fels, 2018; V. L. Chen et al., 2017; Günther et al., 2020). However, sufficiency requires reductions in all types of consumption. We contribute to the limited experimental literature dealing with reductions in product consumption. Second, little research has focused on the effect of communicating sufficiency gains on voluntary consumption reduction. Our study seems to be the first that distinguishes between information about sufficiency gains for nature, society, and the individual. In particular, we examine whether and which of these pieces of information affect voluntary consumption reduction. Third, studies analyzing consumption reduction of products are mostly qualitative or used self-reports to measure sufficiency behaviors and are thus unable to assess the impact on actual behavior. We make a methodological contribution by introducing a new incentivized task to measure the level of refraining consumption in the laboratory or online. To the best of our knowledge, there are no comparable tasks that measure actual sufficiency behavior with real consequences in an incentivized way. Therefore, this measure is an important complement to self-reported sufficiency measures (e.g., Homar & Cvelbar, 2021; Lades et al., 2021).

2 Related literature and hypotheses

Sufficiency is about reducing production and consumption in order to mitigate the environmental impact of human activities to respect planetary boundaries (Figge et al., 2014; Princen, 2005). While much of the literature addresses the need to implement sufficiency to stay within planetary boundaries (e.g., Cordroch et al., 2022; Haberl et al., 2020), several studies also discuss what sufficiency lifestyles look like (e.g., Bocken & Short, 2016; Kropfeld et al., 2018) as well as the barriers to adoption (e.g., Sandberg, 2021; Tröger & Reese, 2021). Accordingly, sufficiency is also related to questions about individual and societal needs and wants, and the conditions for a good life (O'Neill et al., 2018; Schneidewind & Zahrnt, 2014). The debate revolves around possible behavioral change toward reduced individual consumption and questioning the capitalist norm of ever-greater consumption as the path to happiness and life satisfaction (O'Neill et al., 2018). In this context, sufficiency is related to various movements such as anti-consumerism (Whitmarsh et al., 2017), voluntary simplicity (Alexander & Ussher, 2012; Rich et al., 2020), frugality (Kropfeld et al., 2018), or minimalism (Herziger et al., 2020).

Besides mitigating environmental harm (e.g., Ivanova et al., 2016; Wiedmann et al., 2020), sufficiency lifestyles may improve the lives of individuals and society, especially in countries of the Global North. Refraining from consumption enables individuals to perceive a stronger sense of authenticity (Zavestoski, 2002), to reduce the risk of falling into debt (Nepomuceno & Laroche, 2015), to be better able to self-express (Black & Cherrier, 2010), to be happier (Alexander & Ussher, 2012; Hüttel et al., 2020), and to have a higher life satisfaction (Boujbel & d'Astous, 2015; Kuanr et al., 2020). On a societal level, sufficiency may enhance societal well-being in consumer nations (Hüttel et al., 2020), ensure social justice (Muller, 2009),

improve health (Workman et al., 2019), and indirectly inhibit zoonotic disease outbreaks (Ellwanger et al., 2020). Thus, implementing sufficiency lifestyles in the Global North may reduce the negative ecological impact of consumption and simultaneously improve the lives of humans and society (Chancellor & Lyubomirsky, 2011).

Consumerist culture has been identified as the most prevalent barrier to sufficiency behavior (Sandberg, 2021). Consumers may be hindered to deviate from the prevailing consumption norms due to internalized norms or feelings of not meeting their own desires or expectations from peers (Joyner Armstrong et al., 2016). For example, consumers seek prestige and status through owning the latest goods and gadgets (Bocken & Short, 2016). These barriers may provoke negative reactions toward sufficiency since it contradicts people's deeply internalized "more is better" mindset (Tröger & Reese, 2021). Therefore, how sufficiency is presented is crucial for promoting sufficiency behavior (Gossen et al., 2019).

There are studies that show that framing pro-environmental behaviors as a sacrifice might not be effective to convince people to adopt them. For example, Gifford and Comeau (2011) show that motivational messages (e.g., "We help solve climate change when we take transit, compost, or buy green energy") lead to higher pro-environmental intentions than sacrifice messages (e.g., "I am going to have to get used to driving less, turning off the lights, and turning down the heat"). In a similar vein, Nolan and Tobia (2019) find that polling questions asking about a financially costly climate change policy when the goal of the policy is to create efficient technologies (e.g., "Require that all gasoline be formulated to produce lower emissions even if it adds an additional cost of five cents to the price of gasoline") received more support than when the goal is to curtail behavior (e.g., "Adding an additional cost of five cents to the price of gasoline so people either drive less, or buy cars that use less gas"). Taken together, these

studies show that if pro-environmental behavior is presented as sacrifice, pro-environmental intentions and support for environmental policy measures are relatively low.

Fruitful tools to motivate people to refrain from consumption are interventions such as moral appeals (S. Chen et al., 2022), social comparison feedback (Kim & Kaemingk, 2021), or informing about health impacts (V. L. Chen et al., 2017). In particular, the formulation of social norms that emphasize the common goal or social opinions about behaviors have been shown to be effective (Andor & Fels, 2018). However, most of these experimental studies aiming to change sufficiency behavior have focused on influencing energy and water conservation behavior. Few experimental studies have studied how focusing on sufficiency benefits affects self-reported indicators that measure product consumption reduction. For example, Balderjahn and Appenfeller (2023) show that communicating a social norm with regard to personal benefits (i.e., “Increasingly more people say they are happy and satisfied with consuming less.”) significantly reduces the intentions to consume whereas communicating a social norm with an environmental benefit (i.e., “Increasingly more people say they consume less to protect the environment.”) does not (Balderjahn & Appenfeller, 2023). Another intervention showing videos about minimalism increased participants’ willingness to curtail their consumption more if it was presented with an egoistic motivation for minimalism than if it was introduced with a biospheric motivation (Herziger et al., 2020). Tomaselli et al. (2021) found no effect of different messages regarding environmental gains, environmental losses, well-being gains, and well-being losses on attitudes toward moving to a post-growth economy. Due to the inconclusive results and a lack of incentivized outcome measures, further research is needed on the question of what kind of sufficiency benefits should be emphasized to promote actual sufficiency behavior.

The present study addresses this gap by investigating whether sufficiency gain framings for nature, society, and the individual can be used to promote voluntary consumption reduction measured by an incentivized decision task. The three selected dimensions, i.e., nature, society, and individual, roughly correspond to the three "disciplinary roots" of the sufficiency concept (Jungell-Michelsson & Heikkurinen, 2022): First, ecological economics with the idea of complementarity of capital and limitations to economic growth. Second, political ecology with the idea of creating a just social metabolism that meets the needs of all humanity. Third, ecological philosophy with considerations of non-material values and self-restraint as a path to greater well-being, as well as altruistic motivations to engage in sufficiency behavior.

As with other pro-environmental behaviors (Homar & Cvelbar, 2021; Jacobson et al., 2019; Segev et al., 2015), information about the benefits to nature may also encourage to refrain from consumption. Although Balderjahn and Appenfeller (2023) and Herziger et al. (2020) find no effect of promoting sufficiency through environmental motivation, communicating specific benefits of reducing consumption to the planet can make people aware of the positive effects of their actions. In addition, explaining sufficiency gains for nature may activate other-regarding preferences, i.e., considering the well-being of plants and animals or nature as a whole (Heinz & Koessler, 2021). A well-established stream of research has found that other-regarding preferences are positively related with pro-environmental behavior (Dietz et al., 2005; Schultz & Zelezny, 1999). Therefore, we hypothesize that informing about sufficiency gains for nature leads participants to refrain from a higher amount of consumption than not informing about sufficiency gains (Hypothesis 1).

Instead of presenting the impact of environmental issues on nature, research has also shown that emphasizing societal outcomes can be fruitful to motivate pro-environmental behavior

(Klein et al., 2022; Sapiains et al., 2016). Similar to highlighting outcomes for nature, highlighting societal issues can activate other-regarding preferences, i.e., giving up own resources to the benefit of others (Fehr & Schmidt, 2006; Heinz & Koessler, 2021). One channel through which other-regarding interventions can work is by enlarging the moral circle. As the number of entities considered to have moral value increases, the willingness to protect these entities even at one's own expense increases (Crimston et al., 2016). Accordingly, we hypothesize, that informing about sufficiency gains for society leads participants to refrain from a higher amount of consumption than not informing about sufficiency gains (Hypothesis 2).

Pro-environmental behavior can also be promoted by focusing on individual gains. Literature has documented that interventions addressing self-regarding preferences, e.g., focusing on individual gains or economic incentives, are an effective way to promote pro-environmental intentions (Czap et al., 2015; Hafner et al., 2019). In contrast to other-regarding preferences, self-regarding preferences aim to maximize self-interest (Fehr & Schmidt, 2006; Heinz & Koessler, 2021). Communicating that a happy and satisfying life with less consumption is possible has been shown to reduce the intention to purchase (Balderjahn & Appenfeller, 2023; Herziger et al., 2020). Thus, informing about individual benefits of a lifestyle with less focus on consumption may also be a powerful tool to motivate actual behavior toward sufficiency (Tröger & Reese, 2021). Therefore, we hypothesize, that informing about sufficiency gains for individuals leads participants to refrain from a higher amount of consumption than not informing about sufficiency gains (Hypothesis 3).

3 Online lab experiment

3.1 Experimental design and procedure

We conducted a between-subject online experiment to examine the effect of communicating about different sufficiency gains on sufficiency behavior conceptualized as waiving consumption in the form of an Amazon voucher.¹ The study was pre-registered on the platform aspredicted.org (#107289) and obtained ethical approval from the Faculty of Business Administration, Economics and Social Sciences of the University of Bern (serial number: 222022).

The experiment involves a control group and three experimental groups called NATURE, SOCIETY, and INDIVIDUAL treatment. The experimental treatments distinguish in terms of the kind of sufficiency gains described in a text: sufficiency gains through reduced consumption for NATURE (e.g., “By solving the problem of waste pollution, the land, the sea, and the air would be cleaner.”), for SOCIETY (e.g., “We as society would be safer from resource conflicts because more people could benefit from the available natural resources.”), or for the INDIVIDUAL person (e.g., “You could become more independent of material goods and thus experience a higher sense of satisfaction.”). For all three experimental treatments, four different benefits were mentioned and the scientific sources for the benefits were given below the texts. The control group received a text about an artwork unrelated to consumption, nature, society, and the individual. The texts of the experimental groups as well as the one of the control group can be found in the supplementary material.

¹ Experimental instructions and survey questions are available in the online supplementary material.

In the first part of the study, participants were asked to read the text about possible gains enabled through reduced consumption (experimental groups) or about artwork (control group). Depending on the experimental treatment, the text mentioned sufficiency gains for nature, society, or the individual. To ensure that the participants read the text carefully, they had to answer a control question that asked them to identify a sufficiency benefit mentioned in the text. Participants who did not answer the control question correctly were instructed to read the text and answer the control question again. Participants who did not answer the control question correctly the second time were excluded from the main sample.

In the second part of the study, we used an incentivized decision task to measure participants' sufficiency behavior. Participants were offered a 1.50 USD Amazon voucher and had to decide whether to keep the 1.50 USD for themselves or refrain from all or parts of it by donating to a sufficiency project.² The amount of the voucher they refrained from measures sufficiency behavior and serves as the primary outcome of the experiment. For example, choosing 1.30 USD Amazon voucher resulted in a donation of 0.20 USD to a sufficiency project. Participants had to indicate in a text field how much of the 1.50 USD they want to keep for themselves and in a further text field the amount they want to donate. Entries were only accepted in increments of 0.10 USD, giving them 16 options and the total had to add up to 1.50 USD. Participants were informed that their decision would have actual consequences and they were given the opportunity to receive a confirmation email for the donation to the organization. Subsequently, we measured sufficiency policy support and green behavioral intentions as

² The organization is based in Switzerland and called ökozentrum. They promote various projects that aim to increase sufficiency. In one project, they conducted workshops with tourism businesses to show how sufficiency can be implemented in tourism and how this can be promoted to consumers. The reason for this donation was to offer participants a legitimate alternative use for the waived money. This enabled to exclude that participants take the voucher because they fear that our research team might spend the money on consumption. However, the participants were not given the additional information about the organization and specific sufficiency projects in order to keep the focus on the Amazon voucher.

secondary outcome variables. Sufficiency policy support was measured using four items from Haring et al. (2017) and one self-formulated item (Cronbach's alpha = 0.74). Participants could indicate their support for a policy such as "Impose consumption taxes on polluting consumption" on a 5-point Likert scale ranging from 1 (a very bad suggestion) to 5 (a very good suggestion). Green behavioral intentions were measured with three different items previously used by Mancha and Yoder (2015) (e.g., "I will try to reduce my carbon footprint in the forthcoming month."). The participants were asked to rate the items on a 7-point Likert scale ranging from 1 (extremely unlikely) to 7 (extremely likely). The reliability of the measure was good (Cronbach's alpha = 0.84).

In the third part of the study, we measured the psychological distance to sufficiency benefits, sufficiency orientation, perceived effectiveness of reduced consumption, and demographic variables. An adapted scale from Brügger et al. (2016) was used to measure the perceived psychological distance to the benefits of reduced consumption. Participants could indicate for five different kinds or formulations of psychological distance how close the benefits of a reduced consumption feel for them (e.g., very close (1) to very distant (7) or very real (1) to very hypothetical (7)) (Cronbach's alpha = 0.92). Next, we measured sufficiency orientation with a 5-point Likert scale from Tröger et al. (2021) (Cronbach's alpha = 0.87). Participants indicated how strongly they agree or disagree with 13 different statements. Subsequently, participants were asked to indicate how effective they consider reduced consumption to increase the well-being of the stakeholder mentioned in their treatment (i.e., nature, society, or individual person).³ Participants in the control treatment were asked how effective they consider reduced

³ In our experiment, people in the INDIVIDUAL group showed a significantly higher level of belief in the effectiveness of sufficiency measures than people in the SOCIETY group ($p = 0.018$). That means that people in INDIVIDUAL rate the effectiveness of consumption reduction as to increase their own well-being higher than people in SOCIETY do related to the well-being of society.

consumption to increase planetary and human well-being (4-point Likert scale ranging from “very effective” to “not effective at all”). Finally, the demographic variables gender, age, education, political ideology, and the household income were collected.

The experiment was conducted online on the crowdsourcing platform Amazon Mechanical Turk (MTurk) from September 21 to September 27, 2022. Experimental sessions lasted on average 5.74 minutes, with a flat payment of 0.50 USD per participant. The mean additional payment for the decision task was 0.91 USD in form of an Amazon voucher (range: 0 to 1.50 USD, SD = 0.42). Participants gave on average 0.59 USD to the sufficiency project resulting in total donations of 949.60 USD.

3.2 Sample characteristics

The participants of the experiment were from the United States. We aimed for a final sample of 1,400 participants, with 350 in each condition. This enables to detect an effect of Cohen’s d of 0.2 with an error probability of 0.05 and a power of 0.80 (based on a two-sided Wilcoxon-Mann-Whitney test). Due to the exclusion criteria, we planned to recruit 1,600 completed surveys.

We collected 1,611 completed surveys. In accordance with the pre-registered protocol, participants were excluded who did not complete the survey within 30 minutes of starting ($n = 2$), who completed the survey faster than two standard deviations from the average completion time ($n = 0$), who failed the attention check ($n = 128$), and who incorrectly answered the control question more than once ($n = 203$). The exclusion criteria reduced the main sample to 1,317

subjects (53% female; mean age: 32 years, $SD = 9.57$).^{4,5} Out of these subjects, 312 received the NATURE treatment, 335 the SOCIETY treatment, 337 the INDIVIDUAL treatment, and 333 the CONTROL condition. In Table 1 we provide an overview of the mean values of the demographic variables for each of the three experimental groups and the CONTROL group. Randomization between the groups was successful for all variables considered, except for gender.⁶

Table 1

Characteristics of main sample and randomization check between experimental conditions.

Variables	CONTROL	NATURE	SOCIETY	INDIVIDUAL	Group Comparisons
Demographics					
Gender (% female)	59.46	53.85	48.96	49.85	$\chi^2(3) = 9.21$, p = 0.03
Age in years	32.09 (9.25)	32.58 (10.18)	31.96 (9.70)	31.74 (9.17)	$F_{(3,1313)} = 0.43$, p = 0.73
Education (% above bachelor)	14.16	18.06	20.06	16.96	$\chi^2(3) = 4.22$, p = 0.24
Income (% $\geq 60,000$ USD)	39.64	32.69	38.81	36.20	$\chi^2(3) = 4.04$, p = 0.26
Conservative ideology (% conservative)	56.40	56.39	55.96	53.94	$\chi^2(3) = 0.55$, p = 0.91
Observations	333	312	335	337	1317

Note. The table reports means and standard deviations for continuous variables and percentage frequencies for categorical variables for each group of the experiment. Standard deviations are given in parentheses. Female is a binary variable taking a value of 1 for women and 0 for men, non-binary and other individuals. Education is a binary variable taking the value 1 for an education level higher than a Bachelor's degree and 0 otherwise. Income is a binary variable taking the value 1 for an income higher than or equal to 60,000 USD and 0 otherwise. Conservative ideology is a binary variable taking the value of 1 if the political ideology is "somewhat conservative", "conservative", or "very conservative". For categorical variables the results of Chi-squared test comparisons are given and for continuous variables the results of one-way analyses of variance (one-way ANOVA).

⁴ There are overlaps regarding participants who did not complete the survey within 30 minutes of starting and who failed the attention check ($n = 1$), who did not complete the survey within 30 minutes of starting and who incorrectly answered the control question more than once ($n = 2$), who failed the attention check and who incorrectly answered the control question more than once ($n = 37$), who did not complete the survey within 30 minutes of starting and failed the attention check ($n = 1$) and incorrectly answered the control question more than once ($n = 1$).

⁵ In the Appendix (Table 4), we test the robustness of the results with an alternative sample excluding participants who do not consider the benefits of reduced consumption as effective to increase the well-being of the planet, our society, or the individual well-being.

⁶ In the analysis, we control for gender.

4 Results

4.1 Effect of sufficiency gain framing on consumption level

First, we investigate whether informing about sufficiency gains leads to more sufficiency behavior conceptualized as waiving consumption in the form of an Amazon voucher. Of the 1.50 USD Amazon voucher provided, participants in the CONTROL group waived on average 0.57 USD (SD = 0.42, SE = 0.02). Participants in the NATURE treatment waived on average 0.56 USD (SD = 0.41, SE = 0.02), participants in the SOCIETY treatment waived on average 0.59 USD (SD = 0.44, SE = 0.02), and participants in the INDIVIDUAL treatment waived on average 0.63 USD (SD = 0.42, SE = 0.02). The difference between CONTROL and INDIVIDUAL results in an effect size of Cohen's d of 0.15. Fig. 1 displays the distribution of the voucher waived. The difference between the INDIVIDUAL and the CONTROL treatment (H_3) is statistically significant at the 5-percent level (two-sided Mann-Whitney rank sum test: $z = -2.21$, $p = 0.027$). However, there are no statistically significant differences between NATURE and CONTROL treatment (H_1) ($z = -0.23$, $p = 0.816$), between SOCIETY and CONTROL treatment (H_2) ($z = -0.61$, $p = 0.541$), and between the experimental treatments (INDIVIDUAL vs. SOCIETY: $z = -1.585$, $p = 0.113$; INDIVIDUAL vs. NATURE: $z = -1.878$, $p = 0.060$; NATURE vs. SOCIETY: $z = -0.367$, $p = 0.713$).

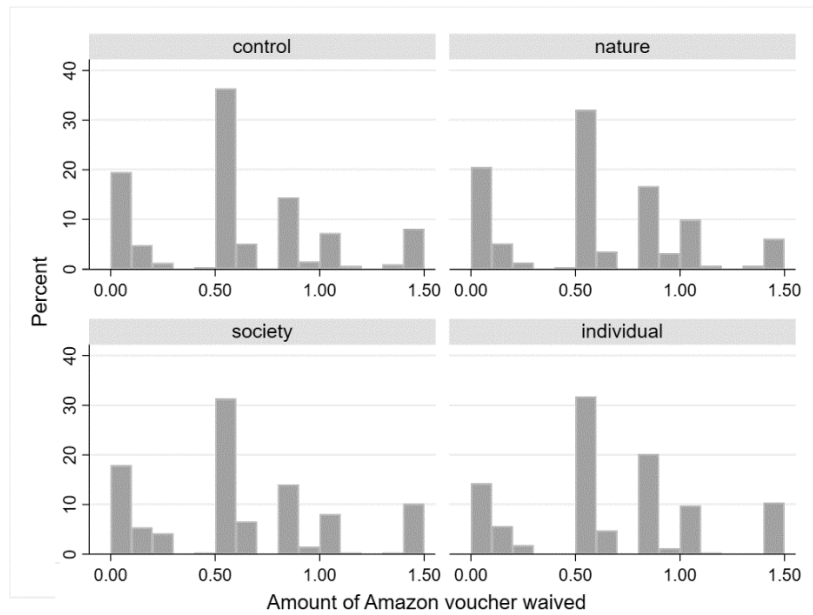


Fig. 1. Distribution of the amount of Amazon voucher waived by experimental treatments

OLS regression modeling reveals the stability of the results and shows additional factors influencing the amount of voucher waived (Table 2). Compared to the control group, only the INDIVIDUAL treatment has a consistently statistically significant positive influence on the amount of voucher waived. The INDIVIDUAL treatment effect remains on the same significance level and the magnitude of the coefficient slightly increases when controlling for sociodemographic variables (Specification 2). Females and older people show significantly higher levels of sufficiency behavior, whereas education, income, and a conservative ideology have no significant effect on the amount of voucher waived. The finding that women generally show more sufficiency behavior than other genders combined with the fact that there are significantly more women in the CONTROL than in the INDIVIDUAL group (Pearson $\chi^2(1) = 6.24, p = 0.013$; see also

Table I), suggests that the treatment effect is larger than estimated in the hypothesis test. Specification 3 additionally includes sufficiency orientation and perceived psychological distance to sufficiency benefits. Not surprisingly, sufficiency orientation is significantly related to a higher amount of voucher waived. The positive correlation between the amount of voucher waived and participant's sufficiency orientation can be seen as an indicator that we have developed a valid incentivized task to measure sufficiency behavior (Pearson correlation

coefficient; $r = 0.12$, $p < 0.001$). Psychological distance has no significant effect. Taking together, the regression results provide considerable indication for a significant positive effect of the INDIVIDUAL treatment on sufficiency behavior compared to the control group (H_3).

Table 2

Effect of sufficiency gain framing on the amount of voucher waived: OLS regression results.

	Amount of voucher waived (1)	Amount of voucher waived (2)	Amount of voucher waived (3)
NATURE	-0.004 (0.033)	0.004 (0.033)	0.003 (0.033)
SOCIETY	0.019 (0.033)	0.026 (0.033)	0.025 (0.033)
INDIVIDUAL	0.065** (0.033)	0.077** (0.033)	0.073** (0.032)
Female		0.059** (0.024)	0.059** (0.024)
Age in years		0.003** (0.001)	0.003** (0.001)
Education (above Bachelor)		-0.028 (0.033)	-0.030 (0.033)
Income ($\geq 60,000$ USD)		0.023 (0.027)	0.025 (0.026)
Conservative ideology		0.023 (0.025)	0.020 (0.025)
Sufficiency orientation			0.104*** (0.021)
Psychological distance			-0.005 (0.007)
Constant	0.568*** (0.023)	0.405*** (0.057)	0.045 (0.099)
Observations	1,317	1,285	1,285
R-squared	0.004	0.016	0.035

Note. The table presents ordinary least squares estimates. Robust standard errors are in parentheses. The dependent variable is the amount of Amazon voucher waived. The reference group for the experimental treatments (NATURE, SOCIETY, INDIVIDUAL) is the CONTROL group. Female is a binary variable taking a value of 1 for women and 0 for men and non-binary and other individuals. Education is a binary variable taking the value 1 for an education level higher than a Bachelor's degree and 0 otherwise. Income is a binary variable taking the value 1 for an income higher than or equal to 60,000 USD and 0 otherwise. Conservative ideology is a binary variable taking the value of 1 if the political ideology is "somewhat conservative", "conservative", or "very conservative. Sufficiency orientation is measured on a 5-point scale, with higher numbers indicating a higher sufficiency orientation. Psychological distance is measured on a 7-point scale, with higher numbers indicating a higher psychological distance. 32 observations are omitted because of missing observations from the non-required responses on education ($n = 5$) and political ideology ($n = 27$). *, **, and *** document significance at the 10%, 5%, and 1% levels, respectively.

4.2 Effect of sufficiency gain framing on pro-environmental intentions and sufficiency policy support

For exploratory purposes, we measured the effect of the experimental treatments on sufficiency policy support and green behavioral intentions. According to Mann Whitney U tests, the experimental treatments do not differ statistically significantly from the control group in neither sufficiency policy support⁷ nor green behavioral intentions.⁸ OLS regression analyses support this finding. Table 3 presents specifications with sufficiency policy support and with green behavioral intentions as dependent variables.

Furthermore, the results indicate high approval rates for sufficiency policies. Across all groups and for all policies, approval was greater than disapproval (overall mean policy support = 3.86; SD = 0.72). This high approval rates for sufficiency policies is particularly noteworthy for the U.S. sample at hand, in which 56% describe themselves as conservative and 63% have household incomes of less than \$60,000 per year.⁹ In addition, we find weak, positive correlations between the amount of voucher waived and green behavioral intentions ($r = 0.11$, $p < 0.001$) as well as between the amount of voucher waived and sufficiency policy support ($r = 0.06$, $p < 0.05$). Sufficiency policy support and green behavioral intentions highly correlate ($r = 0.65$, $p < 0.001$).

⁷ CONTROL vs. NATURE $z = -0.658$, $p = 0.511$; CONTROL vs. SOCIETY $z = -0.245$; $p = 0.810$; CONTROL vs. INDIVIDUAL $z = -0.638$; $p = 0.523$.

⁸ CONTROL vs. NATURE $z = -0.103$, $p = 0.918$; CONTROL vs. SOCIETY $z = 0.496$, $p = 0.620$; CONTROL vs. INDIVIDUAL $z = -0.568$, $p = 0.570$.

⁹ Median household income in U.S. in 2021: 70,784 USD (Semega & Kollar, 2022).

Table 3

Effect of sufficiency framing on sufficiency policy support and green behavioral intentions: OLS regression results.

	Sufficiency policy support		Green behavioral intentions	
	Model 1	Model 2	Model 1	Model 2
NATURE	0.028 (0.057)	0.045 (0.040)	0.027 (0.091)	0.037 (0.063)
SOCIETY	-0.007 (0.055)	-0.026 (0.040)	-0.068 (0.094)	-0.076 (0.066)
INDIVIDUAL	0.026 (0.055)	0.006 (0.041)	0.098 (0.086)	0.054 (0.062)
Female		0.032 (0.029)		0.055 (0.047)
Age in years		-0.004** (0.002)		0.001 (0.003)
Education (above Bachelor)		0.108** (0.042)		0.084 (0.069)
Income (\geq 60.000 USD)		0.027 (0.030)		-0.017 (0.051)
Conservative ideology		0.028 (0.031)		0.045 (0.049)
Sufficiency orientation		0.894*** (0.031)		1.455*** (0.050)
Psychological distance		0.007 (0.009)		-0.067*** (0.014)
Constant	3.849*** (0.039)	0.606*** (0.137)	5.537*** (0.065)	0.385* (0.230)
Observations	1,317	1,285	1,317	1,285
R-squared	0.000	0.485	0.003	0.492

Note. The table presents ordinary least squares estimates. Robust standard errors are in parentheses. The dependent variables are sufficiency policy support and green behavioral intentions. Sufficiency policy support was measured on a 5-point scale, with higher numbers indicating more support for the policies. Green behavioral intentions were measured on a 7-point scale, with higher numbers indicating higher behavioral intentions. The reference group for the experimental treatments (NATURE, SOCIETY, INDIVIDUAL) is the CONTROL group. Female is a binary variable taking a value of 1 for women and 0 for men and non-binary and other individuals. Education is a binary variable taking the value 1 for an education level higher than a Bachelor's degree and 0 otherwise. Income is a binary variable taking the value 1 for an income higher than or equal to 60,000 USD and 0 otherwise. Conservative ideology is a binary variable taking the value of 1 if the political ideology is "somewhat conservative", "conservative", or "very conservative. Sufficiency orientation is measured on a 5-point scale, with higher numbers indicating a higher sufficiency orientation. Psychological distance is measured on a 7-point scale, with higher numbers indicating a higher psychological distance. 32 observations are omitted because of missing observations from the non-required responses on education (n = 5) and political ideology (n = 27). *, **, and *** document significance at the 10%, 5%, and 1% levels, respectively.

5 Discussion and conclusion

We examine whether information about the needs and benefits of sufficiency encourages voluntary consumption reduction measured by an incentivized task. Thereby, we contribute to the literature by distinguishing three different kinds of sufficiency benefits: benefits to the nature, benefits to the society and benefits to the individual well-being. The results suggest that

focusing on sufficiency benefits that emphasize individual well-being leads to less consumption compared to a neutral control condition. In contrast, focusing on sufficiency benefits to nature and society has no effect on consumption levels compared to the control group. Accordingly, sufficiency behavior in our study seems to respond to the information about self-regarding, individual gains.

But why might the individual sufficiency gain frame have been successful in reducing consumption and the society and nature sufficiency gain frame not? One plausible explanation is that people may perceive a high self-efficacy and likelihood of success of reducing the own consumption level to achieve individual sufficiency gains. Note that the benefits of reduced consumption mentioned in the INDIVIDUAL treatment can be achieved without having to rely on other people to cooperate, i.e., that others also reduce their consumption level. In contrast, to obtain the benefits mentioned in the NATURE and SOCIETY treatment, individuals also rely on others to reduce consumption. Following Heinz and Koessler (2021), we speculate that the perceived cooperation of other people might be critical for effective interventions targeting other-regarding preferences. This assumption is related to research on social dilemmas which has shown that many people cooperate when others also cooperate (Fischbacher et al., 2001). In addition, other experimental studies suggest that interventions targeting other-regarding preferences only work when combined with social norms (Ferraro et al., 2011). Therefore, we think that future work should aim to further examine under which conditions sufficiency gain frames for nature or society are effective in changing consumption behavior.

In addition, the results reveal that females and older people engage in significantly more sufficiency behavior, whereas education, income, and a conservative ideology do not have a significant effect on sufficiency behavior. Our findings with regard to gender and age are in

line with previous research (e.g., Gifford & Nilsson, 2014; Hunter et al., 2004; Zelezny et al., 2000). However, literature has consistently found the level of education to be one of the strongest drivers of concern and engagement in pro-environmental behavior globally (Blankenberg & Alhusen, 2019; Meyer, 2015). Similarly, for conservative ideology, where Democratic-Republican partisanship has been shown to be one of the strongest drivers of climate change awareness, concern, and of pro-environmental behavior in the United States (Coffey & Joseph, 2013; Lee et al., 2015). Our divergent results indicate the importance of distinguishing between different forms of pro-environmental behavior and suggest that sufficiency behavior may be partly driven by different sociodemographic factors than other pro-environmental behaviors. The study only marks a starting point for further research on the role of individual characteristics in promoting sufficiency behavior.

Furthermore, the results show that the experimental treatments are not statistically significantly different from the control group in terms of either sufficiency policy support or green behavioral intentions. A reason for these null results may be, that the link of these outcome variables to the texts on sufficiency gains was too little noticed. The treatment texts on sufficiency gains specifically suggest the act of reducing consumption to achieve the mentioned sufficiency benefits. The action of reducing consumption through waiving an Amazon voucher might have well-captured this behavior, since it is tangible and connected with immediate real consumption reduction. In contrast, to make an effective link of the effects of overconsumption and sufficiency policies (e.g., “Introduce a ban on advertising”) more cognitive effort might be needed, because the policies do not directly lead to less consumption.

The results have direct implications for policy making by showing practitioners what form of content and arguments they can use to promote reduced consumption. In particular, policy

makers and other stakeholders may foster sufficiency behavior by communicating individual benefits of reduced consumption such as more free time, better mental health, or a higher sense of satisfaction. However, emphasizing benefits to the individual can be seen as a contradictory means of moving toward a more sufficiency-oriented society, since such a society is much less about egoism and more about cooperation and community (Brossmann & Islar, 2020). But even if focusing on sufficiency benefits to the individual might distract people from engaging in collective actions, it may be that being convinced of the individual benefits of sufficiency is a prerequisite for being motivated to support and engage in actions targeting systemic changes. With this in mind and the plausible assumption that benefits to the individual, society and nature do not activate conflicting preferences, we suggest to test the combined effect of different sufficiency benefits in future research.

Another limitation that should be considered in the interpretation of the results and that may be addressed in future research is that the current study focuses only on sufficiency gain frames. It would be interesting to examine frames in relation to losses that can arise from non-sufficiency lifestyles (Homar & Cvelbar, 2021), and to compare both frames in their effects on sufficiency behavior. Finally, the focus of this study was on measuring the immediate impact of the interventions on subsequent behavior, which restricts the results to evidence of short-term effects. A long-term study, in which sufficiency gains are communicated repeatedly, would enable to examine whether such communication can have a lasting effect on behavior change and habit formation.

6 References

- Alexander, S., & Rutherford, J. (2019). A critique of techno-optimism: Efficiency without sufficiency is lost. In A. Kalfagianni, D. Fuchs, & A. Hayden (Eds.), *Routledge handbook of global sustainability governance* (pp. 231–241). Routledge.
<https://doi.org/10.4324/9781315170237-19>
- Alexander, S., & Ussher, S. (2012). The voluntary simplicity movement: A multi-national survey analysis in theoretical context. *Journal of Consumer Culture*, *12*(1), 66–86.
<https://doi.org/10.1177/1469540512444019>
- Andor, M. A., & Fels, K. M. (2018). Behavioral economics and energy conservation – A systematic review of non-price interventions and their causal effects. *Ecological Economics*, *148*, 178–210. <https://doi.org/10.1016/j.ecolecon.2018.01.018>
- Balderjahn, I., & Appenfeller, D. (2023). A social marketing approach to voluntary simplicity: Communicating to consume less. *Sustainability*, *15*(3), 2302.
<https://doi.org/10.3390/su15032302>
- Black, I. R., & Cherrier, H. (2010). Anti-consumption as part of living a sustainable lifestyle: Daily practices, contextual motivations and subjective values. *Journal of Consumer Behaviour*, *9*(6), 437–453. <https://doi.org/10.1002/cb.337>
- Blankenberg, A.-K., & Alhusen, H. (2019). On the determinants of pro-environmental behavior: A literature review and guide for the empirical economist. *Center for European, Governance, and Economic Development Research (CEGE)*, 350.
<https://doi.org/10.2139/ssrn.3473702>
- Bocken, N. M. P., & Short, S. W. (2016). Towards a sufficiency-driven business model: Experiences and opportunities. *Environmental Innovation and Societal Transitions*, *18*, 41–61. <https://doi.org/10.1016/j.eist.2015.07.010>
- Boujbel, L., & d’Astous, A. (2015). Exploring the feelings and thoughts that accompany the

- experience of consumption desires. *Psychology and Marketing*, 32(2), 219–231.
<https://doi.org/10.1002/mar.20774>
- Brockway, P. E., Sorrell, S., Semieniuk, G., Heun, M. K., & Court, V. (2021). Energy efficiency and economy-wide rebound effects: A review of the evidence and its implications. *Renewable and Sustainable Energy Reviews*, 141, 110781.
<https://doi.org/10.1016/j.rser.2021.110781>
- Brossmann, J., & Islar, M. (2020). Living degrowth? Investigating degrowth practices through performative methods. *Sustainability Science*, 15(3), 917–930.
<https://doi.org/10.1007/s11625-019-00756-y>
- Brügger, A., Morton, T. A., & Dessai, S. (2016). “Proximising” climate change reconsidered: A construal level theory perspective. *Journal of Environmental Psychology*, 46, 125–142.
<https://doi.org/10.1016/j.jenvp.2016.04.004>
- Chancellor, J., & Lyubomirsky, S. (2011). Happiness and thrift: When (spending) less is (hedonically) more. *Journal of Consumer Psychology*, 21(2), 131–138.
<https://doi.org/10.1016/j.jcps.2011.02.004>
- Chen, S., Kou, S., Hu, L., & Xiao, T. (2022). Leveraging voluntary simplicity in promoting sustainable consumption from the perspective of moral appeals. *Sustainable Production and Consumption*, 33, 63–72. <https://doi.org/10.1016/j.spc.2022.06.019>
- Chen, V. L., Delmas, M. A., Locke, S. L., & Singh, A. (2017). Information strategies for energy conservation: A field experiment in India. *Energy Economics*, 68, 215–227.
<https://doi.org/10.1016/j.eneco.2017.09.004>
- Coffey, D. J., & Joseph, P. H. (2013). A polarized environment: The effect of partisanship and ideological values on individual recycling and conservation behavior. *American Behavioral Scientist*, 57(1), 116–139. <https://doi.org/10.1177/0002764212463362>
- Cordroch, L., Hilpert, S., & Wiese, F. (2022). Why renewables and energy efficiency are not

- enough - The relevance of sufficiency in the heating sector for limiting global warming to 1.5 °C. *Technological Forecasting and Social Change*, 175, 121313. <https://doi.org/10.1016/j.techfore.2021.121313>
- Crimston, D., Bain, P. G., Hornsey, M. J., & Bastian, B. (2016). Moral expansiveness: Examining variability in the extension of the moral world. *Journal of Personality and Social Psychology*, 111(4), 636–653. <https://doi.org/10.1037/pspp0000086>
- Czap, N. V., Czap, H. J., Lynne, G. D., & Burbach, M. E. (2015). Walk in my shoes: Nudging for empathy conservation. *Ecological Economics*, 118, 147–158. <https://doi.org/10.1016/j.ecolecon.2015.07.010>
- Dietz, T., Fitzgerald, A., & Shwom, R. (2005). Environmental values. *Annual Review of Environment and Resources*, 30(1), 335–372. <https://doi.org/10.1146/annurev.energy.30.050504.144444>
- Ellwanger, J. H., Kulmann-Leal, B., Kaminski, V. L., Valverde-Villegas, J. M., Da Veiga, A. B. G., Spilki, F. R., Fearnside, P. M., Caesar, L., Giatti, L. L., Wallau, G. L., Almeida, S. E. M., Borba, M. R., Da Hora, V. P., & Chies, J. A. B. (2020). Beyond diversity loss and climate change: Impacts of Amazon deforestation on infectious diseases and public health. *Anais Da Academia Brasileira de Ciencias*, 92(1). <https://doi.org/10.1590/0001-3765202020191375>
- Fehr, E., & Schmidt, K. M. (2006). The economics of fairness, reciprocity and altruism – Experimental evidence and new theories. In S.-C. Kolm & J. Mercier Ythier (Eds.), *Handbook of the economics of giving, altruism and reciprocity* (pp. 615–691). North-Holland. [https://doi.org/10.1016/S1574-0714\(06\)01008-6](https://doi.org/10.1016/S1574-0714(06)01008-6)
- Ferraro, P. J., Miranda, J. J., & Price, M. K. (2011). The persistence of treatment effects with norm-based policy instruments: Evidence from a randomized environmental policy experiment. *American Economic Review*, 101(3), 318–322.

<https://doi.org/10.1257/aer.101.3.318>

- Figge, F., Young, W., & Barkemeyer, R. (2014). Sufficiency or efficiency to achieve lower resource consumption and emissions? The role of the rebound effect. *Journal of Cleaner Production*, *69*, 216–224. <https://doi.org/10.1016/j.jclepro.2014.01.031>
- Fischbacher, U., Gächter, S., & Fehr, E. (2001). Are people conditionally cooperative? Evidence from a public goods experiment. *Economics Letters*, *71*(3), 397–404. [https://doi.org/10.1016/S0165-1765\(01\)00394-9](https://doi.org/10.1016/S0165-1765(01)00394-9)
- Frick, V., Gossen, M., Santarius, T., & Geiger, S. (2021). When your shop says #lessismore. Online communication interventions for clothing sufficiency. *Journal of Environmental Psychology*, *75*, 101595. <https://doi.org/10.1016/j.jenvp.2021.101595>
- Gifford, R., & Comeau, L. A. (2011). Message framing influences perceived climate change competence, engagement, and behavioral intentions. *Global Environmental Change*, *21*(4), 1301–1307. <https://doi.org/10.1016/j.gloenvcha.2011.06.004>
- Gifford, R., & Nilsson, A. (2014). Personal and social factors that influence pro-environmental concern and behaviour: A review. *International Journal of Psychology*, *49*(3), 141–157. <https://doi.org/10.1002/ijop.12034>
- Gossen, M., Ziesemer, F., & Schrader, U. (2019). Why and how commercial marketing should promote sufficient consumption: A systematic literature review. *Journal of Macromarketing*, *39*(3), 252–269. <https://doi.org/10.1177/0276146719866238>
- Günther, S. A., Staake, T., Schöb, S., & Tiefenbeck, V. (2020). The behavioral response to a corporate carbon offset program: A field experiment on adverse effects and mitigation strategies. *Global Environmental Change*, *64*, 102123. <https://doi.org/10.1016/j.gloenvcha.2020.102123>
- Haberl, H., Wiedenhofer, D., Virág, D., Kalt, G., Plank, B., Brockway, P., Fishman, T., Hausknost, D., Krausmann, F., Leon-Gruchalski, B., Mayer, A., Pichler, M., Schaffartzik,

- A., Sousa, T., Streeck, J., & Creutzig, F. (2020). A systematic review of the evidence on decoupling of GDP, resource use and GHG emissions, part II: Synthesizing the insights. *Environmental Research Letters*, *15*(6), 065003. <https://doi.org/10.1088/1748-9326/ab842a>
- Hafner, R., Elmes, D., Read, D., & White, M. P. (2019). Exploring the role of normative, financial and environmental information in promoting uptake of energy efficient technologies. *Journal of Environmental Psychology*, *63*, 26–35. <https://doi.org/10.1016/j.jenvp.2019.03.004>
- Harring, N., Jagers, S. C., & Matti, S. (2017). Public support for pro-environmental policy measures: Examining the impact of personal values and ideology. *Sustainability*, *9*(5), 679. <https://doi.org/10.3390/su9050679>
- Heinz, N., & Koessler, A. K. (2021). Other-regarding preferences and pro-environmental behaviour: An interdisciplinary review of experimental studies. *Ecological Economics*, *184*, 106987. <https://doi.org/10.1016/j.ecolecon.2021.106987>
- Herziger, A., Berkessel, J. B., & Steinnes, K. K. (2020). Wean off green: On the (in)effectiveness of biospheric appeals for consumption curtailment. *Journal of Environmental Psychology*, *69*, 101415. <https://doi.org/10.1016/j.jenvp.2020.101415>
- Homar, A. R., & Cvelbar, L. K. (2021). The effects of framing on environmental decisions: A systematic literature review. *Ecological Economics*, *183*, 106950. <https://doi.org/10.1016/j.ecolecon.2021.106950>
- Hunter, L. M., Hatch, A., & Johnson, A. (2004). Cross-national gender variation in environmental behaviors. *Social Science Quarterly*, *85*(3), 677–694. <https://doi.org/10.1111/j.0038-4941.2004.00239.x>
- Hüttel, A., Balderjahn, I., & Hoffmann, S. (2020). Welfare beyond consumption: The benefits of having less. *Ecological Economics*, *176*, 106719.

<https://doi.org/10.1016/j.ecolecon.2020.106719>

IPBES. (2019). *Global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services*.

<https://doi.org/10.5281/zenodo.3831673>

IPCC. (2022). *Climate change 2022: Impacts, adaptation and vulnerability: Contribution of working group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*. https://report.ipcc.ch/ar6/wg2/IPCC_AR6_WGII_FullReport.pdf

Ivanova, D., Stadler, K., Steen-Olsen, K., Wood, R., Vita, G., Tukker, A., & Hertwich, E. G. (2016). Environmental impact assessment of household consumption. *Journal of Industrial Ecology*, 20(3), 526–536. <https://doi.org/10.1111/jiec.12371>

Jacobson, S. K., Morales, N. A., Chen, B., Soodeen, R., Moulton, M. P., & Jain, E. (2019). Love or loss: Effective message framing to promote environmental conservation. *Applied Environmental Education and Communication*, 18(3), 252–265. <https://doi.org/10.1080/1533015X.2018.1456380>

Joyner Armstrong, C. M., Connell, K. Y. H., Lang, C., Ruppert-Stroescu, M., & LeHew, M. L. A. (2016). Educating for sustainable fashion: Using clothing acquisition abstinence to explore sustainable consumption and life beyond growth. *Journal of Consumer Policy*, 39(4), 417–439. <https://doi.org/10.1007/s10603-016-9330-z>

Jungell-Michelsson, J., & Heikkurinen, P. (2022). Sufficiency: A systematic literature review. *Ecological Economics*, 195, 107380. <https://doi.org/10.1016/j.ecolecon.2022.107380>

Kim, J. H., & Kaemingk, M. (2021). Persisting effects of social norm feedback letters in reducing household electricity usage in Post-Soviet Eastern Europe: A randomized controlled trial. *Journal of Economic Behavior and Organization*, 191, 153–161. <https://doi.org/10.1016/j.jebo.2021.08.032>

Klein, S. A., Horsten, L. K., & Hilbig, B. E. (2022). The effect of environmental versus social

- framing on pro-environmental behavior. *Journal of Environmental Psychology*, 84, 101897. <https://doi.org/10.1016/j.jenvp.2022.101897>
- Kropfeld, M. I., Nepomuceno, M. V., & Dantas, D. C. (2018). The ecological impact of anticonsumption lifestyles and environmental concern. *Journal of Public Policy and Marketing*, 37(2), 245–259. <https://doi.org/10.1177/0743915618810448>
- Kuanr, A., Pradhan, D., & Chaudhuri, H. R. (2020). I (do not) consume; therefore, I am: Investigating materialism and voluntary simplicity through a moderated mediation model. *Psychology and Marketing*, 37(2), 260–277. <https://doi.org/10.1002/mar.21305>
- Kurz, R. (2019). Post-growth perspectives: Sustainable development based on efficiency and on sufficiency. *Public Sector Economics*, 43(4), 401–422. <https://doi.org/10.3326/pse.43.4.4>
- Lades, L. K., Laffan, K., & Weber, T. O. (2021). Do economic preferences predict pro-environmental behaviour? *Ecological Economics*, 183, 106977. <https://doi.org/10.1016/j.ecolecon.2021.106977>
- Lee, T. M., Markowitz, E. M., Howe, P. D., Ko, C. Y., & Leiserowitz, A. A. (2015). Predictors of public climate change awareness and risk perception around the world. *Nature Climate Change*, 5(11), 1014–1020. <https://doi.org/10.1038/nclimate2728>
- Mancha, R. M., & Yoder, C. Y. (2015). Cultural antecedents of green behavioral intent: An environmental theory of planned behavior. *Journal of Environmental Psychology*, 43, 145–154. <https://doi.org/10.1016/j.jenvp.2015.06.005>
- Meyer, A. (2015). Does education increase pro-environmental behavior? Evidence from Europe. *Ecological Economics*, 116, 108–121. <https://doi.org/10.1016/j.ecolecon.2015.04.018>
- Muller, A. (2009). Sufficiency – Does energy consumption become a moral issue? *IOP Conference Series: Earth and Environmental Science*, 6(26), 262003.

<https://doi.org/10.1088/1755-1307/6/6/262003>

- Nepomuceno, M. V., & Laroche, M. (2015). The impact of materialism and anti-consumption lifestyles on personal debt and account balances. *Journal of Business Research*, 68(3), 654–664. <https://doi.org/10.1016/j.jbusres.2014.08.006>
- Nolan, J. M., & Tobia, S. E. (2019). Public support for global warming policies: Solution framing matters. *Climatic Change*, 154(3–4), 493–509. <https://doi.org/10.1007/s10584-019-02438-1>
- O’Neill, D. W., Fanning, A. L., Lamb, W. F., & Steinberger, J. K. (2018). A good life for all within planetary boundaries. *Nature Sustainability*, 1(2), 88–95. <https://doi.org/10.1038/s41893-018-0021-4>
- Princen, T. (2005). *The logic of sufficiency*. MIT Press Cambridge, MA.
- Rich, S. A., Wright, B. J., & Bennett, P. C. (2020). Development of the voluntary simplicity engagement scale: Measuring low-consumption lifestyles. *Journal of Consumer Policy*, 43(2), 295–313. <https://doi.org/10.1007/s10603-018-9400-5>
- Rockström, J., Steffen, W., Noone, K., Persson, Å., Chapin, F. S., Lambin, E. F., Lenton, T. M., Scheffer, M., Folke, C., Schellnhuber, H. J., Nykvist, B., De Wit, C. A., Hughes, T., Van Der Leeuw, S., Rodhe, H., Sörlin, S., Snyder, P. K., Costanza, R., Svedin, U., ... Foley, J. A. (2009). A safe operating space for humanity. *Nature*, 461(7263), 472–475. <https://doi.org/10.1038/461472a>
- Sandberg, M. (2021). Sufficiency transitions: A review of consumption changes for environmental sustainability. *Journal of Cleaner Production*, 293, 126097. <https://doi.org/10.1016/j.jclepro.2021.126097>
- Sapiains, R., Beeton, R. J. S., & Walker, I. A. (2016). Individual responses to climate change: Framing effects on pro-environmental behaviors. *Journal of Applied Social Psychology*, 46(8), 483–493. <https://doi.org/10.1111/jasp.12378>

- Schneidewind, U., & Zahrnt, A. (2014). *The politics of sufficiency: Making it easier to live the good life*. oekom verlag GmbH.
- Schultz, P. W., & Zelezny, L. (1999). Values as predictors of environmental attitudes: Evidence for consistency across 14 countries. *Journal of Environmental Psychology, 19*(3), 255–265. <https://doi.org/10.1006/jevp.1999.0129>
- Segev, S., Fernandes, J., & Wang, W. (2015). The effects of gain versus loss message framing and point of reference on consumer responses to green advertising. *Journal of Current Issues and Research in Advertising, 36*(1), 35–51. <https://doi.org/10.1080/10641734.2014.912600>
- Semega, J., & Kollar, M. (2022). *Income in the United States: 2021*. <https://www.census.gov/content/dam/Census/library/publications/2022/demo/p60-276.pdf>
- Tomaselli, M. F., Kozak, R., Gifford, R., & Sheppard, S. R. J. (2021). Degrowth or not degrowth: The importance of message frames for characterizing the new economy. *Ecological Economics, 183*, 106952. <https://doi.org/10.1016/j.ecolecon.2021.106952>
- Tröger, J., & Reese, G. (2021). Talkin' bout a revolution: An expert interview study exploring barriers and keys to engender change towards societal sufficiency orientation. *Sustainability Science, 16*(3), 827–840. <https://doi.org/10.1007/s11625-020-00871-1>
- Tröger, J., Wullenkord, M. C., Barthels, C., & Steller, R. (2021). Can reflective diary-writing increase sufficiency-oriented consumption? A longitudinal intervention addressing the role of basic psychological needs, subjective well-being, and time affluence. *Sustainability, 13*(9), 4885. <https://doi.org/10.3390/su13094885>
- Whitmarsh, L., Capstick, S., & Nash, N. (2017). Who is reducing their material consumption and why? A cross-cultural analysis of dematerialization behaviours. *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences,*

375(2095), 20160376. <https://doi.org/10.1098/rsta.2016.0376>

- Wiedmann, T., Lenzen, M., Keyßer, L. T., & Steinberger, J. K. (2020). Scientists' warning on affluence. *Nature Communications*, *11*(1), 3107. <https://doi.org/10.1038/s41467-020-16941-y>
- Workman, A., Blashki, G., Bowen, K. J., Karoly, D. J., & Wiseman, J. (2019). Health co-benefits and the development of climate change mitigation policies in the European Union. *Climate Policy*, *19*(5), 585–597. <https://doi.org/10.1080/14693062.2018.1544541>
- Zavestoski, S. (2002). The social-psychological bases of anticonsumption attitudes. *Psychology and Marketing*, *19*(2), 149–165. <https://doi.org/10.1002/mar.10007>
- Zelezny, L. C., Chua, P.-P., & Aldrich, C. (2000). New ways of thinking about environmentalism: Elaborating on gender differences in environmentalism. *Journal of Social Issues*, *56*(3), 443–457. <https://doi.org/10.1111/0022-4537.00177>
- Zell-Ziegler, C., Thema, J., Best, B., Wiese, F., Lage, J., Schmidt, A., Toulouse, E., & Stagl, S. (2021). Enough? The role of sufficiency in European energy and climate plans. *Energy Policy*, *157*, 112483. <https://doi.org/10.1016/j.enpol.2021.112483>

Appendix

Additional Analyses

Table 4 shows the coefficients of the NATURE, SOCIETY, and INDIVIDUAL treatment of Specification 1 of model 1 with the main sample and with a subsample that excludes participants who do not consider reduced consumption as effective to increase well-being of the planet, our society, or the individual well-being. Excluding the few participants who do not believe in the effectiveness of reduced consumption did not change the results. The effect of the individual treatment remains significant for all specifications.

Table 4

Analysis of different samples for Specification 1 of Model 1

Variables	Main sample	Subsample (belief in sufficiency effectiveness)
NATURE	-0.004 (0.033)	0.003 (0.033)
SOCIETY	0.019 (0.033)	0.021 (0.033)
INDIVIDUAL	0.065** (0.033)	0.065** (0.033)
Constant	0.568*** (0.023)	0.572*** (0.023)
Observations	1,317	1,285
R-squared	0.004	0.004

Note. The table presents ordinary least squares estimates. Robust standard errors are in parentheses. The dependent variable is the amount of Amazon voucher waived, either for the main sample, for the restricted sample excluding those who do not consider the benefits of reduced consumption as effective to increase the well-being of the planet, our society, or the individual well-being. The reference group for the experimental treatments (NATURE, SOCIETY, INDIVIDUAL) is the CONTROL group. *, **, and *** document significance at the 10%, 5%, and 1% levels.

Access to raw data and statistical codes:

Raw data and statistical codes for the manuscript "The benefits of less: The effect of sufficiency gain framings on consumption reduction" by Manuel Suter, Simon Rabaa, and Andrea Essl can be found under the following link:

https://osf.io/vms6p/?view_only=6bb03ea0d6c04fb8897ca42b53bf8d69.