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Planet or pocketbook? Environmental motives complement financial motives for energy efficiency across the political spectrum in the United States

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ABSTRACT

While policies to encourage low-cost energy saving behaviors have increasingly incorporated nonfinancial behavioral science interventions to motivate behavioral change, policies to encourage large structural energy efficiency upgrades have been slow to adopt such tools to motivate consumers, relying instead on economic incentives to reduce upfront cost and targeting financial and comfort motivations. This research examines whether adding an emphasis on environmental benefits can increase interest in these upgrades and explores whether political ideology moderates the effectiveness of different environmental benefits frames. In Study 1, we explore how homeowners rate the importance of financial and nonfinancial decision factors of weatherization, a large energy efficiency upgrade, including the financial, informational, environmental, material, and social benefits and costs. We find that social factors and environmental benefits explain the most variance of any decision factor in reported likelihood to upgrade. In Study 2, we examine whether adding a description of environmental benefits of upgrades to their financial benefits can increase upgrade likelihood across political ideologies. We find that adding environmental benefits framed as mitigation of climate change increases liberals' likelihood to upgrade but has no effect on conservatives; however, adding benefits framed as an increase in environmental stewardship and energy independence increases both liberals and conservatives' likelihood to upgrade. This research demonstrates that, contrary to existing practice, adding environmental messages after characterizing financial benefits may increase investment likelihood for energy efficiency upgrades across the political spectrum.

1. Introduction

For decades, policy makers and utilities have used energy efficiency initiatives to reduce demand on electricity grids and hence mitigate the contribution of electricity generation to climate change. In 2017, global energy efficiency investment neared $240 billion, and U.S. utilities spent more than $7.9 billion on energy efficiency incentives and other programs to reduce residential and commercial energy use [1,2]. Since the 1970s, U.S. energy efficiency efforts have relied primarily on economic incentives by utilities, such as rebates, to drive energy efficiency technology uptake. Although energy efficient technologies typically have a higher upfront cost than corresponding inefficient technologies, the energy savings usually more than offsets this upfront cost over the lifetime of the technology, yielding a positive return on investment. These technologies also reduce greenhouse gas emissions, providing multiple benefits for the consumer and for society. Yet despite decades of study, policies, and subsidies, the uptake of these technologies continues to lag behind anticipated adoption rates, given their financial benefit to individuals and environmental benefit to society [3].

There is a growing realization that behavioral science can provide critical insights into how to motivate the adoption of energy saving behaviors [4]. Energy saving behaviors include a diverse range of behaviors from personal conservation measures (e.g. turning off the lights or running the dishwasher only when full) to long-term energy efficiency investments (e.g. purchasing energy efficient dishwashers or insulating one's home) [5–7]. Behavioral theory-based interventions have so far

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almost always been restricted to initiatives that seek to influence conservation behaviors rather than motivating energy efficiency investments that lead to larger reductions in energy use [4,6,8].

A wide range of behavioral science interventions have been applied to energy saving behaviors [9], including changing the way that the benefits are presented [10,11]. Energy saving behaviors, both large and small, have long-term financial benefits in the form of reduced energy bills, but also have non-energy individual material benefits, such as improved comfort and occupant health and improved technological features or reliability, and societal environmental benefits from reduced electricity generation such as conserving natural resources, climate change mitigation, and air pollution reduction. Our research addresses the question of whether the behavioral science-based strategies that increase personal conservation behaviors by highlighting their multiple benefits are also effective in increasing long-term energy efficiency measures where to-date the messages focus on the financial and material benefits associated with these investments. Little research has focused on large energy efficiency investments [12].

We first outline past research on variables that predict large structural energy efficiency upgrades, and experimental research on the role of financial versus environmental benefits information in energy saving behaviors, and then describe the present research.

1.1. Predictors of energy efficiency investments

A number of correlational studies have explored demographic, dispositional, and motivational predictors of large energy efficiency investments. Homeowner motivations for undertaking these investments echo their financial, environmental, material benefits as well as social factors [13]. Financial factors include utility bill savings from reduced energy use over time, offset by the upfront cost of installation. Environmental factors include resource conservation, energy independence, reduced air pollution, and climate change mitigation from reduced fossil fuel consumption. Material factors include increased thermal comfort and other benefits from the physical upgrades completed. Social factors are less well documented, but may include beliefs about social norms or setting an example among one's social network.[1] Across multiple prospective and retrospective studies assessing motivations for efficiency investments, environmental motivations are sometimes (but not always) correlated with uptake of large structural energy efficiency investments, but participants frequently rate financial motivations as more important investment drivers than environmental motivations [13–18]. Home retrofit program designers and implementers report that cost and comfort motivations are critical in motivating large efficiency investments [19,20].

In sum, some past correlational research on motivations of large energy efficiency investments suggests that environmental motivations may play a small role, but financial motivations, and possibly comfort, are often rated as more important motivations.

1.2. Environmental versus financial motivations

A number of researchers have explored financial and nonfinancial incentives around sustainable behavior [21] and several experimental studies suggest that environmental and/or health messaging outperforms financial messaging in motivating actual conservation behaviors or intent to perform conservation behaviors [10,22]. Very little experimental research has addressed the causality of these motivations for large energy efficiency upgrade behaviors. One such study found that activating financial, comfort, and health motivations led to increased intentions relative to an informational control message; the effect of environmental motivations was positive but did not reach statistical significance [23]. This study did not explore the effect of combining financial and environmental benefits to determine whether this would increase energy efficiency investments.

There are also a number of conflicting findings. First, research on different types of energy saving behaviors provides conflicting evidence on whether jointly presenting environmental and financial messaging increases energy saving likelihood. One empirical study on motivating participation in an energy conservation program found no difference between financial messaging alone and financial plus environmental messaging [22] while another study of vehicle purchases found that adding environmental benefits in addition to financial benefits increased likelihood of selecting a more energy efficient vehicle [11].[2] As noted above, the experimental study on large efficiency investments found no statistically significant effect of presenting environmental benefits alone [23]. Given that efficiency investments have an upfront financial cost, presenting environmental benefits without considering their financial benefits is likely impractical in many policy settings, though.

Second, studies comparing the effect of financial and environmental motivations on investments in energy efficiency measures have found that political ideology [22,25] and/or environmental values [11] moderate the effect of environmental messaging. Thus far, results differ on whether environmental messaging reduces or has no effect on likelihood to engage in energy saving behavior for those with a conservative political ideology. Studies that explicitly point out only the pro-environmental benefits of some options find that this visibility may increase liberals' likelihood but reduces conservatives' likelihood to make the environmental choice [25,26]. On the other hand, one study that showed both financial and environmental benefits, separately or together, found that displaying the environmental benefit increases liberals' likelihood but does not reduce conservatives' likelihood to make the environmental choice [22]. If including environmental benefits messaging actually reduces the likelihood of engaging in energy saving behavior for some populations, then environmental benefits messaging would be an unappealing strategy for many policy makers.

Third, the environmental benefits of energy savings can be presented in multiple ways, and the extent to which political ideology moderates their effectiveness depends on how the benefits are framed. One of the most important benefits of saving energy is that it mitigates climate change via reducing greenhouse gas emissions in the atmosphere through reducing residential energy use. Climate change is a politically polarizing issue, though: in 2018, 89% of Democrats but only 35% of Republicans agreed that climate change is anthropogenic [27]. In addition to mitigating climate change, reducing energy use has other environmental benefits: it also reduces air pollution through reducing the emissions from power plants, conserves natural gas and other energy resources, and increases energy independence. These different environmental benefit frames differ in their effectiveness across the political spectrum: climate change-related frames are motivating for liberals, while frames that emphasize air pollution reduction, conservation, purity, and energy independence appeal to both conservatives and, secondarily, liberals [10,28–31]. These differences have a variety of explanations, and may stem in part from differences in basic values across the ideological spectrum [32–38]. The effectiveness of these different environmental frames in influencing energy efficiency investments has not been explored.

1.3. The current research

Given the mixed evidence about the importance of environmental messages for large structural energy efficiency investments, our research

[1] Although social factors are examined in study 1, this research focused primarily on environmental and financial motivations, rather than social factors. See [14] for a review of social norms and energy efficiency upgrades.

[2] These apparently conflicting findings could be due to the difference in the magnitude of the financial rewards, as small extrinsic rewards may reduce intrinsic motivation [24].

assesses the role of perceived financial, environmental, informational, material, and social decision factors in structural energy efficiency upgrade decisions.

Study 1 explores the relative importance of financial and nonfinancial (environmental, informational, material, and social) motivations for these upgrades, and how these considerations differ across the political spectrum. Based on the results of Study 1, Study 2 examines whether presenting environmental benefits in addition to financial benefits can increase engagement with large energy efficiency investments, and whether political ideology moderates the effect of different environmental benefits frames.

2. Study 1: Observational study

This study explores the influence of different motivations on large energy efficiency investment decisions, specifically weatherization. Weatherization refers to building envelope upgrades including sealing air leaks, upgrading windows, and upgrading insulation, which allow the home heating and cooling equipment to operate more efficiently. We selected weatherization because, like many large energy efficiency upgrades, it is an investment without a large social signaling component since it is internal to the home structure and not obvious to others residing in the neighborhood, and has few personal co-benefits beyond increased thermal comfort [6]. It does not have a replacement cycle based on existing equipment failure like an efficient appliance, and it is a reasonably attractive investment that has a relatively low incidence among U.S. homes [39] making it a relevant decision for most homowning survey participants.

Table 1
Respondent Characteristics.

Variable	Scale	Responses ($N = 421$)
Political ideology	Liberal	32%
	Moderate	29%
	Conservative	39%
Environmental attitudes	New Environmental Paradigm - Revised, 1 to 5, 5 is most pro-environmental	3.63 (0.75)
Gender	Male	40%
	Female	60%
	Other	0%
Age	years (SD)	55 (13.9)
Race/Ethnicity	White	87%
	Non-white	13%
Language	English	92%
Education	% with Bachelors or higher	49%
Income	% < 50 k	35%
	% 50–100	45%
	% > 100 k	18%
Home type	Detached single family	87%
Household size	People (SD)	2.44 (1.14)
Marital status	Married or cohabitating	68%
Occupant ages	Children under 5	6%
	Children between 5 and 18	19%
	Adults over 65	36%
	None of these	44%
Occupancy duration	Less than two years	10%
	3 to 5 years	12%
	6 to 10 years	17%
	More than 10 years	61%
Planned duration	Less than two years	11%
	3 to 5 years	12%
	6 to 10 years	11%
	More than 10 years	67%
Location	Rural	30%
	Urban	15%
	Suburban	55%
Household energy use decision maker	Yes	88%
Previous academic surveys	number of surveys (SD)	112.4 (291.4)
Previous similar academic surveys	number of surveys (SD)	5.5 (44.6)

While there are numerous economic and structural barriers (high cost, limited availability of trained contractors and materials) and other external factors (home age, climate zone) that restrict investment in weatherization [13,16] this study focused on motivations and how homeowners think about different reasons for investing or not investing in weatherization. Specifically, we explored the relative importance of financial and nonfinancial (including environmental, material, and social) reasons in explaining variance in efficiency investment likelihood. We focused on these reasons for weatherization because they can be influenced by behavioral science-based interventions that change the way this investment is presented, whereas structural barriers are much less easily reduced by these types of interventions.

We explored how participants weigh the importance of financial and nonfinancial decision factors in two ways. First, we analyzed the amount of variance in weatherization likelihood explained by each decision factor of interest (environmental, financial, informational, material, and social). Consistent with conventional policy maker wisdom [19,20] we expected that financial benefits and material comfort would explain more variance in investment likelihood than environmental, informational, or social factors. Second, we explored differences in the importance of these different financial and nonfinancial decision factors across political ideology. As discussed above, political ideology is associated with differences in climate change belief [32,40–42] and presenting the environmental benefits of energy saving behaviors can produce different reactions across the political spectrum [22,25]. We explored whether the motivations for large structural energy efficiency investments differed between liberals and conservatives.

2.1. Methods

U.S. resident homeowners were recruited via Amazon Mechanical Turk ($N = 100$) and an online panel managed by ClearVoice ($N = 491$), which included a more representative proportion of Republicans than Mechanical Turk [43].[3] Data collection took place in early 2017 and was approved by the University's Institutional Review Board.

Table 1 presents the demographic characteristics of our sample. 591 respondents completed the study, but because of the 20-minute length of the study we had relatively high rates of inattention. In this regard, we omitted 6 respondents who completed the study in less than 10 min, 80 respondents who provided the same response for every item on any page of the rating scales, 78 respondents who failed both attention checks, and six respondents who reported renting their home. Eighty-eight percent of the 421 attentive respondents retained for the analyses reported they were involved in household decisions about energy use.[4]

Participants completed a 20-minute online questionnaire about weatherization.[5] After indicating whether they had ever heard of, considered, or completed installing insulation, installing double glazed windows, or air sealing their homes (the three elements of weatherization), participants read a sentence defining weatherization: ("Weatherizing involves installing extra insulation in your walls or attic, air sealing

[3] For this observational study, sample size was approximated to ensure a sufficient number of respondents across the political spectrum would report having undertaken some of the elements of weatherizing their homes, and a sufficient number of respondents to enable random forest analysis. We combined the two panels to reduce data collection costs. Results are unchanged if MTurk respondents are excluded. Post-hoc power analyses reveal we have ample power (greater than 0.99) to detect the 10% increase in R^2 detected in the linear regression analyses below.

[4] See the Supplementary Materials for additional information about the attention checks.

[5] See Table S2 for a list of variables, their means, and differences in responses across the two panels. This data collection also included additional questions collected for separate research projects.

your home so you lose less heat, and updating any of your old windows to double glazed windows.") They then wrote at least 50 characters of text about how they would determine whether to weatherize so as to indicate their decision process.[6] Participants then answered a series of questions as to which factors influenced their weatherization decision.[7] They answered factual questions about the benefits and cost-savings of weatherization. They rated the importance of several concerns about weatherization (including cost, maintenance, and uncertainty about environmental benefits and savings) and the importance of benefits to weatherizing (financial, environmental, comfort, setting a good example for others, and reducing dependence on foreign oil) both for their own household and for other households in their area. They rated their perception of the riskiness of weatherization as an investment, their likelihood to take out a loan to pay for weatherization, and whether they knew someone who had weatherized their home, and then rated their likelihood of weatherizing their home in the next five years on a 0 (not at all likely) to 10 (extremely likely) scale (our primary outcome measure).

Twenty-six respondents reported having completed all three weatherization-related upgrades (insulation, air sealing, and windows) and were assigned a weatherization likelihood score of 10. After indicating their weatherization likelihood, participants reported how much they thought weatherizing would cost overall and save in energy bills per year. Finally, participants provided demographic characteristics and individual difference information. We measured general environmental attitudes using the Revised New Environmental Paradigm scale [44].

2.2. Results

Table 2 shows the mean responses on each variable. Overall, respondents reported a mean of 5.3 ($SD = 3.27$) likelihood on a scale of 0 to 10 to weatherize in the next five years, i.e., slightly above the midpoint. A majority of respondents had completed at least some elements of weatherization on their homes: twenty-six respondents (6%) reported they had already completed all three weatherization-related upgrades: insulation, air sealing, and windows. Half of respondents (50%) had completed 1 or 2 of the 3 upgrades, and 43% had completed none. Among those who had not completed weatherizing their homes, those who had completed at least one of the behaviors rated themselves as more likely to continue weatherizing (mean of 5.9/10) than those who had not started (mean of 4.0/10; $t(390) = 6.27$, $p < .001$). Table 1 presents the respondent characteristics.[8]

The first two columns of Table 2 present average participant ratings of the importance of each decision factor, organized into financial and nonfinancial decision factors. Descriptively, participants rated the importance of financial cost savings and comfort improvements as the most important decision factors (a mean of 4.36 and 4.40 respectively, out of 5). Likewise, participants rated concern about the upfront cost as the most important concern (4.44/5) and gave middle values to the importance of environmental benefits (3.31/5) and the importance of reducing dependence on foreign oil (2.98/5). Participants rated weatherization as a low-risk investment compared to investing in a diversified stock portfolio (1.70/5). Overall, participants reported the average cost of weatherization as $4,384 and the average annual savings as $349, but variance was wide. These estimates are roughly in line with the actual cost and savings of weatherization [45] although estimated savings are somewhat lower than actual values and estimated upfront cost slightly higher.

Table 2
Decision Factor Ratings.

Variable (scale)[1]	Overall *M*(*SD*) (*N* = 421)	Liberals *M*(*SD*) (*N* = 135)	Conservatives *M*(*SD*) (*N* = 165)	Difference *p* value [3]
Outcome Measure				
Weatherization likelihood (0 to 10 scale)[2]	5.30 (3.27)	5.52 (3.10)	4.95 (3.31)	0.14
Financial Decision Factors				
Savings benefit importance	4.36 (0.88)	4.44 (0.83)	4.28 (0.96)	0.14
Perceived investment risk	1.70 (0.94)	1.59 (0.82)	1.68 (0.93)	0.52
Savings uncertainty concern importance	3.87 (1.08)	3.70 (1.05)	3.99 (1.05)	**0.01**
Upfront cost concern importance	4.44 (0.83)	4.39 (0.86)	4.51 (0.78)	0.22
Upfront cost concern type (select one): Can't afford Other priorities No loan Long payback	26% 35% 17% 21%	29% 39% 13% 19%	25% 34% 19% 22%	0.38
Cost Estimate	$4384.20 (5800.90)	4229.48 (4316.44)	4288.81 (6330.67)	0.92
Savings Estimate	$348.62 (450.76)	394.14 (540.62)	310.87 (371.16)	0.13
Nonfinancial Decision Factors				
Weatherization knowledge (range 0–1)	0.69 (0.23)	0.71 (0.23)	0.67 (0.24)	0.15
Environmental benefit importance	3.31 (1.23)	3.62 (1.17)	2.95 (1.25)	**0.00**
Reduce foreign oil dependence importance	2.98 (1.37)	2.96 (1.34)	2.90 (1.38)	0.72
Increase comfort importance	4.40 (0.81)	4.39 (0.81)	4.41 (0.84)	0.60
Set a good example importance	2.23 (1.26)	2.24 (1.19)	2.16 (1.27)	0.36
Environmental benefit uncertainty importance	2.97 (1.29)	2.94 (1.27)	2.98 (1.30)	0.83
Technology reliability concern importance	3.48 (1.22)	3.24 (1.22)	3.65 (1.16)	**0.00**
Know someone who has weatherized (% Yes)	37%	42%	30%	**0.03**

Notes: A summary of the importance rating given to each decision factor by participants overall and separately for liberals and conservatives. The righthand column shows the *p* values of the differences in ratings between liberals and conservatives. [1] All variables measured on a five point scale unless otherwise noted. [2] Participants who had weatherized were assigned a score of 10. [3] Differences assessed using nonparametric Mann-Whitney *U* test for independent groups for 1 to 5 rating scales, t-tests for continuous cost estimates, and Chi-squared test of independence for categorical variables.

We also explored whether the rated importance of these decision factors varied across political ideology (Table 2 columns 2 through 4). There were significant differences across political ideology in the importance of the environmental benefits, uncertainty about the savings, and uncertainty about maintenance requirements that suggest that liberals and conservatives think about weatherization differently. For liberals in our sample, environmental benefits are significantly more important while concern about the amount of cost savings and technology reliability are less important than for conservatives.

Overall, financial and material comfort decision factors were most often rated as important factors in deciding whether to weatherize. This analysis does not discriminate beween levels of weatherization

[6] This question was designed to allow participants to consider their decision process before being prompted to rate specific decision factors. Inductive coding was performed on these responses and is presented in the supplementary materials.

[7] Table A1 presents the wording of each of these decision factors.

[8] Significant differences between MTurk and ClearVoice samples on some demographic variables are shown in Table S2.

likelihood, however. Do respondents who are more likely to weatherize rate the decision factors differently than those who are less likely to weatherize? Subsequent analyses assessed which decision factors explained the most variance in the full range of weatherization likelihood.

2.2.1. Importance of decision factors for weatherization likelihood

To assess the relative importance of the decision factors identified in Table 2, we used a series of linear regression models and a random forest algorithm. Note that relative importance is also function of measurement precision: variables that are measured with less precision will tend to have lower predictive power. We included seven variables measuring financial factors and eight variables measuring the three nonfinancial factors (including environmental, social, and comfort factors), thus we had lower measurement precision around each nonfinancial factor. Most of these variables were measured on the same five-point scale, but two of the financial variables were continuous cost measures, and one of the nonfinancial variables was a dichotomous variable. Thus, these results have lower measurement precision for each of the nonfinancial factors, and may underestimate their importance, relative to the better-measured financial factors.

The regression models examined weatherization interest as a function of the respondent characteristics alone and in combination with the financial and nonfinancial decision factors listed with the results shown in Table A2. We found that the demographic variables explained 3.7% of the variance in weatherization likelihood. Adding the financial decision factors from Table 2 explains 17.8% of the variance, and adding the nonfinancial decision factors explained 23.4% of the variance. Together, the demographic, financial, and nonfinancial predictors explained 27.8% of the variance in weatherization upgrade likelihood. From these models, we concluded that both financial and nonfinancial decision factors explained variance in weatherization likelihood.

To assess the relative explanatory power[9] of each decision factor more directly, we added all the decision factor variables shown in Table 2 to a random forest model predicting weatherization likelihood. Random forest is a classification machine learning algorithm that aggregates many trees with random subsets of variables and bootstrapped samples to classify respondents [46]. It generates a summary of variable importance, assessed by the increase in mean squared error observed by omitting the variable. Random forest was implemented with the R package randomForest with 2000 trees and a node size of 10 [47].

The random forest model revealed that, of the decision factors shown in Table 1, whether the respondent knew someone who had weatherized explained the most variance in weatherization likelihood, followed by the perceived importance of the environmental benefits of the upgrade, the importance of reducing dependence on foreign oil, and the most prominent type of upfront cost concern, as shown in Table 3. The importance of setting a good example (a social factor), and weatherization knowledge explained the next-most variance, followed by the importance of long-term financial savings. These findings suggest that how respondents rate the importance of social, environmental, and financial decision factors explains variance in their likelihood to weatherize, but the importance of social and environmental benefits are more predictive than expected.

Table 3
Random Forest Variable Importance.

Decision Factor	% increase MSE
Know someone who has weatherized	59.8
Environmental benefit importance	33.8
Reduce foreign oil dependence importance	25.7
Upfront cost concern type	19.9
Set a good example importance	17.4
Weatherization knowledge	16.9
Savings benefit importance	15.9
Environmental benefit uncertainty importance	12.5
Cost estimate	11.6
Perceived investment risk	10.1
Savings estimate	9.8
Increase comfort importance	8.6
Technology reliability importance	1.9
Savings uncertainty concern importance	0.8
Upfront cost concern importance	−0.2

Note: Percentage increase in mean squared error (MSE) is a measure of the increase in classification error in the absence of the variable. Variables higher in percent increase MSE explain more variance in (that is, are more important in classifying) weatherization likelihood ratings. The importance of the environmental benefit rating has the highest percent increase MSE, followed by the importance of long-term financial savings and reducing U.S. dependence on foreign oil.

2.3. Discussion

Past research has focused largely on structural considerations around weatherization, but this study took a bottom-up approach to explore the extent to which a variety of financial and nonfinancial decision factors explain variance in people's interest in weatherizing their homes. We had expected that social factors and environmental benefits would play a relatively unimportant role in motivating interest in weatherization investment. We find that when we look at the importance of a variety of decision factors on weatherization likelihood, both financial decision factors (the importance of financial savings) and nonfinancial factors (particularly, knowledge of others who have weatherized, the importance of environmental benefits, reducing foreign oil dependence, weatherization knowledge, and the importance of setting a good example) each explain variance in weatherization likelihood. Respondent knowledge of others who had weatherized, and their perceptions of the importance of environmental benefits of the upgrade explained the most variance in weatherization likelihood of any decision factor, surprisingly.[10]

We further find that liberals and conservatives consider the decision factors around weatherization somewhat differently: notably, liberals rated the importance of environmental benefits on their decision significantly higher than conservatives. This is consistent with past research showing that environmental appeals for energy saving behaviors are more effective for liberals [22].

Thus, this study suggests that social influence and the way homeowners think about the environmental benefits are correlated with homeowner interest in weatherizing, in addition to the financial benefits of weatherization. This suggests that social norms interventions and benefits framing interventions would be worth exploring to motivate weatherization, in addition to existing financial policies. While social comparison interventions can effectively motivate energy conservation behaviors, and potentially energy efficiency investments [48] researchers have also documented that participants under-report the influence of social comparison on their behavior [49]. For this reason, we elected not to test a social comparison intervention where the dependent variable would be self-reported behavioral intent, because, while participants are willing to report knowing someone who has weatherized, they are unlikely to self-report being influenced by these connections. Instead, the remainder of this paper focuses on the potential of presenting environmental benefits to increase weatherization engagement.

[9] Because of the large number of predictors and correlation between the predictors in the linear models, we were not able to use these models to assess the relative explanatory power of each decision factor.

[10] These findings are particularly notable given that the financial factors were measured with more precision than the three nonfinancial factors (environmental, social, and comfort). Future research that measures each decision factor with equal precision might find even greater variance explained by nonfinancial factors.

Future research should explore whether a social norms intervention could also influence weatherization engagement.

From a behavioral policy perspective, we cannot conclude from this study that these interventions will increase interest, because of the correlational nature of the study. Although we focused on decision factors that might be influenced by behavioral policy, we are unable to determine whether *changing* how homeowners think about the decision would influence their likelihood to invest. Unmodeled confounds may be contributing to the apparent relationship, as well. Can the importance of motivations be influenced by the way in which the upgrade is presented? To address these limitations, we conducted a second, experimental study.

3. Study 2: Experimental study

Study 2 involved an experiment to understand whether changing information presentation to influence perceptions of environmental benefits *and* financial benefits could play a causal role in homeowner interest in weatherization. We examined whether making the perceived financial benefits of weatherization more attractive (through decreasing the upfront cost and increasing the upfront benefits via a zero-interest loan) would increase investment likelihood. We predicted respondents would be more likely to weatherize when the financial benefits of weatherization are framed so that they are more attractive.

Based on the results of Study 1, we also expected that adding environmental benefits to the financial savings benefits message would increase investment intent. Given that past research (outlined in Section 1) has consistently found that political ideology moderates the effectiveness of different environmental frames, we tested the effect of two environmental frames: one classic frame aligned with liberal perceptions of the need to act on climate change ("climate change message"), and one frame aligned with centrist-to-conservative-oriented positions: conservation, stewardship of the planet, and air pollution (which we call the "stewardship message" [10,29,31]). We predicted that politically-aligned environmental benefits messages would lead to increased investment intent compared to financial benefits alone: liberals would respond to the liberal-aligned climate change message and potentially the stewardship message, and conservatives would respond to the stewardship message.

From a policy perspective, the potential for backlash against politically-misaligned messages (such as a climate change message for conservatives) poses a concern for incorporating environmental benefits into policy guidance on messaging weatherization programs. Thus we explored whether politically misaligned environmental benefits (in particular, a climate change message for conservatives) can backfire to reduce intent to weatherize. We had two competing predictions about the effect of misaligned environmental messages in the context of multiple-benefits messages: either people would selectively attend to aligned motivations and misaligned messages would have no effect on investment intent, or misaligned motivations would produce reactance and decrease investment intent. Some research shows that making pro-environmental behaviors highly visible or identity-signalling can backfire and reduce conservative behavioral performance [25,26]. Research that has shown both financial and environmental benefits of energy saving behaviors concurrently, however, tends to find that the addition of environmental benefits has no effect on conservative intent; rather, the addition of the environmental benefit activates the latent environmental goal for those with strong environmental values but is ignored by others [11,22].

3.1. Methods

U.S. homeowners were recruited via Amazon Mechanical Turk ($N = 754$) and an online panel managed by ClearVoice ($N = 799$, target $N = 750$) in September 2017.[11] ClearVoice was used because their panel includes a higher proportion of conservatives, while Mechanical Turk participants tend to be more liberal, but for cost reasons participants were recruited from both platforms. Mechanical Turk recruitment screened for home ownership, and ClearVoice distributed the survey to a sample of homeowner panelists.

Results excluded those participants who reported renting their homes ($N = 25$) and those living in a boat, van, or RV ($N = 3$). Results also exclude those who had already completed all three weatherization upgrades (insulated, air-sealed, and installed efficient windows in their homes, $N = 89$), leaving a total of 1,436 respondents.[12]

Ninety-seven percent of retained respondents passed an attention check correctly identifying the decision as related to weatherization. To avoid the potential for any effect of condition on attention to the study, results reported below retain all respondents who failed attention checks. All results are unchanged when respondents failing attention checks are excluded (see Table S5).

Among respondents, 35% self-reported as liberals, 36% as conservatives, and 30% as moderates (political ideology was recoded as 1–3, 4, and 5–7 on the 1–7 political ideology scale; due to rounding, totals do not add to 100%). All respondents were homeowners, 63% self-reported as female, 93% as involved in household energy use-related purchase decisions, 26% described their location as rural, 53% as suburban, and 22% as urban; participants reported a mean age of 44 ($SD = 13.8$), 60% were married, 81% were white, 52% had at least a bachelor's degree, and 47% reported household incomes of between $60,000 and $150,000 dollars a year. A large majority (86%) reported living in a single-family home (as opposed to a condo or townhouse), and half (52%) reported that they planned to stay in their homes for 11 years or more.[13]

3.1.1. Materials

Participants were randomly assigned to one of six conditions in a 2 by 3 design, including one of two financial messages: a high upfront cost or a no upfront cost financial message, crossed with one of three motivational messages: financial only, financial and climate change, or financial and stewardship/independence (referred to as "stewardship"). Table 4 provides the text of the message for each condition.

In Study 1, the cost savings was the second most important predictor of likelihood to weatherize their home. To influence perception of these financial decision factors, in this study we manipulated the temporal presentation of savings: in the high upfront cost condition participants bore the entire cost of weatherization and accrued benefits annually over a 10-year time period, while in the no upfront cost condition

[11] We estimated a sample size of 1500 with a power analysis estimated based on effect size estimates from a pre-test of financial frames. We estimated an R^2 of 0.015 across our three predictors (17 degrees of freedom), which required a sample size of 1363 for a power of 0.8 with a type on error rate of 0.05, or just over 215 per condition. We rounded up to 250 per condition to allow for ineligible and inattentive respondents.

[12] We excluded those respondents who reported already having weatherized their homes because their potential responses to the dependent variable (likelihood to weatherize) were ambiguous: they could be indicating their hypothetical likelihood to weatherize in response to this stimulus, or they could be indicating the fact that they have already weatherized and can't weatherize their homes again. Including these respondents in the analyses does not substantively change the results, although one effect becomes marginally statistically significant ($p < .10$).

[13] See Table S3 in the supplementary materials for a complete table of demographic information.

Table 4
Weatherization Stimulus Text by Component and Condition.

Message component	Condition	Message Text
Definition		
	[All see]	Weatherization is a combination of sealing the air leaks in your home, upgrading the insulation in your floor, wall, and/or ceiling, and upgrading to efficient, double-paned windows.
Benefits Frame		
	Financial	[one of two cost frames below, no additional information]
	Climate Change	[one of two cost frames below, PLUS the following information]:Weatherizing reduces the amount of electricity and natural gas used to heat and cool your home, reducing climate change-causing greenhouse gas emissions. Producing electricity accounts for 33% of climate change-causing greenhouse gas emissions in this country. Climate change is causing an increase in extreme weather like droughts and heat waves and will cost this country an estimated $220 billion per year by the end of the century.Weatherizing will reduce your home's energy use by 20%, making it one of the most impactful ways to reduce your contribution to climate change. Over 20 years, you'll save about 22 tons of carbon emissions through weatherizing your home, as much as the average American not driving for 4 years.
	Stewardship	[one of two cost frames below, PLUS the following information]:Weatherizing reduces the amount of electricity and natural gas it takes to heat and cool your home, reducing pollution from power plants and resource use.It takes 3 times as much energy to power U.S. homes today than it did in 1950, contributing to air pollution, reliance on foreign fossil fuels, and strain on our energy systems. Producing electricity accounts for 20% of dangerous air pollutants in this country and uses precious resources.Weatherizing will reduce your home's energy use by 20%, making it one of the most impactful ways to engage in stewardship of our country and help protect the health, safety, independence, and well-being of our children and grandchildren. Over 20 years, you'll save 1,600 lb of air pollutants and 22,000 kWh of electricity and natural gas through weatherizing your home, as much as the average American not driving for 4 years.
Other Benefits		
	[All see]	Weatherization can help you lower your utility bills, make your home more comfortable year-round, and improve the health and safety of your home by preventing dampness and mold.
Cost Frame		
	No upfront cost	You can receive a $600 rebate from your utility, and spread the $2,900 cost of weatherization over time with 10-year financing on your utility bill while saving $150 a year on your bills.
	High upfront cost	After weatherizing, a typical household saves about $5,000 on utility bills over the next 10 years, and spends $3,500 upfront, saving $1,500 over 10 years.

Note: Participants in each condition saw one of the three benefits messages (Financial, Climate Change, or Stewardship), and one of the two cost frames, in a 3 X 2 experimental design. All participants saw the "other benefits" sentence as well. For example, a participant in the high upfront cost/climate change condition would see the definition sentence, the climate change benefit frame text, the other benefit sentence, and finally the cost frame text.

participants received a loan and thus bore no upfront cost, accrued benefits annually, and received an upfront benefit in the form of a rebate to cover a portion of the upfront cost. In addition to manipulating the temporal dynamics of costs and benefits, this frame is consistent with the design of many policy initiatives that promote home energy upgrades via rebates that reduce the overall cost and access to financing to reduce the upfront cost to zero [e.g., [50]].

The high upfront cost financial message mentioned a $3,500 initial cost of weatherization and ten-year energy bill and total savings of weatherizing. The no-upfront cost financial message added a $600 utility subsidy that reduced the upfront cost to $2,900, and a 10-year financing of this cost mentioning the annual net bill savings of $150. All participants also saw a definition of weatherization and a sentence about additional benefits of weatherization, following the benefits frame.

The climate change message emphasized that weatherization was "one of the most impactful ways to reduce your contribution to climate change," and estimated 22 tons of carbon emissions saved, or as much as the average American not driving for four years. The stewardship message emphasized that weatherization was "one of the most impactful ways to engage in stewardship of our country and help protect the health, safety, independence, and well-being of our children and grandchildren," and estimated 1,600 lb of air pollutants and 22,000 kWh of electricity and natural gas saved, as much as the average American not driving for four years. These messages were developed to be consistent with past weatherization costs and financial offers, and pre-tested.

3.1.2. Procedure

Participants were recruited to complete a 15-minute online survey about household decisions. After answering a few questions about their home and its location, participants were randomly assigned to read one of six versions of a page of information about a home upgrade: one of the two financial frames combined with one of the three benefits frames (Table 4). To ensure attention, participants had to view the screen for at least 15 s before proceeding and were asked to summarize the information they saw. Next, participants wrote at a minimum of 50 characters about "how you would decide to weatherize your home." [14] Then, participants rated how likely they would be to weatherize (or complete weatherizing) their home in the next three years, on a scale from 1 (not at all likely) to 7 (extremely likely). To screen for attention, participants indicated what decision the previous question was asking them to consider, ("weatherizing my home", "buying a new washing machine and dryer", or "whether to be a responsible person").

Study attrition was low: 50 participants (3.5%) dropped out of the study at some point after seeing the weatherization message, and rates of dropout did not differ across benefit message condition (χ^2 (2) = 0.28, $p = .87$). These participants are not included in the sample sizes reported in the text, which include only complete responses.

All analyses were conducted in R. While our dependent variable (likelihood to weatherize) is ordinal, it has minimal amounts of skew (slightly negatively skewed, skewness = −0.16) and is only moderately platykurtotic (kurtosis = 2.04, where 3 is mesokurtotic). We therefore used linear regression to test all hypotheses to facilitate interpreting coefficients. Results are unchanged with ordinal regression [51]. We assessed the effects of the environmental message frame and the interaction of environmental message and political affiliation using a series of linear models: we modeled likelihood to weatherize as a function of financial message strength (levels: no upfront cost, high upfront cost; mean-centered) alone (Table A3 Model 1) and interacted with environmental benefit message (levels: none, climate change, stewardship; dummy coded, reference: none) for all participants (Model 2), and separately for conservatives (Model 3) and liberals (Model 4), controlling for a main effect of survey source. Lastly, we tested whether political ideology interacts with environmental message type (Model 5). This model explained 3.4% of the variance in weatherization likelihood (*F*

[14] These responses were not analyzed: the writing exercise was used to encourage attention.

(18, 1417) = 3.78, $p < .001$, $R^2_{adj} = 0.034$), and predicted weatherization likelihood significantly better than political affiliation and survey source alone ($F(15,1417) = 2.16$, $p = .006$).

ClearVoice respondents included a significantly higher proportion of conservatives than MTurk (40% versus 32%, χ^2 (2) = 62.27, $p < .001$). ClearVoice respondents also differed significantly from MTurk respondents on all demographic characteristics (see Table S3). Controlling for political ideology, MTurk respondents were significantly more likely to weatherize in the next three years than ClearVoice respondents ($b = 0.51$, $t = 5.37$, $p < .001$, R^2 *adj.* = 0.022; see "Source: MTurk" coefficient in Table A3). As a result, all analyses control for source.[15] There were no significant differences in the proportion of respondents from each source across the six treatment conditions (χ^2 (5) = 1.00, $p = .96$). The results presented below are unchanged when demographic predictor variables are included in the models.

3.2. Results

Overall, respondents ($N = 1{,}436$) reported an average likelihood to weatherize in the next three years of 4.17 ($SD = 1.8$) (slightly above "somewhat likely") on a scale of 1 to 7 (not at all likely to extremely likely).

3.2.1. Financial message effects

We found that, overall, without controlling for environmental message presence, participants who saw the no upfront cost financial message reported increased likelihood to invest in weatherization in the next three years compared with participants who saw the high upfront cost message ($b = 0.25$, $t = 2.67$, $p = .007$; Model 1 Table A3). This difference is largely driven by the messages where respondents saw both environmental and financial benefits, though: we find no effect of cost frame in the financial benefit-only message conditions ($b = 0.04$, $t = 0.26$, $p = .80$; see Model 2 Table A3).[16]

3.2.2. Environmental message and political alignment

Overall, participants who saw the climate change or stewardship message reported significantly higher likelihood to weatherize than participants who saw the financial-only message ($b = 0.23$, $t = 1.99$, $p = .046$; and $b = 0.34$, $t = 3.00$, $p = .003$, respectively; Table A3 Model 2).

Examining the results separately for conservatives and liberals, we found support for our prediction that respondents responded selectively to politically-aligned messages (Fig. 1). Averaging across levels of financial message strength, conservative respondents who received the stewardship message were significantly more likely to weatherize than conservative respondents who received the financial only message ($b = 0.46$, $t = 2.46$, $p = .01$; Model 3), implying that reflecting on the well-being of future generations has an impact regardless of political ideology. We found no evidence of a difference between conservative respondents who received the climate change message versus the financial message ($b = 0.03$, $t = 0.15$, $p = 0.88$; Model 3).

Somewhat unexpectedly, we found that liberals responded to both the climate change and the stewardship message (Model 4). Overall, liberals who saw the climate change message ($b = 0.46$, $t = 2.55$, $p = .01$) and the stewardship message ($b = 0.54$, $t = 2.96$, $p = .003$) rated themselves more likely to weatherize than those who saw only the financial message.

Results differed somewhat across the two upfront cost messages, although the interactions did not reach statistical significance (Table A4). Liberal response to the climate change message was moderated by a marginally significant interaction with financial frame strength ($b = 0.69$, $t = 1.93$, $p = .054$; Model 4): the effect of the climate change frame was stronger for participants who saw the no upfront cost financial frame.[17] Among liberals who saw the high upfront cost message, we observed no notable difference between likelihood to invest in response to the financial message versus the financial plus climate change message, but there was an increase in the financial plus stewardship message condition, as shown in Table A4.

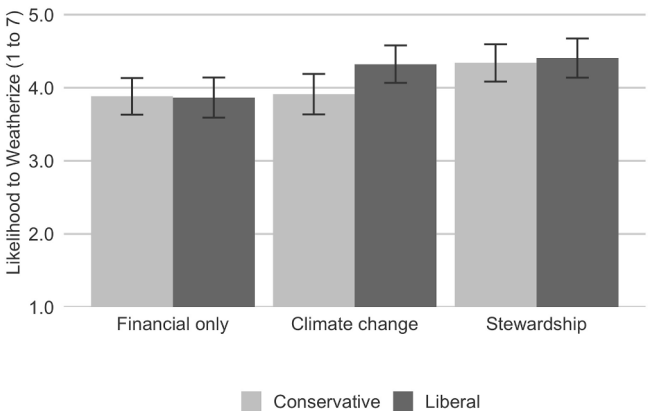

Fig. 1. Predictions of likelihood to weatherize in the next 5 years (on scale from 1 not at all likely to 7 extremely likely) as a function of the three benefit message conditions (financial only, financial + climate change, financial + stewardship) for Conservatives (light) and Liberals (dark). Results have been collapsed across the two upfront cost conditions. Error bars show 95% confidence intervals. Conservative $N = 516$, Liberal $N = 498$.

Although this pattern of results is different for liberals and conservatives, the interactions between political affiliation and environmental message type are somewhat under-powered and not statistically significant (Model 5). The interaction between political ideology and financial versus climate change message type is marginally significant ($b = -0.43$, $t = -1.58$, $p = 0.11$): the effect of the climate change message is directionally stronger for liberals than conservatives. The interaction between political ideology and climate change versus stewardship message is directionally consistent but not statistically significant ($b = 0.34$, $t = 1.28$, $p = .20$).

3.2.3. Reactance to environmental benefits messages

Our results fail to demonstrate evidence of reactance to misaligned messages: we don't find evidence that willingness to weatherize was lower for conservatives who saw the climate change message with the financial benefit message compared to those who saw only the financial benefit message ($b = 0.03$, $t = 0.16$, $p = 0.87$; Model 3). This suggests support for our prediction that participants selectively attend to aligned goals in the face of multiple benefit messages, rather than attending to both aligned and misaligned goals. Conservatives who saw the climate change message were not significantly less likely to weatherize than conservatives who did not see the climate change message. Even among those who report not believing that anthropogenic climate change is occurring ($N = 552$), we fail to find evidence that exposure to the climate change message substantially reduces weatherization likelihood relative to the financial message only among those who think climate change is natural, don't believe it is occurring, or are unsure ($b = 0.03$ $t = 0.16$, $p = .88$). While failure to reject a null is not conclusive proof that there is no difference, these findings are suggestive that any reactance is small in magnitude.

Selection bias could explain this lack of reactance, if participants

[15] Results are unchanged when this variable is excluded, see Table S4.

[16] In our pilot test of these conditions using very similar wording, we found a small but significant difference between the two cost conditions, so the absence of a difference here is surprising and most likely due to chance.

[17] The interaction between financial message strength and the two environmental messages was not statistically significant for liberals, ($b = 0.44$, $t = 1.19$, $p = .23$.)

who reacted negatively to the climate change frame started but failed to complete the study. However, as noted above, rates of dropout did not differ by condition, so we reject this alternate explanation.

3.3. Discussion

Building on the results of Study 1, where we found evidence that homeowners' perceptions of the environmental benefits of weatherization explained the most variance of any decision factor in their likelihood to weatherize, this study experimentally demonstrated that emphasizing environmental benefits in addition to financial benefits can increase weatherization likelihood, relative to financial benefits alone. Although Study 1 showed that environmental benefits were more important to liberals than conservatives, this study showed that different ways of presenting environmental benefits can increase weatherization engagement among conservatives as well as liberals. An environmental benefit message emphasizing climate change benefits of weatherization had no effect for conservatives, but led to a 0.46 point (on a 1 to 7 scale) increase in weatherization likelihood for liberals, moderated by upfront cost. An environmental benefit message emphasizing the stewardship and energy independence benefits of weatherization led to a 0.46 point increase in weatherization likelihood for conservatives and a 0.54 point increase in weatherization likelihood for liberals. While we failed to find strong evidence of an interaction between political affiliation and environmental message type, we found strong overall evidence of an environmental message effect, and we were somewhat underpowered to detect this interaction. Notably, we failed to find evidence that the climate change message substantially decreased conservative likelihood to weatherize, relative to a financially-focused message.

These results do not indicate that the financial benefits of weatherization are unimportant. Instead, our results suggest that environmental benefits that resonate with the target audience can increase interest in weatherization when combined with information on the financial benefits of weatherization.

These results don't provide a clear indication of the relationship between upfront costs and nonfinancial benefits. More research is needed to determine whether there is an interaction between the effects of financial and environmental benefits: if an investment is prohibitively expensive, will a clear environmental benefit may be persuasive? While this explanation makes sense given that a high upfront cost may act as a structural barrier for homeowners who would be unable to afford this cost regardless of any benefits it might accrue them, we find inconsistent support: this effect is observed only for liberals, and only in the climate change condition but not the stewardship condition.

4. General discussion

Through this research, we have contributed to the very limited prior experimental research examining the effects of message presentation on intent to complete large structural energy efficiency investments. We found that large structural home energy efficiency upgrades are related to environmental attitudes and political affiliation in addition to financial considerations, and that messages that emphasize environmental motivations can increase interest in weatherization when these messages are aligned with respondent ideology. In Study 1, our results suggested that general environmental attitudes explain variance in weatherization likelihood, and that perceptions of the importance of social and environmental benefits to the decision to weatherize explain more variance in weatherization likelihood than other decision factors such as financial savings and comfort. In Study 2, we showed experimentally that adding environmental messages to financial ones can increase weatherization interest in both liberals and conservatives, depending on the message frame: a climate change benefit frame generates liberal interest, while a stewardship and independence frame generates both liberal and conservative interest. The relationship between financial offer attractiveness and environmental benefit message requires further study to understand to what extent the effects of environmental benefits are contingent on the features of the financial offer.

Yet critically, in the context of a message that presents multiple benefits, we fail to find that a message that is misaligned with respondent ideology (such as presenting a climate change message to many political conservatives) leads to reactance. While this failure to reject the null hypothesis does not conclusively confirm that no reactance exists, these results suggest that the magnitude of any reactance, if it exists, is small, and that policy makers can incorporate carefully worded environmental messages without undue fear of promoting excessive reactance among customers with misaligned ideologies.

In addition to contributing to our understanding of the role of environmental benefits in consumer decisions about large energy efficiency upgrades, these results have important policy implications. An environmental message can't substitute for addressing a broad structural barrier to weatherizing, but we find that adding an environmental stewardship message can matter just as much or more than commonly used financial programs to lower upfront costs [19]. We find that environmental benefits need not be politically polarizing: they can appeal to conservatives as well as liberals, depending on the way they are framed, and we fail to find evidence of substantial reactance to messages of "climate change" among conservatives in the context of multiple benefits messages.

Future research should expand on these promising findings and address the limitations of these studies. First, future research should replicate these findings in the field with prospective weatherizers, using preregistration. This research was not preregistered, and is based on self-reported behavioral intent, which is a proxy of interest in weatherization rather than a direct indicator of future behavior. In the domain of pro-environmental behavior, behavioral intent can diverge from behavior [52] and the gap between proenvironmental attitudes and behaviors widens as the behaviors become more costly [53]. Yet findings on environmental benefits and energy conservation behaviors have been consistent across behavioral intent and behavior, suggesting that findings based on behavioral intent have some validity in this domain [10,22]. Replicating the findings of this research in the field is a critical next step.

Second, while this study explores the effect of misaligned environmental messages on weatherization interest among those who have read a weatherization message, future field research should also explore the effect of misaligned environmental messages on message attention: faced with a weatherization message (such as a web ad or a utility bill insert), will a conservative individual allocate attentional resources to a message that presents the climate change benefits of weatherization? Third, future research should further explore the interaction of environmental message and political affiliation, and the types of environmental messages that appeal across the political spectrum. We were somewhat underpowered to detect an interaction between environmental message and political affiliation, as has been found in past research [29,31]. Furthermore, the environmental benefits messages

used in this study, particularly the stewardship message, included a range of different appeals, including geopolitical and value-based appeals. Which elements of these appeals explain the observed effects? Can a message that displays all financial, climate change, and stewardship benefits of weatherization increase interest for all respondents? Research on efficient vehicle labelling suggests that it can [11] but too many reasons can weaken the persuasive power of messaging [54]. Is there an upper limit to the number of message frames that can be deployed in a single communication? Fourth, as the financial frames used in this study combined a variety of strategies to manipulate upfront cost, and the results of the cost and environmental benefits interaction were ambiguous, future research should explore the features and framing of the financial offer under which these types of multiple benefits frames are most successful.

Fifth, future research should examine whether the visibility of the behavior moderates this effect. This research studied weatherization, which is a low-visibility behavior, like many large efficiency behaviors including appliance upgrades and heating and cooling system upgrades. Past research suggests that visible behaviors tend to have stronger identity associations, and thus may be more strongly moderated by environmental identity strength [26]. It is possible that the effects of nonfinancial information nudges would be politically polarizing for these behaviors. Finally, more broadly, based on the results of Study 1, researchers should explore the promise of social norms interventions to motivate large energy efficiency investments.

Household decisions around structural energy efficiency upgrades are multifaceted and constrained by structural, external, and financial household limitations. Within these constraints, though, our research suggests that policy makers should reconsider their exclusive focus on financial benefits in messaging about structural energy efficiency upgrades. Messages that emphasize both financial and environmental benefits in a way that resonates with audience values may be more effective than financial messages alone at interesting households in weatherization.

5. Author note

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Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A

Table A1. Study 1 Variable question wording.

Variable	Item wording	Measurement scale
Financial Decision Factors		
Perceived investment risk	Compared to investing your money in a diversified portfolio of stocks, how much financial risk do you think weatherizing your home poses?	1 much less risk – 5 much more risk
Upfront cost concern importance	Rate the importance of these concerns for your household in making this decision… Upfront cost	1 not at all important – 5 extremely important
Savings uncertainty concern importance	Rate the importance of these concerns for your household in making this decision… Uncertainty about the cost savings	1 not at all important – 5 extremely important
Upfront cost concern type	What is the most important reason why upfront cost of weatherization is important to you? -I can't afford it -I have other priorities for my money -I don't want to take out a loan -The payback period to cover the upfront costs is too long	(select one)
Savings benefit importance	Rate the importance of each of these benefits for your household in making this decision… Long-term savings	1 not at all important – 5 extremely important
Cost Estimate	How much do you think weatherizing your home would cost?	$
Savings Estimate	How much do you think weatherizing your home would save per year on energy bills?	$
Nonfinancial Decision Factors		
Knowledge	Four true/false items. (Correct answer in parentheses.) Items: -Over time, weatherization can save more money than it costs (T) -Weatherization is only needed in very cold climates (F) -Utilities may offer financial incentives to help you pay for weatherization (T) -Weatherization saves less energy than upgrading to efficient appliances (F)	Proportion correct, 0-1 True/False/Not sure
Environmental benefit importance	Rate the importance of each of these benefits for your household in making this decision… Environmental benefits	1 not at all important – 5 extremely important
Reduce foreign oil dependence importance	Rate the importance of each of these benefits for your household in making this decision… Reduce my dependence on foreign oil	1 not at all important – 5 extremely important
Increase comfort importance	Rate the importance of each of these benefits for your household in making this decision… Make my home more comfortable	1 not at all important – 5 extremely important
Set a good example importance	Rate the importance of each of these benefits for your household in making this decision…Set a good example for others	1 not at all important – 5 extremely important
Environmental benefit uncertainty importance	Rate the importance of these concerns for your household in making this decision… Uncertainty about the environmental benefits	1 not at all important – 5 extremely important
Technology reliability importance	Rate the importance of these concerns for your household in making this decision…Concerns about technology maintenance and reliability	1 not at all important – 5 extremely important

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Variable	Item wording	Measurement scale
Personal experience	Do you know someone who has weatherized their home?	Binary (Yes/No)
Outcome Measure		
Weatherization likelihood	How likely are you to weatherize (or to complete weatherizing) your home in the next five years?	0 not at all likely – 10 extremely likely Participants who had weatherized were assigned a score of 10.

Table A2. Regression model of likelihood to weatherize as a function of participant characteristics, financial decision factors, and non-financial decision factors.

	Likelihood to weatherize (0-10)			
	(1) Respondent Characteristics	(2) + Financial Decision Factors	(3) + Nonfinancial Decision Factors	(4) + Financial & Nonfinancial Decision Factors
Environmental attitudes	0.554*	0.372	−0.105	−0.094
	(0.250)	(0.235)	(0.248)	(0.245)
Race/Ethnicity	0.632	0.758	0.495	0.655
	(0.518)	(0.490)	(0.464)	(0.462)
Education	−0.176	−0.154	−0.128	−0.117
	(0.113)	(0.107)	(0.101)	(0.101)
Income	−0.093	−0.065	−0.084	−0.059
	(0.081)	(0.080)	(0.073)	(0.076)
Marital status: Living together	0.529	−0.232	0.191	−0.112
	(0.937)	(0.874)	(0.854)	(0.832)
Marital status: Married	−0.305	−0.638	0.013	−0.332
	(0.563)	(0.533)	(0.506)	(0.506)
Marital status: Single	−0.729	−0.555	0.476	0.200
	(0.703)	(0.660)	(0.641)	(0.630)
Marital status: Widowed	−0.065	−0.350	0.786	0.388
	(0.828)	(0.773)	(0.746)	(0.737)
Age	−0.019	−0.020	−0.006	−0.006
	(0.019)	(0.019)	(0.017)	(0.018)
Gender: Male	0.385	0.268	0.205	0.199
	(0.343)	(0.322)	(0.317)	(0.312)
Location: Suburban	−0.081	−0.121	0.322	0.247
	(0.387)	(0.363)	(0.351)	(0.346)
Location: Urban	0.343	0.370	0.367	0.417
	(0.540)	(0.503)	(0.490)	(0.481)
Household size	0.323	0.226	0.396*	0.315
	(0.223)	(0.209)	(0.200)	(0.197)
Occupant ages: None of these	1.823	0.993	1.265	0.686
	(1.041)	(0.970)	(0.931)	(0.911)
Occupant ages: Adults over 65	2.045*	1.259	1.397	0.894
	(1.028)	(0.955)	(0.921)	(0.898)
Occupant ages: Children between 5 and 18	1.748	1.331	1.073	0.831
	(0.975)	(0.914)	(0.873)	(0.860)
Occupant ages: Children under 5	0.138	0.655	−0.348	0.015
	(0.855)	(0.814)	(0.769)	(0.772)
Home type: Mobile home	−0.732	−0.700	−1.536	−1.391
	(1.160)	(1.101)	(1.053)	(1.045)
Home type: One-family house attached to one or more houses	0.490	0.620	0.555	0.499
	(1.112)	(1.052)	(1.005)	(0.996)
Home type: One-family house detached from any other house	1.176	1.222	0.582	0.619
	(0.882)	(0.844)	(0.800)	(0.801)
Language at home: Non-English	0.927	1.085	0.525	0.634
	(0.647)	(0.609)	(0.586)	(0.581)
Occupancy duration	−0.098	−0.089	−0.080	−0.072
	(0.138)	(0.130)	(0.124)	(0.123)
Planned duration	−0.057	−0.033	0.056	0.052
	(0.087)	(0.081)	(0.078)	(0.077)
Political ideology: Moderate	−0.168	−0.041	−0.055	0.007
	(0.429)	(0.399)	(0.386)	(0.378)
Political ideology: Conservative	−0.301	−0.089	−0.141	−0.119
	(0.463)	(0.433)	(0.427)	(0.417)
Upfront cost concern importance		−0.555**		−0.396*
		(0.210)		(0.201)
Savings uncertainty concern importance		−0.231		−0.257
		(0.156)		(0.171)
Savings benefit importance		0.855***		0.411*
		(0.187)		(0.194)
Perceived investment risk		−0.468**		−0.471**
		(0.169)		(0.161)
Savings estimate		0.001*		0.001

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(*continued*)

	Likelihood to weatherize (0-10)			
	(1) Respondent Characteristics	(2) + Financial Decision Factors	(3) + Nonfinancial Decision Factors	(4) + Financial & Nonfinancial Decision Factors
		(0.0004)		(0.0003)
Cost estimate		−0.00004		−0.00002
		(0.00003)		(0.00003)
Upfront cost concern type: No loan		1.660***		0.975*
		(0.497)		(0.481)
Upfront cost concern type: Other priorities		−0.153		−0.340
		(0.415)		(0.394)
Upfront cost concern type: Long payback		0.524		0.366
		(0.500)		(0.471)
Environmental benefit importance			0.486*	0.296
			(0.192)	(0.196)
Increase comfort importance			0.644***	0.533*
			(0.189)	(0.207)
Set a good example importance			0.375*	0.339*
			(0.159)	(0.160)
Reduce foreign oil dependence importance			0.213	0.121
			(0.150)	(0.155)
Environmental benefit uncertainty importance			−0.244	−0.103
			(0.145)	(0.157)
Technology reliability concern importance			0.059	0.168
			(0.142)	(0.144)
Know someone who has weatherized			3.264***	2.732***
			(0.698)	(0.692)
Constant	39.268	43.050	6.914	10.299
	(37.814)	(36.939)	(34.277)	(35.323)
Observations	412	408	412	408
R^2	0.095	0.246	0.293	0.351
Adjusted R^2	0.037	0.178	0.234	0.278
Residual Std. Error	3.207 (df = 386)	2.951 (df = 373)	2.860 (df = 379)	2.765 (df = 366)
F Statistic	1.624* (df = 25; 386)	3.584*** (df = 34; 373)	4.918*** (df = 32; 379)	4.819*** (df = 41; 366)

Note: Model 1 predictors are participant characteristics only, Model 2 predictors are participant characteristics and financial decision factors, Model 3 predictors are participant characteristics and nonfinancial decision factors, and Model 4 predictors are participant characteristics and both financial and nonfinancial decision factors. Decision factors are itemized in Table 2 of the main text. Reference categories for categorical variables are: Marital status: Divorced, Location: Rural, Home type: Condo; Political ideology: Liberal; Upfront cost concern type: I can't afford it. Significance values have been truncated to: + p< .10; * p<0.05; * *p<0.01; *** p<0.001.

Table A3. Study 2 Regression Model Output: Likelihood to Weatherize.

Coefficient	Model 1 Cost Only	Model 2 Cost + Benefit	Model 3 Conservatives Only	Model 4 Liberals Only	Model 5 Ideology * Benefit
Upfront cost (mean-centered)	0.246**	0.041	0.039	0.060	0.063
	(0.092)	(0.159)	(0.261)	(0.263)	(0.279)
Environmental Benefit: Climate Change		0.225*	0.028	0.458*	0.457*
		(0.113)	(0.195)	(0.179)	(0.191)
Environmental Benefit: Stewardship		0.336**	0.457*	0.541**	0.540**
		(0.112)	(0.186)	(0.183)	(0.195)
Ideology: Conservative					0.016
					(0.190)
Ideology: Moderate					0.417*
					(0.207)
Financial Strength * Environmental Benefit: Climate Change		0.466*	0.194	0.693+	0.689+
		(0.225)	(0.389)	(0.359)	(0.382)
Financial Strength * Environmental Benefit: Stewardship		0.136	−0.126	0.245	0.241
		(0.224)	(0.372)	(0.367)	(0.390)
Financial Strength * Ideology: Conservative					−0.024
					(0.378)
Financial Strength * Ideology: Moderate					0.051
					(0.412)
Environmental Benefit: Climate Change * Ideology: Conservative					−0.427
					(0.269)
Environmental Benefit: Stewardship * Ideology: Conservative					−0.083

(*continued on next page*)

(*continued*)

Coefficient	Model 1 Cost Only	Model 2 Cost + Benefit	Model 3 Conservatives Only	Model 4 Liberals Only	Model 5 Ideology * Benefit
					(0.266)
Environmental Benefit: Climate Change * Ideology: Moderate					−0.333
					(0.283)
Environmental Benefit: Stewardship * Ideology: Moderate					−0.622*
					(0.287)
Financial Strength * Environmental Benefit: Climate Change * Ideology: Conservative					−0.496
					(0.539)
Financial Strength * Environmental Benefit: Stewardship * Ideology: Conservative					−0.364
					(0.533)
Financial Strength * Environmental Benefit: Climate Change * Ideology: Moderate					−0.353
					(0.567)
Financial Strength * Environmental Benefit: Stewardship * Ideology: Moderate					−0.018
					(0.574)
Source: MTurk	0.505***	0.512***	0.560***	0.543***	0.519***
	(0.092)	(0.092)	(0.158)	(0.151)	(0.094)
Constant	4.177***	3.988***	3.885***	3.862***	3.865***
	(0.046)	(0.080)	(0.131)	(0.133)	(0.140)
Observations	1,436	1,436	516	498	1,436
R^2	0.025	0.035	0.039	0.063	0.046
Adjusted R^2	0.024	0.031	0.027	0.051	0.034
Residual Std. Error	1.743 (df = 1433)	1.737 (df = 1429)	1.772 (df = 509)	1.628 (df = 491)	1.734 (df = 1417)
F Statistic	18.673*** (df = 2; 1433)	8.538*** (df = 6; 1429)	3.422** (df = 6; 509)	5.459*** (df = 6; 491)	3.781*** (df = 18; 1417)

Regression output for Study 2. Dependent variable is likelihood to weatherize. Model 1 presents upfront cost results only. Models 2 presents upfront cost and benefit frame results, with the financial benefit frame as the reference category. Models 3 and 4 present results for conservatives and liberals, respectively. Model 5 presents overall results with an interaction for political affiliation (Liberal has been coded as the reference category).

Note: For space reasons significance values are abbreviated to: + p< .10; * p<0.05; * *p<0.01; *** p<0.001. Exact p values for all hypotheses appear in the main text.

Table A4. Study 2 Likelihood to weatherize by political affiliation, benefit message, and upfront cost.

Environmental benefit	No upfront cost		High upfront cost	
	Conservative	Liberal	Conservative	Liberal
	M [95% CI]	M [95% CI]	M [95% CI]	M [95% CI]
Financial only	3.9 [3.6, 4.2]	3.9 [3.5, 4.3]	3.9 [3.5, 4.2]	3.8 [3.5, 4.2]
Climate change	4.0 [3.6, 4.4]	4.7 [4.3, 5.1]	3.8 [3.4, 4.2]	3.9 [3.6, 4.3]
Stewardship	4.3 [3.9, 4.7]	4.6 [4.2, 4.9]	4.4 [4.0, 4.7]	4.3 [3.9, 4.6]

Model 5 estimates and 95% CIs of likelihood to weatherize across upfront cost level, political affiliation, and environmental benefit frame.

Appendix B. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.erss.2021.101938.

References

[1] W. Berg, S. Nowak, G. Relf, S. Vaidyanathan, E. Junga, M. DiMascio, E. Cooper, The 2018 State Energy Efficiency Scorecard, American Council for an Energy Efficient Economy, Washington D.C., 2018. https://aceee.org/sites/default/files/publications/researchreports/u1808.pdf.

[2] IEA, World Energy Investment 2019, International Energy Agency, 2019. iea.org/wei2019 (accessed September 27, 2019).

[3] T.D. Gerarden, R.G. Newell, R.N. Stavins, Assessing the Energy-Efficiency Gap, Harvard Environmental Economics Program, Cambridge, MA, 2015 http://www.nber.org/papers/w20904%5Cnhttp://www.nber.org/papers/w20904.pdf.

[4] P.C. Stern, K.B. Janda, M.A. Brown, L. Steg, E.L. Vine, L. Lutzenhiser, Opportunities and insights for reducing fossil fuel consumption by households and organizations, Nat. Energy 1 (2016) 16043, https://doi.org/10.1038/nenergy.2016.43.

[5] F. Creutzig, J. Roy, W.F. Lamb, I.M.L. Azevedo, W.B. de Bruin, H. Dalkmann, O. Y. Edelenbosch, F.W. Geels, A. Grubler, C. Hepburn, E.G. Hertwich, R. Khosla, L. Mattauch, J.C. Minx, A. Ramakrishnan, N.D. Rao, J.K. Steinberger, M. Tavoni, D. Ürge-Vorsatz, E.U. Weber, Towards demand-side solutions for mitigating climate change, Nat. Clim. Change 8 (2018) 260, https://doi.org/10.1038/s41558-018-0121-1.

[6] T. Dietz, G.T. Gardner, J. Gilligan, P.C. Stern, M.P. Vandenbergh, Household actions can provide a behavioral wedge to rapidly reduce US carbon emissions, Proc. Natl. Acad. Sci. U. S. A. 106 (2009) 18452–18456, https://doi.org/10.1073/pnas.0908738106.

[7] B. Karlin, N. Davis, A. Sanguinetti, K. Gamble, D. Kirkby, D. Stokols, Dimensions of conservation: exploring differences among energy behaviors, Environ. Behav. 46 (2014) 423–452, https://doi.org/10.1177/0013916512467532.

[8] S. Mazur-Stommen, K. Farley, ACEEE Field Guide to Utility-Run Behavior Programs, American Council for an Energy Efficient Economy (2013).

[9] E. Yoeli, D.V. Budescu, A.R. Carrico, M.A. Delmas, J.R. DeShazo, P.J. Ferraro, H. A. Forster, H. Kunreuther, R.P. Larrick, M. Lubell, E.M. Markowitz, B. Tonn, M. P. Vandenbergh, E.U. Weber, Behavioral science tools to strengthen energy & environmental policy, Behav. Sci. Policy 3 (2017) 68–79, https://doi.org/10.1353/bsp.2017.0006.

[10] O.I. Asensio, M.A. Delmas, Nonprice incentives and energy conservation, Proc. Natl. Acad. Sci. U. S. A. 112 (2015) E510–E515, https://doi.org/10.1073/pnas.1401880112.

[11] C. Ungemach, A.R. Camilleri, E.J. Johnson, R.P. Larrick, E.U. Weber, Translated attributes as choice architecture: Aligning objectives and choices through decision signposts, Manage. Sci. (2018), https://doi.org/10.1287/mnsc.2016.2703.

[12] P.C. Stern, How can social science research become more influential in energy transitions? Energy Res. Soc. Sci. 26 (2017) 91–95, https://doi.org/10.1016/j.erss.2017.01.010.

[13] I. Kastner, P.C. Stern, Examining the decision-making processes behind household energy investments: A review, Energy Res. Soc. Sci. 10 (2015) 72–89, https://doi.org/10.1016/j.erss.2015.07.008.

[14] C. Wilson, Social norms and policies to promote energy efficiency in the home, Environ. Law Report. News Anal. 38 (2008) 10882–10888.

[15] C. Aravena, A. Riquelme, E. Denny, Money, comfort or environment? Priorities and determinants of energy efficiency investments in Irish households, J. Consum. Policy 39 (2016) 159–186, https://doi.org/10.1007/s10603-016-9311-2.

[16] J.C. Cole, J.B. McDonald, X. Wen, R.A. Kramer, Marketing energy efficiency: Perceived benefits and barriers to home energy efficiency, Energy Effic. 11 (2018) 1811–1824, https://doi.org/10.1007/s12053-018-9614-z.
[17] I. Stiess, E. Dunkelberg, Objectives, barriers and occasions for energy efficient refurbishment by private homeowners, J. Clean. Prod. 48 (2013) 250–259, https://doi.org/10.1016/j.jclepro.2012.09.041.
[18] H.B. Truelove, A.J. Gillis, Perception of pro-environmental behavior, Glob. Environ. Change. 49 (2018) 175–185, https://doi.org/10.1016/j.gloenvcha.2018.02.009.
[19] M.C. Fuller, C. Kunkel, M. Zimring, I. Hoffman, K. Lindgren Soroye, C. Goldman, Driving Demand for Home Energy Improvements: Motivating Residential Customers to Invest in Comprehensive Upgrades That Eliminate Energy Waste, Avoid High Utility Bills, and Spur the Economy, Lawrence Berkeley National Laboratory, Berkeley, CA, 2011. http://escholarship.org/uc/item/2010405t.
[20] K. Palmer, M. Walls, H. Gordon, T. Gerarden, Assessing the energy-efficiency information gap: results from a survey of home energy auditors, Energy Effic. 6 (2013) 271–292, https://doi.org/10.1007/s12053-012-9178-2.
[21] D. Schwartz, T.L. Milfont, D. Hilton, The interplay between intrinsic motivation, financial incentives and nudges in sustainable consumption, In K. Gangle, E. Kirchler, (Eds.), A Research Agenda for Economic Psychology (2019), pp. 87-103. https://doi.org/10.4337/9781788116060.00012.
[22] D. Schwartz, W. Bruine de Bruin, B. Fischhoff, L. Lave, Advertising energy saving programs: The potential environmental cost of emphasizing monetary savings, J. Exp. Psychol. Appl. 21 (2015) 158–166, https://doi.org/10.1037/xap0000042.
[23] R. Sussman, M. Chikumbo, R. Gifford, Message framing for home energy efficiency upgrades, Energy Build. 174 (2018) 428–438, https://doi.org/10.1016/j.enbuild.2018.06.032.
[24] U. Gneezy, S. Meier, P. Rey-Biel, When and why incentives (don't) work to modify behavior, J. Econ. Perspect. 25 (2011) 191–209, https://doi.org/10.1257/jep.25.4.191.
[25] D.M. Gromet, H. Kunreuther, R.P. Larrick, Political ideology affects energy-efficiency attitudes and choices, Proc. Natl. Acad. Sci. 110 (2013) 9314–9319, https://doi.org/10.1073/pnas.1218453110.
[26] C. Brick, D.K. Sherman, H.S. Kim, "Green to be seen" and "brown to keep down": visibility moderates the effect of identity on pro-environmental behavior, J. Environ. Psychol. 51 (2017) 226–238, https://doi.org/10.1016/j.jenvp.2017.04.004.
[27] M. Brenan, L. Saad, Global Warming Concern Steady Despite Some Partisan Shifts, Gallup, Inc., 2018. https://news.gallup.com/poll/231530/global-warming-concern-steady-despite-partisan-shifts.aspx (accessed October 6, 2018).
[28] E.P.S. Baumer, F. Polletta, N. Pierski, G.K. Gay, A simple intervention to reduce framing effects in perceptions of global climate change, Environ. Commun. 11 (2017) 289–310, https://doi.org/10.1080/17524032.2015.1084015.
[29] N. Petrovic, J. Madrigano, L. Zaval, Motivating mitigation: When health matters more than climate change, Clim. Change. 126 (2014) 245–254, https://doi.org/10.1007/s10584-014-1192-2.
[30] L. Whitmarsh, A. Corner, Tools for a new climate conversation: A mixed-methods study of language for public engagement across the political spectrum, Glob. Environ. Change. 42 (2017) 122–135, https://doi.org/10.1016/j.gloenvcha.2016.12.008.
[31] M. Feinberg, R. Willer, The moral roots of environmental attitudes, Psychol. Sci. 24 (2013) 56–62, https://doi.org/10.1177/0956797612449177.
[32] S.M. Cruz, The relationships of political ideology and party affiliation with environmental concern: A meta-analysis, J. Environ. Psychol. 53 (2017) 81–91, https://doi.org/10.1016/j.jenvp.2017.06.010.
[33] J.N. Druckman, M.C. McGrath, The evidence for motivated reasoning in climate change preference formation, Nat. Clim. Change. 9 (2019) 111–119, https://doi.org/10.1038/s41558-018-0360-1.
[34] R.E. Dunlap, C. Xiao, A.M. McCright, Politics and environment in America: partisan and ideological cleavages in public support for environmentalism, Environ. Polit. 10 (2001) 23–48, https://doi.org/10.1080/714000580.
[35] J. Haidt, J. Graham, C. Joseph, Above and below left–right: Ideological narratives and moral foundations, Psychol. Inq. 20 (2009) 110–119, https://doi.org/10.1080/10478400903028573.
[36] B. Kidwell, A. Farmer, D.M. Hardesty, Getting liberals and conservatives to go green: Political ideology and congruent appeals, J. Consum. Res. 40 (2013) 350–367, https://doi.org/10.1086/670610.
[37] P.W. Schultz, L. Zelezny, Reframing environmental messages to be congruent with American values, Hum. Ecol. Rev. 10 (2003) 11. https://www.jstor.org/stable/24706963.
[38] K.M. Sheldon, C.P. Nichols, Comparing Democrats and Republicans on intrinsic and extrinsic values, J. Appl. Soc. Psychol. 39 (2009) 589–623, https://doi.org/10.1111/j.1559-1816.2009.00452.x.
[39] D. York, S. Nadel, E. Rogers, R. Cluett, S. Kwatra, H. Sachs, J. Amann, M. Kelly, New Horizons for Energy Efficiency: Major Opportunities to Reach Higher Electricity Savings by 2030, American Council for an Energy Efficient Economy, 2015. http://aceee.org/sites/default/files/publications/researchreports/u1507.pdf.
[40] L.C. Hamilton, Education, politics and opinions about climate change evidence for interaction effects, Clim. Change. 104 (2011) 231–242, https://doi.org/10.1007/s10584-010-9957-8.
[41] A. Mayer, T.O. Shelley, T. Chiricos, M. Gertz, Environmental risk exposure, risk perception, political ideology and support for climate policy, Sociol. Focus. 50 (2017) 309–328, https://doi.org/10.1080/00380237.2017.1312855.
[42] A.M. McCright, Political orientation moderates Americans' beliefs and concern about climate change, Clim. Change. 104 (2011) 243–253, https://doi.org/10.1007/s10584-010-9946-y.
[43] C. Huff, D. Tingley, "Who are these people?" Evaluating the demographic characteristics and political preferences of MTurk survey respondents, Res. Polit. 2 (2015), https://doi.org/10.1177/2053168015604648.
[44] R.E. Dunlap, K.D.V. Liere, A.G. Mertig, R.E. Jones, Measuring endorsement of the new ecological paradigm: A revised NEP scale, J. Soc. Issues. 56 (2000) 425–442, https://doi.org/10.1111/0022-4537.00176.
[45] B. Tonn, D. Caroll, E. Rose, B. Hawkins, D. Bausch, G. Dalhoff, M. Blasnik, J. Eisenberg, C. Cowan, B. Conlon, Weatherization Works II – Summary of Findings from the ARRA Period Evaluation of the U.S. Department of Energy's Weatherization Assistance Program, Oak Ridge National Laboratory, Oak Ridge, 2015.
[46] A. Liaw, M. Wiener, Classification and regression by randomForest, R News. 2 (2002) 18–22.
[47] A. Liaw, M. Wiener, Package 'randomForest,' 2015. ftp://ie.freshrpms.net/pub/CRAN/web/packages/randomForest/randomForest.pdf (accessed August 1, 2017).
[48] H. Allcott, T. Rogers, The short-run and long-run effects of behavioral interventions: Experimental evidence from energy conservation, Am. Econ. Rev. 104 (2014) 3003–3037, https://doi.org/10.3386/w18492.
[49] J.M. Nolan, P.W. Schultz, R.B. Cialdini, N.J. Goldstein, V. Griskevicius, Normative social influence is underdetected, Pers. Soc. Psychol. Bull. 34 (2008) 913–923, https://doi.org/10.1177/0146167208316691.
[50] NYSERDA, How the Program Works – Home Performance with ENERGY STAR, (2017). https://www.nyserda.ny.gov/All-Programs/Programs/Home-Performance-With-ENERGY-STAR/How-the-Program-Works (accessed June 12, 2017).
[51] P.-C. Bürkner, M. Vuorre, Ordinal regression models in psychology: a tutorial, Adv. Methods Pract. Psychol. Sci. 2 (2019) 2515245918823199. https://doi.org/10.1177/2515245918823199.
[52] P.D. Pelsmacker, L. Driesen, G. Rayp, Do consumers care about ethics? Willingness to pay for fair-trade coffee, J. Consum. Aff. 39 (2005) 363–385, https://doi.org/10.1111/j.1745-6606.2005.00019.x.
[53] M. Farjam, O. Nikolaychuk, G. Bravo, Experimental evidence of an environmental attitude-behavior gap in high-cost situations, Ecol. Econ. 166 (2019), 106434, https://doi.org/10.1016/j.ecolecon.2019.106434.
[54] K. Weaver, S.J. Hock, S.M. Garcia, "Top 10" reasons: When adding persuasive arguments reduces persuasion, Mark. Lett. 27 (2016) 27–38, https://doi.org/10.1007/s11002-014-9286-1.