



# “Green to be seen” and “brown to keep down”: Visibility moderates the effect of identity on pro-environmental behavior



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## ABSTRACT

Social identities predict pro-environmental behavior, but the strength may depend on whether the behavior is visible to others. When an environmentalist considers a pro-environmental behavior such as carrying reusable grocery bags, being observed by others may motivate signaling the valued group membership and may increase behavior (“green to be seen”). When an anti-environmentalist considers a pro-environmental behavior that signals an unwanted social identity, being observed may lead to less behavior (“brown to keep down”). United States residents completed three correlational surveys (total  $N = 1126$ ) of identity, visibility, and self-reported behavior frequency using the Recurring Pro-environmental Behavior Scale. Three multilevel studies revealed that environmentalist identity predicted pro-environmental behavior more strongly for high-visibility behaviors, controlling for confounds at the person level (attitudes, political identity) and the behavior level (difficulty, effectiveness). This research helps uncover the key social identities and contextual factors that lead individuals to embrace or reject pro-environmental behaviors.

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## 1. Introduction

Consider these puzzling behaviors: farmers avoid organic techniques that they know are more profitable (Press, Arnould, Murray, & Strand, 2014), and liberals pay extra for the Toyota Prius® relative to less visible hybrids in Democratic regions (Sexton & Sexton, 2011). These behaviors appear to contradict economic self-interest and can be partly explained through social identity concerns. Social identities affect individuals' experiences, emotions, and behaviors (Brewer, 2003, pp. 480–491; Dunning, 1999; Ellemers, Spears, & Doosje, 2002), and while social identities such as liberal, Green Party, and vegetarian are associated with pro-environmental behaviors, other social identities are less compatible such as conservative, petroleum engineer, or rancher.

Social identities strongly influence behavior (Ellemers et al., 2002), and behavioral models use identity to bridge the weak link between environmental concern and behavior (Bamberg, 2003). However, an open question of theoretical and applied importance is how identity interacts with social context in determining pro-environmental behavior. We propose that social

identity leads to pro-environmental behavior by two processes: identity consistency and identity signaling. First, according to the identity consistency model, environmentalists will engage more in pro-environmental behaviors, because the identity-consistency of behaviors serves as a guideline for desirable actions (Ellemers et al., 2002; Steg, Bolderdijk, Keizer, & Perlaviciute, 2014).

Second, a valued social identity will more strongly drive identity-associated behaviors when behaviors are visible to others, because these actions signal valued (or devalued) identities and could influence reputation (the identity signaling model; cf. Gal, 2015). Pro-environmental behaviors differ in their visibility to other people. Individuals may know which of their neighbors bicycle to work, but they may not know which neighbors are buying carbon offsets to reduce their greenhouse gas emissions. The literature provides some support for the identity signaling hypothesis in the introductory examples as well as another study, in which conservatives shunned energy-efficient lightbulbs when paired with a sticker reading “Protect the Environment” (Gromet, Kunreuther, & Larrick, 2013). When a person's identities are aligned with a behavior, e.g., when a liberal has the opportunity to buy a “green” product, social visibility may increase behavior frequency. However, a conservative may choose not to publicly purchase this product when conspicuously labeled (Gromet et al., 2013). In sum, when a behavior signals an unwanted identity, we

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predict that visibility will decrease that behavior.

### 1.1. Social visibility

Individuals generally engage in more prosocial behavior when their actions are visible to others. The bystander effect of not helping during a crime (Latané & Darley, 1968) may reverse entirely when individuals are watched: bystanders intervene more often when in the presence of a closed-circuit camera (Bommel, Prooijen, Eiffers, & Lange, 2014). While being watched, individuals are also more generous (Nettle et al., 2013; Northover, Pedersen, Cohen, & Andrews, 2016; Van Rompay, Vonk, & Fransen, 2009). Previous work suggested that visibility also increases pro-environmental behavior. Being watched leads individuals to prefer eco-friendly over luxury goods (Griskevicius, Tybur, & Van den Bergh, 2010) and to litter less (Bateson, Callow, Holmes, Redmond Roche, & Nettle, 2013).

However, the claim that visibility leads to prosocial behavior contains an implicit assumption that the behavior is signaling desired characteristics and traits (e.g., honesty; generosity). The identity consistency and identity signaling models lead to different predictions about visibility. According to identity consistency, environmental identity will predict more pro-environmental behavior regardless of visibility, because people will act consistent with their beliefs and identities across contexts (Brick & Lewis, 2016; Steg et al., 2014). Situational factors such as difficulty or visibility may still drive behavior, but they would not affect the strength of the relationship between identity and behavior. In contrast, identity signaling would suggest that when pro-environmental behavior is associated with desired traits, visibility would lead to more behavior, and for unwanted traits visibility would lead to less behavior. Because identity strongly predicts behavior across diverse contexts (Dono, Webb, & Richardson, 2010; Kashima, Paladino, & Margetts, 2014), and because pro-environmental behavior signals group memberships (Gromet et al., 2013; Sexton & Sexton, 2011), we expect both models to be supported. That is, we predict that identity itself and the interaction of identity and visibility will both uniquely predict pro-environmental behavior. These predictions depend on the way environmentalism is viewed within the United States, where the research was conducted (Eom, Kim, Sherman, & Ishii, 2016; Zaval, 2016).

Individuals in the United States increasingly think that the environmentalist movement has done more harm than good (Gallup, 2016), and since 1991 identification with environmentalists has decreased steadily to 42% (Jones, 2016). A series of studies identified the traits that people spontaneously attribute to environmentalists (e.g., militant, aggressive, and unclean), and showed that these negative perceptions were associated with lower willingness to affiliate with environmentalists and to engage in pro-environmental behavior (Bashir, Lockwood, Chasteen, Nadolny, & Noyes, 2013). When negative aspects of environmentalism are salient, visibility may overall reduce pro-environmental behavior, since individuals will be motivated to maintain their social reputation by avoiding the negative category (“brown to keep down”). Previous research found that college students prefer eco-friendly over luxury products such as backpacks, but only when primed with both need for social status and visibility to others (“green to be seen”; Griskevicius et al., 2010). We extend this work by testing whether visibility can both increase and decrease behavior based on social identity. The current studies use more representative samples, measure self-reported behavior rather than preferences, and examine real-world visibility. These advances allow a strong test for whether identification with environmentalists is a unique predictor of pro-environmental behavior beyond environmental

attitudes and political orientation.

### 1.2. Identity signaling

Individuals are motivated to think positively about themselves, their groups, and to cultivate warm social reactions (Fiske, 2010; Leary, 2007; Steele, 1988; Swann & Bosson, 2010). These motivations drive individuals to demonstrate positive identities with a wide array of public behaviors including speech and clothing choices. For example, consumers strategically choose products that demonstrate their identities to others (Berger & Heath, 2007), such as Prius<sup>®</sup> drivers who signal an eco-friendly identity through their vehicle choice.

Individuals often act against self-interest by neglecting their finances, health, and natural environment. Part of the explanation is that individuals signal positive identities based on what is valued in their social context (Anderson, Hildreth, & Howland, 2015). Therefore, whether a person will adopt a behavior such as reducing meat consumption may depend on social norms and how others are expected to react to the behavior (Cialdini, Reno, & Kallgren, 1990; Loughnan, Bastian, & Haslam, 2014). Individuals are especially vigilant to the reactions of others in their valued social groups. We propose that the most important identity for expressing and signaling pro-environmental behavior is identifying with environmentalists.

### 1.3. Social identity

Diverse social groups are responding differently to the dire news of climate change, pollution, and deforestation. On one end, environmentalists attend to ecological damage and value sustainability. On the other end, anti-environmentalists oppose environmental regulations, see nature as a resource to be used by humans (de Groot & Steg, 2008), and define themselves in opposition to environmentalists (Ogbu, 1994). An extreme example of asserting an anti-environmental identity is “rolling coal”: modifying diesel trucks to belch smoke into traffic (Tabuchi, 2016). Pro- and anti-environmental identities are social group memberships that individuals are motivated to strategically signal, because these groups have identifiable clothing, speech, vehicles, and other social markers (Dono et al., 2010; Fielding, McDonald, & Louis, 2008).

Environmental identity is often conceptualized by how individuals think about their personal relationship to nature and about the proper role of humans on earth (Clayton, 2003). Identification with nature and the environment are generally thought to be caused by environmental values (Stern, 2000), and these identities then influence attitudes, personal norms, intentions, and behavior (Steg et al., 2014). Individuals report higher environmental identity after engaging in environmental actions, especially difficult and unique behaviors such as purchasing an electric vehicle (van der Werff, Steg, & Keizer, 2014), and environmental identity appears to drive pro-environmental behaviors by strengthening one's personal norms to act sustainably (van der Werff, Steg, & Kaizer, 2013). We focus on the closely related construct of how much individuals self-identify as environmentalists, because identity signaling is more likely for a specific social group.

In the studies below, we assess how environmentalist identity is linked to pro-environmental behavior. The identity consistency model leads to the prediction that environmentalist identity will be associated with more pro-environmental behavior. However, the identity signaling model leads to the prediction that the relationship between environmental identity and pro-environmental behavior will be stronger for highly visible actions. The effect of identity on behavior can be positive (for environmentalists) or

negative (for anti-environmentalists). When an environmentalist considers a pro-environmental behavior such as carrying reusable grocery bags, being observed by others may create a motivation to signal the valued group membership and may increase behavior (“green to be seen”). However, when an anti-environmentalist considers a pro-environmental behavior that could signal that unwanted social identity, being observed may lead to less behavior (“brown to keep down”; see Fig. 1).

#### 1.4. Overview of studies

We ran three correlational surveys of U.S. residents to measure the interaction of environmentalist identity and behavior visibility on pro-environmental behavior frequency. A pilot study was used to develop the Recurring Pro-environmental Behavior Scale. Study 1 provided the first evidence for both consistency and signaling effects of identity on behavior. Study 2 extended the findings of Study 1 with revised measures with improved validity and reliability, and evaluated perceived environmental effectiveness of each behavior as a potential confound. Study 3 extended the key identity finding in a new population and provided convergent validity, and it included the need for social status and the perceptions of environmentalists to better isolate the effect of identity.

## 2. Study 1

Study 1 tested for the overall effect of identity on behavior and whether environmentalist identity leads to pro-environmental behaviors more strongly when those behaviors are visible to others. Second, Study 1 compared the identities of environmentalism and political ideology for predicting pro-environmental behavior.

### 2.1. Method

#### 2.1.1. Participants and procedure

357 American adults were recruited from Amazon MTurk and completed an online survey. Five participants did not complete the study and were excluded. Three participants had duplicate IP addresses with earlier participants and were excluded because of possible non-naïveté. The remaining sample of 349 participants was 34.4% female, 65.5% male (1 missing); 77.1% White/Caucasian,

4.6% Black/African-American, 11.5% Asian/Asian-American, 5.4% Hispanic/Latino, and 1.4% Other; age  $M(SD) = 29.3(10.0)$  years. The participants gave informed consent, were compensated with \$0.50, and were debriefed after the study.

#### 2.1.2. Detecting social visibility effects

The current work operationalized social visibility using both ideographic and consensual approaches. First, to account for cultural and personal differences in behavior context, behavior frequency and perceptions of visibility were measured within each person for each behavior. This ideographic technique requires multi-level modeling, and has the advantage of using all of the visibility and behavior frequency data, not just the behaviors with extreme visibility. The technique also allows the model to account for different behaviors being considered high or low visibility across individuals. However, this approach does not address the possibility of reverse causality: an individual might see their frequent behaviors as more visible. To address this issue, we also conducted a between-subjects analysis based on the behaviors rated highest and lowest visibility across the sample. If these results based on a consensual measure of visibility are consistent with the multilevel results, that will reduce the likelihood of reverse causation.

Evaluating multiple social identities is necessary to understand how identity could lead to pro-environmental behavior. The current studies assess political identity and identification with environmentalists as competing predictors (cf. Gromet et al., 2013). Identification with environmentalists is expected to be more predictive of pro-environmental behaviors because environmentalist identity overlaps conceptually with attitudes about the natural environment, e.g., that humans are damaging nature. To isolate the contribution of identity, environmental attitudes and climate change beliefs are also included below.

#### 2.1.3. Measures

**2.1.3.1. Environmentalist identity.** We adapted four items: “I see myself as pro-environmentalist”; “I am pleased to be pro-environmentalist”; “I feel strong ties with pro-environmentalist people”; and “I identify with pro-environmentalist people” (Smith, Seger, & Mackie, 2007; van der Werff, Steg, & Kaizer, 2013). The four items were combined into a composite, Cronbach's  $\alpha = 0.91$ . A second environmentalist identity scale was piloted and excluded; see Footnote 2.

**2.1.3.2. Environmental attitudes.** Five items from the New Ecological Paradigm scale (NEP; Dunlap, Van Liere, Mertig, & Jones, 2000; subset used by Stern et al. 1999) were combined into a composite, Cronbach's  $\alpha = 0.78$ .

**2.1.3.3. Climate change belief.** Six items assessed belief, concern, and perceived risk of climate change and were included as an exploratory measure of beliefs. See [Supplementary Materials](#) for full text. The six items were combined into a composite, Cronbach's  $\alpha = 0.84$ .

**2.1.3.4. Recurring pro-environmental behavior scale.** A pilot study ( $N = 122$ ) was run on MTurk to develop a scale of pro-environmental behavior frequency with a broad range of repeated environmental actions accessible to a diverse population (Carbon Footprint Ltd., 2012; Dietz, Gardner, Gilligan, Stern, & Vandenberg, 2009; Union of Concerned Scientists, 2012); see [Supplementary Materials](#) for full methods and rationale of the pilot study. To maximize ecological validity, our scale includes both curtailment behaviors (e.g., reducing water use) and efficiency behaviors (e.g., replacing lights with energy-efficient bulbs but not

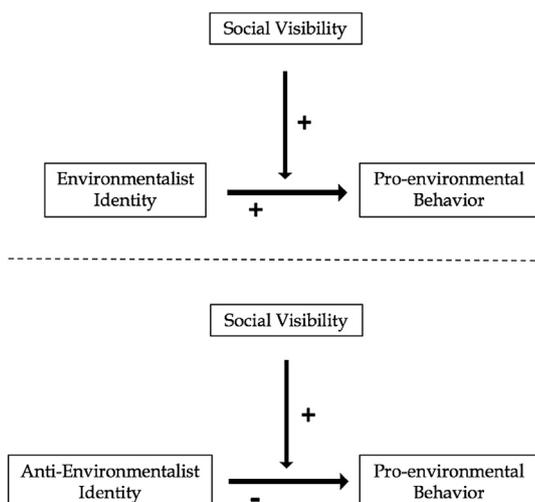
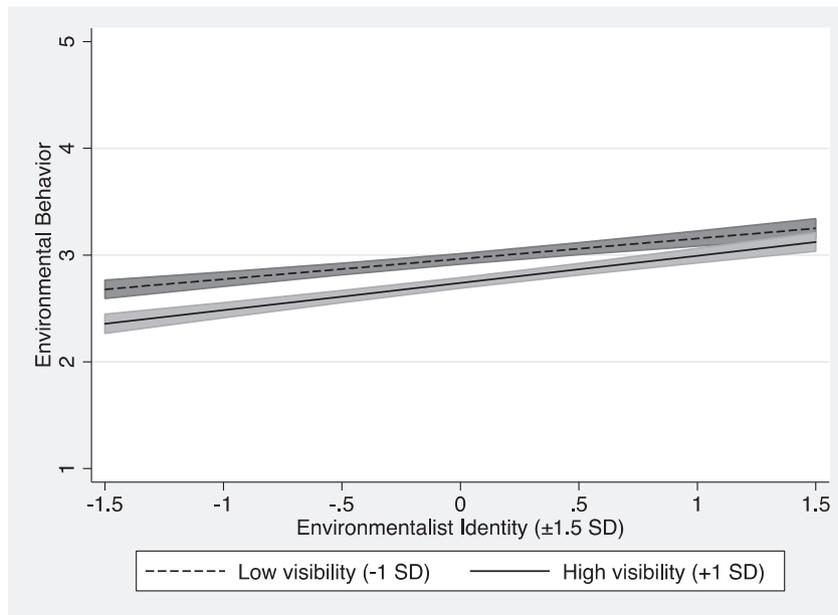
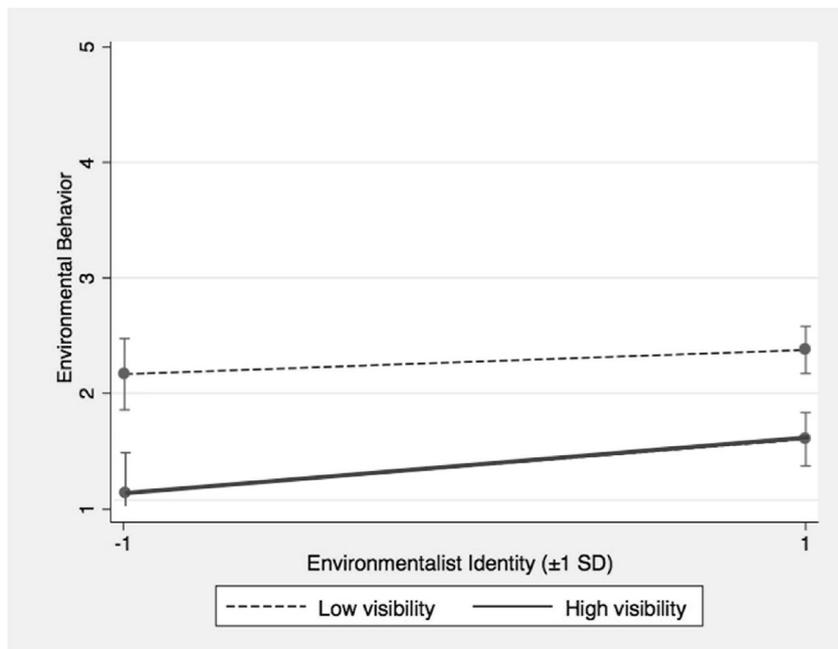


Fig. 1. Visibility strengthens the effect of social identity on pro-environmental behavior.



**Fig. 2.** Visibility moderated the relationship between environmentalist identity and pro-environmental behavior in a multi-level random-effects linear regression with participant and behavior type as levels, shown with continuous 95% confidence intervals (Study 1, observations = 7328,  $N = 349$ ).



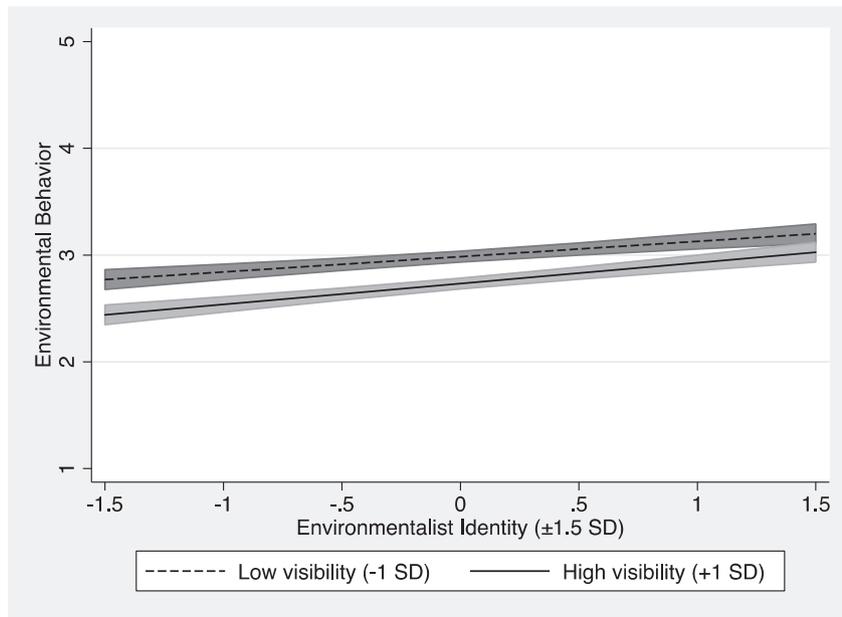
**Fig. 3.** Environmentalist identity predicted the four highest-more than the four lowest-visibility pro-environmental behaviors in a single-level analysis (Study 1,  $N = 349$ ). Note: The high- and low-visibility behavior composites are separate outcome measures, and therefore each line represents a separate regression.

changing usage). Participants reported their frequency of performing 21 pro-environmental behaviors, including items such as air travel (reversed), meat and dairy consumption (reversed), water conservation, and recycling, from 1 (*Never*) to 5 (*Always*) (see Appendix for the final scale used in Studies 1–3). The 21 items were reliable, Cronbach's  $\alpha = 0.82$ .

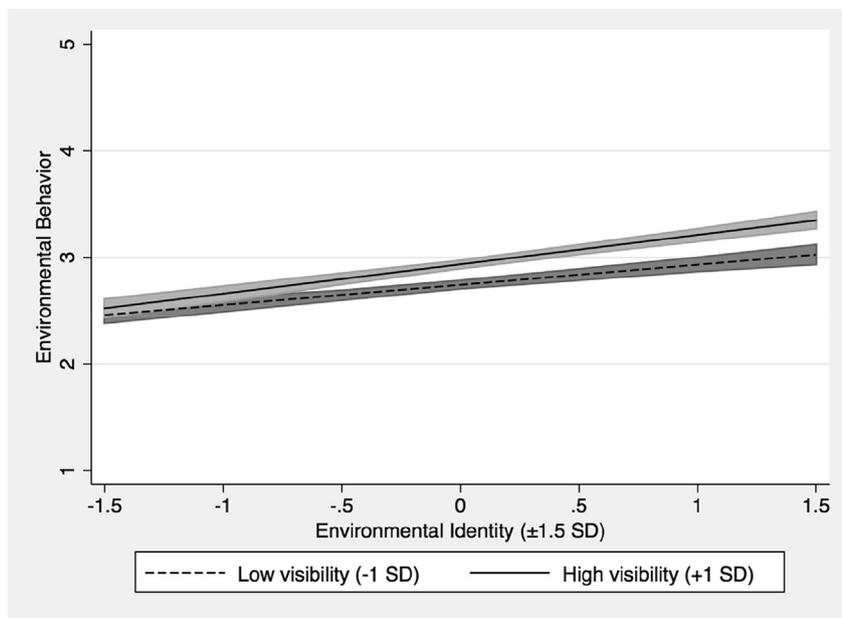
**2.1.3.5. Social visibility of behaviors.** Participants were instructed: "These behaviors can reduce a person's greenhouse gas emissions. Some of these actions can be easily observed by other people. Some

actions are more private. Please rate the following behaviors on how socially visible they are: that is, how much they can be observed by other people." Participants rated 21 behaviors from 1 (*Not at all visible*) to 7 (*Extremely visible*).

**2.1.3.6. Difficulty of behaviors.** To account for the potential confounding factor of behavior difficulty, participants responded to the following prompt: "Now, please indicate how difficult these actions are to complete, including effort and expense", and rated all 21 behaviors from 1 (*Extremely easy*) to 7 (*Extremely difficult*).



**Fig. 4.** Visibility moderated the relationship between identity and pro-environmental behavior in a multi-level random-effects linear regression with participant and behavior type as levels and controlling for confounds, shown with continuous 95% confidence intervals (Study 2, observations = 6969,  $N = 332$ ).



**Fig. 5.** Visibility moderated the relationship between visibility and pro-environmental behavior in a multi-level random-effects linear regression with participant and behavior type as levels and controlling for confounds, shown with continuous 95% confidence intervals (Study 3, observations = 9110,  $N = 435$ ).

**2.1.3.7. Political identity.** Ideology was measured as in the American National Election Studies (Center for Political Studies, 2013). If participants selected a political party affiliation of Democrat or Republican, they next indicated the strength of their party affiliation from 1 (*Not very strong [Democrat/Republican]*) to 7 (*Strong [Democrat/Republican]*). If participants first selected Independent or another category (e.g., Green Party), they rated their party preferences from 1 (*Strong Democrat*) to 7 (*Strong Republican*). All ratings were combined to yield a rating of political liberalism from 1 (*Strong Republican*) to 7 (*Strong Democrat*).

**2.1.3.8. Demographics and quality check.** Participants reported their

age, gender, education, income, ethnicity, and wrote a brief statement to demonstrate English fluency.

#### 2.1.4. Analytic plan

The dataset has two levels of analysis: individuals and behavior. Visibility and difficulty were rated for each of the 21 behaviors. A multilevel model was used to nest the ratings by behavior within each individual. Each of the 21 behaviors was considered part of the broader construct of pro-environmental behavior, and so the effects on behavior can be interpreted like a typical regression.

## 2.2. Results

### 2.2.1. Descriptives

Environmental identity was moderate,  $M (SD) = 4.60 (1.36)$ , range 1–7. Self-reported pro-environmental behavior frequencies were also moderate,  $M (SD) = 2.86 (1.29)$ , range 1–5, median “Sometimes”. See [Supplementary Materials](#) for means, standard deviations, scale reliabilities, and zero-order correlations.<sup>1</sup>

### 2.2.2. Correlations

Environmental identity<sup>2</sup> covaried moderately with environmental attitudes,  $r(348) = 0.54$ , climate change belief,  $r(348) = 0.55$ , and political liberalism,  $r(347) = 0.32$ ,  $ps < 0.001$ . Self-reported pro-environmental behavior frequency correlated with environmental identity,  $r(348) = 0.24$ ,  $p < 0.001$ , and environmental attitudes,  $r(348) = 0.14$ ,  $p = 0.009$ , and pro-environmental behavior was unrelated to either climate change beliefs,  $r(348) = 0.10$ ,  $p = 0.08$ , or political liberalism,  $r(347) = 0.09$ ,  $p = 0.09$ .

### 2.2.3. Primary analyses

Behavior was regressed onto identity and visibility in a multi-level model controlling for environmental attitudes, climate change beliefs, political identity, perceived difficulty, and the interaction between difficulty and visibility. All betas were standardized. There was a positive main effect of environmental identity on self-reported behavior such that environmentalists performed pro-environmental behaviors more frequently than anti-environmentalists,  $\beta = 0.22$ ,  $SE = 0.03$ ,  $p < .001$ <sup>3</sup>. However, this effect should be interpreted in light of the hypothesized two-way interaction.

Visibility moderated the relationship between identity and behavior, standardized  $\beta = 0.03$ ,  $SE = 0.01$ ,  $p = 0.01$ . Contrasts were performed with the same covariates as the regression and revealed that identity drove behavior more strongly for high-compared to low-visibility behaviors, simple slopes different than zero, high visibility  $\beta = 0.31$ ,  $SE = 0.03$ ,  $z(343) = 11.6$ ,  $p < 0.001$ , vs. low visibility,  $\beta = 0.13$ ,  $SE = 0.03$ ,  $z(343) = 4.99$ ,  $p < 0.001$ . In the other set of contrasts, the interaction pattern was driven by anti-environmentalists ( $-1$  SD identity) performing fewer high-vs. low-visibility pro-environmental behaviors,  $\beta = -0.29$ ,  $SE = 0.04$ ,  $z(343) = -7.96$ ,  $p < 0.001$ . Environmentalists ( $+1$  SD identity) showed a smaller effect of performing fewer visible behaviors,  $\beta = -0.16$ ,  $SE = 0.05$ ,  $z(343) = -2.73$ ,  $p = 0.006$  (see [Fig. 2](#) and [Table 1](#)).

There was also a negative main effect of visibility such that more visible behaviors were performed less frequently,  $\beta = -0.11$ ,  $SE = 0.01$ ,  $p < 0.001$ . Additionally, when behaviors were perceived as more difficult, people reported doing them much less frequently,  $\beta = -0.57$ ,  $SE = 0.01$ ,  $p < 0.001$ . The other main effects were not significant,  $ps \geq 0.56$ . There were no two-way interactions between visibility and attitudes, beliefs, and political identity,  $ps \geq 0.09$ . The inclusion of age, gender, ethnicity (White vs. non-White),

education, and income did not alter the hypothesized interaction, so these variables were removed here for clarity. See [Supplementary Materials](#) for an additional analysis that included these variables and yielded parallel results.

We also conducted an alternative test with the behaviors of highest and lowest visibility across participants. This analysis provides evidence against reverse causality because visibility was aggregated across individuals, and therefore the behavior frequency is not driven by arbitrary individual perceptions of visibility. Composites of behavior frequency were created from the top and bottom visibility quintiles (four highest- and four lowest-visibility behaviors; high: reusable bags, recycling in public, discussing environmental issues, and engaging in political advocacy; low: air travel [reversed], turning off electrical devices, aerosol use [reversed], and recycling in private). Quintiles are comparable to selecting items beyond  $\pm 1SD$  visibility because they exclude the 13 items with medium visibility (62% of behaviors). Separate regressions predicted high- and low-visibility behavior from identity, using the same covariates as above. Identity did not predict low-visibility behaviors,  $\beta = -0.04$ ,  $SE = 0.03$ ,  $p = 0.18$ , but identity did predict high-visibility behaviors,  $\beta = -0.16$ ,  $SE = 0.03$ ,  $p < 0.001$ . This pattern is consistent with the primary analysis and provides convergent validity that visibility moderated the effect of identity (see [Fig. 3](#)).

Last, we examined difficulty as a potential confound. Easy pro-environmental behaviors are better predicted by environmental attitudes and concern (Stern, 2000, p. 416; Stern, Dietz, Abel, Guagnano, & Kalof, 1999), and it follows that perceived difficulty could moderate the relationship between identity and behavior (Gneezy, Imas, Brown, Nelson, & Norton, 2011). Difficulty may interact with environmentalist identity to predict behavior because more difficult behaviors may dissuade anti-environmentalists relatively more than the same high-difficulty behaviors deter environmentalists. In the multi-level model, difficulty did not interact with visibility,  $\beta = -0.02$ ,  $SE = 0.01$ ,  $p = 0.12$ .

## 2.3. Discussion

The results indicate both identity consistency and identity signaling effects. Controlling for a wide range of competing predictors, visibility was associated with less pro-environmental behavior and visibility moderated the identity-behavior relationship such that the relationship was stronger for high-compared to low-visibility behaviors. The interaction was driven by “brown to keep down”: anti-environmentalists engaged in fewer pro-environmental behaviors when those behaviors were more visible. A similar, weaker effect was observed for environmentalists, and we elaborate on this finding in the General Discussion. This is the first demonstration of how visibility affects pro-environmental behavior across levels of identity.

A potential confound for the visibility finding is whether behaviors are perceived to be consistent with an environmental identity (Kashima et al., 2014). Anti-environmentalists may not perform higher-visibility behaviors less because of visibility but because those behaviors are also more consistent with environmental identity. Kashima et al. (2014) found that behavior consistency moderated the relationship between identity and behavior. We believe that consistency is unlikely to explain the visibility interaction in the current studies because the items in the Recurring Pro-environmental Behavior Scale vary in visibility more than consistency. For example, educating oneself about the environment (item #21) and engaging in political activism (item #20) are both consistent with environmentalism but differ in visibility to others. In addition, the scale contains two items that vary only on visibility: recycling in public and recycling in private.

<sup>1</sup> For all studies and pilots, the sample size and the enrollment stopping point were determined prior to data collection, all exclusion criteria and exclusions are specified, and all measured variables and conditions are described.

<sup>2</sup> We used the environmentalist identity scale adapted from Smith et al. (2007) and not the one developed by Whitmarsh and O'Neill (2010) because the former had higher reliability ( $\alpha_s = 0.91$  vs. 0.77) and the latter had conceptual overlap with the measure of self-reported behavior (i.e., “I think of myself as an environmentally-friendly consumer”). The identity measure used here is conceptually separate from behavior.

<sup>3</sup> Environmental attitudes, climate change beliefs, and political orientation were not included due to high collinearity with identity. We conducted a separate regression with these variables, there were no additional main effects, and the identity-visibility interaction emerged again (see [Supplementary Materials](#)).

In Study 2, we also assess the perceived effectiveness of each behavior at addressing environmental problems. Effectiveness is a key component in the Knowledge Structure Model (Frick, Kaiser, & Wilson, 2004), and individuals report that instrumental motives are critical to their environmental choices (Nolan, Schultz, Cialdini, Goldstein, & Griskevicius, 2008). Truelove and Parks (2012) also made a specific call for research on the perceived effectiveness of pro-environmental behaviors. Further, effectiveness is related to consistency (see below), and this provides additional support for the hypothesized link and against consistency as an alternative explanation.

Another issue with Study 1 is that it framed the survey in terms of climate change, this may have primed group memberships. Assessments of climate change beliefs may tap into group identity more than scientific beliefs (Kahan et al., 2012), which limits that measure's construct validity. The instruction wording of the climate change belief measure was intended to provide a context to participants, but could have also primed individuals to view pro-environmental behaviors within a political context or as representative of only one domain of environmental problems. In Study 2, the visibility instructions were changed to remove the mention of climate change.

Next, to minimize shared method variance between the visibility and frequency measures, the measure of visibility was changed from a Likert-type scale to a bin-sorting task where participants moved items to bins on the screen rather than clicking response bubbles. Reducing shared method variance between the visibility and behavior measures provides a more stringent test of the identity-signaling hypothesis. Finally, to avoid any priming effects of visibility on behavior, the measure of self-reported behavior was moved earlier than the measure of behavior visibility.

### 3. Study 2

The goal of Study 2 was to extend the visibility moderation finding with improved measures and to account for additional potential confounds.

#### 3.1. Method

##### 3.1.1. Participants and procedure

332 American adults, 41.6% female, 58.4% male; 76.8% White, 6.6% Black/African-American, 8.1% Asian/Asian-American, 6.9% Hispanic/Latino, and 1.5% Other; age  $M(SD) = 31.8(11.1)$  years, were recruited from Amazon MTurk and completed an online survey (see [Supplementary Materials](#)).

##### 3.1.2. Measures

All procedures and methods were identical to Study 1 except as noted below.

**3.1.2.1. Social visibility.** Participants were instructed: "Some of these actions can be easily observed by other people. Some actions are more private. Please rate the following behaviors on how socially visible they are: that is, how much they can be observed by other people." The 21 behaviors appeared in a randomized list, with instructions: "Click-and-drag each behavior into a box", and three boxes were provided: "Rarely visible", "Medium visible", and "Often visible".

**3.1.2.2. Perceived difficulty.** To improve the normality of the results, the scale markers were revised to 1 (*Not at all difficult*) to 7 (*Extremely difficult*).

**3.1.2.3. Perceived effectiveness.** This was measured for each

behavior with "How effective is each behavior for reducing climate change? Enter your best guess," rated from 1 (*Not at all effective*) to 7 (*very effective*).

#### 3.2. Results

##### 3.2.1. Primary analyses

Behavior was regressed onto key variables using the same multi-level model as described in Study 1, controlling for difficulty, effectiveness, political identity, and key two-way interactions. There was a positive main effect of environmentalist identity on self-reported behavior such that environmentalists performed pro-environmental behaviors more frequently than anti-environmentalists,  $\beta = 0.17, SE = 0.02, p < 0.001$ .

As hypothesized, visibility moderated the link between identity and behavior,  $\beta = 0.03, SE = 0.01, z(323) = 2.01, p = 0.04$ , again showing the "brown to keep down" effect. Contrasts with the same covariates as the regression revealed the same pattern as in Study 1. Simple slopes indicated that there was a stronger relationship between environmentalist identity and behavior for high-visibility behaviors,  $\beta = 0.20, z(323) = 8.25, p < 0.001$ , than for low-visibility behaviors,  $\beta = 0.14, z(323) = 5.99, p < 0.001$ . Anti-environmentalists ( $-1 SD$ ) performed fewer high-than low-visibility behaviors,  $\beta = -0.31, SE = 0.04, z(323) = -8.26, p < 0.001$ . Environmentalists' ( $+1 SD$ ) behavior also differed by visibility, although not as strongly,  $\beta = -0.20, SE = 0.04, z(323) = -5.49, p < 0.001$ , showing that both groups performed fewer actions when they perceived them to be highly visible (see [Fig. 4](#)).

Main effects emerged for identity, difficulty, and effectiveness (see [Table 2](#)). A second two-way interaction emerged for identity  $\times$  difficulty,  $\beta = -0.05, SE = 0.01, z(323) = -4.07, p < 0.001$ , showing that the gap between environmentalist and anti-environmentalist behavior was broader for easy than for difficult behaviors, consistent with [Gneezy et al. \(2011\)](#). See [Supplementary Materials](#) for means, standard deviations, scale reliabilities, and zero-order correlations. As in Study 1, inclusion of demographic covariates in the primary analyses showed no new main effects and did not alter the key interaction, so they were excluded from the primary analyses for clarity.

##### 3.2.2. Effectiveness

Neither the main effect nor the interaction of effectiveness with identity accounted for the key identity  $\times$  visibility interaction (see [Table 2](#)), indicating that the visibility findings are not due to the perceived effectiveness of the behaviors. A secondary goal of Study 2 was responding to a call for descriptive reports of individual perceptions of pro-environmental behavior effectiveness ([Truelove & Parks, 2012](#)). The behaviors were all seen as moderately effective,  $M(SD) = 4.13(0.09)$ , range 3.25–4.98 (overall range 1–7; see [Supplementary Materials](#) for ratings by item). These moderate ratings appear to reflect a lack of knowledge, as these behaviors differ by orders of magnitude in their actual impact on climate

**Table 1**

Visibility Moderated the Relationship between Identity and Pro-environmental Behavior in a Multi-level Random Effects Linear Regression with Participant and Behavior Type as Levels (Study 1, observations = 7328).

$N = 349$	Standardized $\beta$	$SE$	$p$
Environmentalist identity	0.22**	0.02	<0.001
Visibility	-0.11**	0.01	<0.001
Difficulty	-0.57**	0.01	<0.001
Identity $\times$ visibility	0.03*	0.01	0.01
Identity $\times$ difficulty	-0.02s	0.01	0.12

Note. \* $p \leq 0.01$ , \*\* $p \leq 0.001$ .

**Table 2**

Visibility Moderated the Relationship between Identity and Pro-environmental Behavior in a Multi-level Random Effects Linear Regression Controlling for Confounds and using Participant and Behavior Type as Levels (Study 2, observations = 6969).

<i>N</i> = 332	Standardized $\beta$	<i>SE</i>	<i>p</i>
Environmentalism identity	0.17***	0.02	<0.001
Political liberalism	0.00	0.02	0.21
Visibility	-0.13*	0.01	<0.001
Difficulty	-0.48***	0.01	<0.001
Effectiveness	0.30***	0.02	<0.001
Identity $\times$ visibility	0.03*	0.01	0.05
Identity $\times$ difficulty	-0.05***	0.01	<0.001
Identity $\times$ effectiveness	0.01	0.02	0.78

Note. \* $p \leq 0.05$ , \*\* $p \leq 0.01$ , \*\*\* $p \leq 0.001$ .

**Table 3**

Visibility Moderated the Relationship between Visibility and Pro-environmental Behavior in a Multi-level Random Effects Linear Regression with Participant and Behavior Type as Levels (Study 3, observations = 9110).

<i>N</i> = 435	Standardized $\beta$	<i>SE</i>	<i>p</i>
Environmentalism identity	0.23***	0.02	<0.001
Visibility	0.10***	0.01	<0.001
Need for social status	0.07***	0.02	0.001
Difficulty	-0.63***	0.01	<0.001
Effectiveness	0.21***	0.01	<0.001
Political liberalism	0.03	0.02	0.12
Environmental attitudes	-0.07***	0.02	0.001
Identity $\times$ visibility	0.04***	0.01	0.001
Identity $\times$ difficulty	-0.01	0.01	0.58
Identity $\times$ effectiveness	0.00	0.01	0.73

Note. \*\*\* $p \leq 0.001$ .

change (Gardner & Stern, 2008). For example, air travel, behavior frequency  $M (SD) = 4.09 (1.0)$ , causes high greenhouse gas emissions, and aerosol use, frequency  $M (SD) = 3.76 (0.96)$ , is unrelated (see Whitmarsh, 2009).

These effectiveness ratings serve the secondary purpose of shedding light on the consistency interpretation raised above. Kashima et al. (2014) assessed both effectiveness and consistency for a similar set of pro-environmental behaviors, such as consumption, transportation, and discussion of environmental topics. In Kashima et al. (2014; Study 2), effectiveness and consistency were highly related across pro-environmental behaviors,  $r(1091) = 0.64$ , and therefore effectiveness can serve here as a proxy for consistency.<sup>4</sup> If visibility continues to moderate how identity is associated with behavior when including effectiveness as a confound, then consistency is not likely to explain the visibility finding.

### 3.2.3. Between-subjects visibility analysis

Parallel evidence was again provided by a consensual visibility analysis and results were consistent with Study 1 (see Supplementary Materials). Identity predicted low-visibility behaviors,  $\beta = 0.17$ ,  $SE = 0.03$ ,  $p < 0.001$ , and high-visibility behaviors more strongly,  $\beta = 0.28$ ,  $SE = 0.04$ ,  $p < 0.001$ . In sum, the results across both analyses showed that environmental identity was more predictive of high-vs. low-visibility behaviors.

### 3.3. Discussion

Study 2 revealed the same main effect for identity and

interaction as Study 1 and the results are consistent with both identity expression and signaling processes. The “brown to keep down” effect was seen again: visibility led to fewer behaviors especially for anti-environmentalists. Study 2 included several changes that increase confidence in the results. First, the words “climate change” were removed to avoid activation of additional group memberships (i.e., political identity). Second, a new visibility measure was used to test for convergent results across operationalizations by reducing shared method variance. Third, the potential confound of effectiveness was ruled out, and this also suggests that identity consistency does not explain the visibility moderation.

Studies 1 & 2 used the same population (MTurk) and one question is whether the results would generalize to other populations. One finding that stood out from Studies 1 & 2 was the main effect of visibility: participants reported less pro-environmental behavior when highly visible. Environmentalists are widely disliked in the United States, but also associated with positive traits such as caring, intelligent, and helpful (Bashir et al., 2013). Whether visibility leads to more or less pro-environmental behavior may depend on additional factors such as community attitudes about environmentalists. To provide a new sample population and test for convergent validity, for Study 3 recruitment we used the survey firm Nielsen, who maintains and actively manages participant panels. The Study 3 sample was distinct from Studies 1 & 2 on several factors: for example, they were older and more affluent.

## 4. Study 3

The main goals of Study 3 were to test the identity  $\times$  visibility interaction in a different population and to include new attitude and personality measures to evaluate further potential confounds for the identity effect. In one study, priming college students to think of social status increased their preference for eco-friendly vs. luxury goods (Griskevicius et al., 2010), so the need for status was measured below as a personality trait to evaluate whether the need for status predicts a wide range of pro-environmental behaviors, or explains the effects of visibility on behavior. Next, we included new constructs to test for the discriminant validity of identity. First, we assessed personal and local attitudes about environmentalists. Second, we included a validated environmental attitudes scale to improve on the abbreviated and unvalidated measure in Study 1 (Dunlap et al., 2000).

### 4.1. Method

#### 4.1.1. Participants and procedure

Participants were sourced through the survey firm Nielsen. 76 incomplete surveys were excluded prior to hypothesis testing and the final sample contained 437 participants, 51.5% female, 48.5% male; 74.7% White/Caucasian, 10.8% Black/African-American, 3.0% Asian/Asian-American, 8.2% Hispanic/Latino, and 3.2% Other; age  $M (SD) = 48.4 (17.4)$  years. Participants gave informed consent, were compensated with loyalty points and airline miles, and were debriefed after the study.

#### 4.1.2. Measures

Measures were identical to Study 2 except where noted below.

**4.1.2.1. Attitudes about environmentalists.** Two pairs of items were intended to gauge attitudes about environmentalists, rated 1 (*Dislike extremely*) to 7 (*Like extremely*). For the self: “In general, how much do you like environmentalists?” and “How much would you like to socialize with a typical environmentalist?” were highly related,  $r(433) = 0.82$ ,  $p < 0.001$ . For close others: “Think of the

<sup>4</sup> We thank these authors for kindly providing the data for this secondary analysis.

people you mostly interact with. In general, how much do the PEOPLE AROUND YOU like environmentalists?” and “Think of the people you mostly interact with. In general, how much would the PEOPLE AROUND YOU like to socialize with a typical environmentalist?” These two items were also highly related,  $r(433) = 0.84$ ,  $p < 0.001$ . Unexpectedly, the two pairs of items appeared to measure the same construct, Cronbach's  $\alpha$  of four items = 0.92. A principal components analysis showed that all four items loaded  $\geq 0.49$  onto a clear first factor explaining 81% of the variance, and to avoid collinearity the four items were combined into a single composite of attitudes about environmentalists.

#### 4.1.3. Need for social status

Four items were adapted from the HEXACO personality model (Ashton & Lee, 2007; Brick & Lewis, 2016; see [Supplementary Materials](#) for items).

**4.1.3.1. Environmental attitudes.** All 15 items from the New Ecological Paradigm scale (Dunlap et al., 2000) were combined into a composite, Cronbach's  $\alpha = 0.85$ .

**4.1.3.2. Behavior effectiveness.** We adapted the effectiveness instructions to focus more on helping the environment (compared to “climate change” in Study 2): “How effective is each behavior for helping the environment? Enter your best guess,” rated 1 (*Not at all effective*) to 7 (*Extremely effective*).

## 4.2. Results

### 4.2.1. Primary analyses

Self-reported recurring pro-environmental behavior was regressed onto key variables as in Studies 1 & 2, controlling for difficulty, effectiveness, environmental attitudes, political identity, need for social status, and key 2-way interactions. In contrast to Studies 1 & 2, visibility was positively associated with behaviors such that more visible behaviors were performed more often,  $\beta = 0.10$ ,  $SE = 0.01$ ,  $z(425) = 7.47$ ,  $p < 0.001$ .

As hypothesized, there was a significant interaction such the link between identity and behavior was moderated by visibility, showing the “green to be seen” effect,  $\beta = 0.03$ ,  $SE = 0.01$ ,  $z(425) = 2.47$ ,  $p = 0.01$ . Simple slopes indicated that identity drove behavior strongly when visibility was high, slope different from zero,  $\beta = 0.50$ ,  $SE = 0.02$ ,  $z(425) = 22.5$ ,  $p < 0.001$ , but there was no effect of identity on behavior when visibility was low, slope not different from zero,  $\beta = -0.03$ ,  $SE = 0.02$ ,  $z(425) = -1.48$ ,  $p = 0.14$ . Contrasts revealed that environmentalists (+1 SD) performed more high-than low-visibility behaviors,  $\beta = 0.72$ ,  $SE = 0.03$ ,  $z(425) = 28.0$ ,  $p < 0.001$ . Anti-environmentalists (-1 SD) also showed “green to be seen” effect, but more modestly,  $\beta = 0.10$ ,  $SE = 0.04$ ,  $z(425) = 2.98$ ,  $p = 0.003$  (see [Fig. 5](#) and [Table 3](#)).

As in Studies 1 & 2, the inclusion of the competing and collinear predictors of environmental attitudes, climate change beliefs, and political identity in separate linear regression did not change the pattern of results above, and none of these variables yielded a significant main effect. See [Supplementary Materials](#) for means, standard deviations, scale reliabilities, and zero-order correlations.

Positive attitudes about environmentalists were highly related to environmentalist identity,  $r(435) = 0.66$ ,  $p < 0.001$ , and moderately to behavior,  $r(435) = 0.34$ ,  $p < 0.001$ . We repeated the main multi-level regression in the manner of a hierarchical linear regression with a new 2-way interaction added in Step 2: visibility  $\times$  attitudes about environmentalists. If attitudes were a key component of the visibility effect, we would expect the identity  $\times$  visibility interaction to weaken in Step 2. However, identity  $\times$  visibility was unchanged in Step 2,  $z = 3.66$  (Step 1) vs.

3.64 (Step 2), both  $ps < 0.001$ . The visibility  $\times$  attitudes about environmentalists 2-way interaction was not significant,  $\beta = -0.02$ ,  $SE = 0.02$ ,  $z(425) = -1.22$ ,  $p = 0.22$ .

### 4.2.2. Between-subjects visibility analysis

This secondary analysis again revealed parallel effects. Composites of behavior frequency were again created from four-item quintiles with the highest and lowest visibility across subjects (high: bags, highway speed, recycling in public, and water bottle; low: air travel [reversed], composting, dairy consumption [reversed], and aerosol use [reversed]). Separate regressions predicted high- and low-visibility behavior from identity, using the same covariates as above. Identity did not predict low-visibility behaviors,  $\beta = 0.05$ ,  $SE = 0.03$ ,  $p = 0.15$ , but identity did predict high-visibility behaviors,  $\beta = 0.36$ ,  $SE = 0.04$ ,  $p < 0.001$ . This pattern is consistent with the primary analysis and provides convergent validity that visibility moderated the effect of identity.

## 4.3. Discussion

Consistent with Studies 1 & 2, visibility strengthened the relationship between identity and behavior accounting for additional competing predictors and using a new study population. Overall, the visibility interaction pattern across studies consistently supports the identity signaling hypotheses. However, unlike Studies 1 and 2, “green to be seen” was observed in Study 3: individuals reported more pro-environmental behavior when those actions were visible to other people. As hypothesized, this was especially true of environmentalists.

We evaluated multiple explanations for the difference in identity moderation contrasts between Studies 1 & 2 and Study 3. One potential explanation for this change in the main effect of visibility from negative in the first two studies to positive in the third is a demographic difference between the sample populations. One possibility is that socioeconomic status accounts for the change in the visibility effect. The Study 3 sample reported higher income than Studies 1 & 2 by ~\$8,000,  $p < 0.03$ . Individuals higher in SES may have more opportunity to align pro-environmental values and identities to behavior, perhaps because their behaviors are less constrained by other factors such as cost and time pressure, something explored in recent research (Eom, Kim, & Sherman, 2017).

A second possible explanation is based on the observation that the Study 3 sample is older than in Studies 1 & 2: mean age in Study 3 was 48.4 years, which is nearly 2SD higher than the mean in Study 1 or 2. Age positively predicts pro-environmental behavior across several samples including activists and non-activists (Olli, Grendstad, & Wollebaek, 2001). Age may lead people to focus more on intergenerational factors and stewardship (for discussion, see Wright & Lund, 2000). Indeed, recent experimental research shows that emphasizing legacy may lead to greater pro-environmental behaviors, and this may partially explain age differences in pro-environmental behavior (Zaval, Markowitz, & Weber, 2015). Although we did not obtain conclusive evidence to support the hypotheses that income or age is driving the different visibility contrasts across samples, future work could profit by exploring these and other demographic factors and how they interact with visibility to affect pro-environmental behavior.

## 5. General discussion

The results across all three studies support both identity consistency and identity signaling models. Environmentalist identity was associated with more pro-environmental behavior (identity consistency), and visibility predicted how much identity was

associated with behavior (identity signaling). In three correlational studies with a wide set of competing predictors, both individual (e.g., attitudes, political orientation) and contextual (e.g., difficulty, effectiveness) helped to rule out potential confounds.

The current paper helps clarify recent findings where individuals appear to act against their economic self-interest. Farmers avoid profitable organic techniques because those practices signal unwanted group memberships (“brown to keep down”; Press et al., 2014). Liberals pay a premium for a distinctive hybrid car shape because ownership signals their valued group memberships (“green to be seen”; Sexton & Sexton, 2011). However, the impact of visibility is likely to vary widely across contexts, just as we found different effects of visibility in different populations. A new hypothesis based on this heterogeneity is that when there is an overall negative view of environmentalists, brown to keep down may be more likely, whereas when there is an overall positive view of environmentalists, green to be seen may be more likely. However, in the current set of studies this moderation was not observed. Attitudes about environmentalists can be measured explicitly (Bashir et al., 2013) or implicitly, for example based on a reaction-time task (Brick & Lai, 2017). The contextual moderation of visibility effects is a promising area for future research.

A greater understanding of how valued identities interact with social visibility could shed light on other issues relevant to pro-environmental behavior. For example, visibility might determine whether these individuals will also engage in other pro-environmental behaviors such as composting at home, conserving water, or supporting pro-environmental policies (behavioral spillover). Environmental identity is associated with positive spillover (Truelove, Carrico, Weber, Raimi, & Vandenberg, 2014), such that environmentalists who perform one type of pro-environmental behavior are more likely to also perform other types than anti-environmentalists. Because the current results show that environmentalists especially perform visible behaviors, positive spillover may occur more often for visible behaviors.

It is instructive to compare the relative effect sizes for environmentalist identity and political identity as individual difference factors that predict pro-environmental behavior. Earlier research on identity signaling and pro-environmental behavior focused on political identity (Gromet et al., 2013; Sexton & Sexton, 2011). Political identity has several advantages for researchers: it is a powerful predictor of a wide range of attitudes, beliefs, and behaviors, and it is widely measured and therefore easier to use in targeted interventions. However, political identity as either liberal/conservative or Democrat/Republican is difficult to extend conceptually or methodologically from the United States to other countries.

Environmental identity was more predictive of pro-environmental behavior than political identity across all studies. When these variables were entered simultaneously in the main analyses across Studies 1–3, the range of the effect of environmental identity on behavior was standardized beta 0.17–0.22,  $ps < 0.001$ , and the range of political identity was 0.00–0.04,  $ps$  not significant. Environmentalism also revealed interactions with visibility that were not found for political identity, likely because environmentalism is conceptually linked with the diverse pro-environmental behaviors. Certain iconic behaviors like owning a Prius® may be tightly associated with liberalism, but the results suggest that liberalism is a weaker predictor of repeated, daily behaviors such as conserving water.

### 5.1. Implications for environmental interventions

Our results show that anti-environmentalists do behave in ways that help the environment, especially in private. Anti-

environmentalists' modal frequency for low-visibility behaviors was “Sometimes”. Therefore, interventions for anti-environmentalists or the general public may be more effective when targeting private behaviors, since anti-environmentalists may be particularly motivated to avoid public pro-environmental behaviors. Similarly, these results show that environmentalists are more likely to engage in public pro-environmental behaviors, and therefore interventions targeted at environmentalists should consider focusing on high-visibility behaviors that environmentalists are already motivated to adopt but have room to improve, such as reducing personal air travel.

These findings also have relevance to public appeals for pro-environmental or sustainable behavior. Decades of public appeals to increase environmental values and boost environmental actions have resulted in pro-environmental behaviors being paired with social groups, for example through imagery of green leaves, the planet, or the word organic. Unfortunately, anti-environmentalists may avoid these behaviors, even ones they would otherwise choose, when those actions carry an unwanted identity. Thus, we advise caution in associating target behaviors with identities when designing environmental messages, product labels, or appeals to action. Finally, there may be more opportunity to improve pro-environmental behavior by de-emphasizing visibility in campaigns directed at non-environmentalists. For example, when attempting to market reusable bags to a new user, a company might choose not to print images of the earth or an organic logo on the bag, since these images are associated with environmentalists.

### 5.2. Future directions

These correlational designs have inherent strengths and limitations. Compared to laboratory manipulations of a single action directed at a specific audience, the current studies have better ecological validity for visibility and self-reported pro-environmental behavior, but possibly worse internal validity because a third factor other than visibility could be driving the key interactions. This concern was mitigated by measuring a wide range of potential confounds: difficulty, effectiveness, environmental attitudes, climate change beliefs, political identity, attitudes about environmentalists, need for social status, and demographics. The key interaction pattern was robust not only when controlling for these main effects, but also when controlling for their interactions with visibility. Nevertheless, an unmeasured third variable could still be driving the effects, and we recommend caution before inferring causality from these correlational designs. The importance of visibility for behavior is supported by existing research on prosociality, e.g., cooperation with public goods (Yoeli, Hoffman, Rand, & Nowak, 2013). In that large field study, 1408 customers of a public utility took part in a public goods game. Being observed led to socially approved behaviors, and this effect was accounted for by reputation concerns. Those results provide causal support that visibility leads to prosocial behaviors.

A second issue pertains to the operationalization of visibility as being observable by others in general, and not by a specific social group (e.g., family). The ideographic measurement of visibility makes no assumptions about the target of the identity signaling. This has the advantage of capturing signaling across multiple contexts (i.e., work, home, and public), and measuring social visibility broadly provides a stringent test of the identity-signaling hypothesis because it doesn't target the most personally important social groups for signaling. However, there may be critical groups to which individuals especially signal, and this is an important area for future research. For example, research in economics suggests that neighbors are a salient outgroup. In one recent study, the neighbors of lottery winners made new, visible

purchases (e.g., cars) but made no changes to less visible financial decisions (Agarwal, Mikhed, & Scholnick, 2016). These neighbors likely prioritized visible status behaviors as a means to maintain social status. Identity signaling may also be stronger when behaviors are visible to high-status individuals.

A third issue is that pro-environmental behavior was self-reported (Kormos & Gifford, 2014). It could be that individuals shaped their behavior responses towards a perceived correct answer. Although individual differences in social desirability do not predict self-reported pro-environmental behavior (Milfont, 2008), we attempted to reduce social desirability by keeping the materials value-neutral to avoid an injunctive norm, and by obscuring the goal of the research.

Self-reported behavior also depends on introspective accuracy (Nisbett & Wilson, 1977; Wilson & Dunn, 2004). A recent meta-analysis appropriately highlights the absence of work that measures self-report and objective pro-environmental behavior simultaneously (Kormos & Gifford, 2014). Subjective and objective measures had substantial overlap,  $r(17) = 0.46$ , suggesting that self-reported pro-environmental behaviors have construct validity, yet majority of the variance in objective behaviors remains unexplained. It is unclear how much this estimate applies to the current studies because the operationalization of behavior differs greatly across the meta-analysis. For example, individuals are wildly inaccurate when reporting water usage from common activities (Attari, 2014), yet they may be more accurate when reporting behavior frequency such as number and duration of showers per day, because no specialized knowledge is necessary such as how many gallons are used in a five-minute shower. The items in the Recurring Pro-environmental Behavior Scale were based on this frequency approach in order to improve accuracy, and therefore the new scale is expected to correlate with objective measures relatively highly compared to earlier self-report measures. Measuring objective/subjective agreement remains an important area for future research.

It is unknown whether these identity effects on pro-environmental behavior will generalize to other cultures and nations. The literature on environmental identity signaling and current studies both rely on Western and W.E.I.R.D. samples (Henrich, Heine, & Norenzayan, 2010). A recent paper challenges the universality of the assumption that beliefs strongly predict pro-environmental behavior by showing that the relationship between environmental beliefs and behaviors varies widely by country and that social norms better explain pro-environmental behavior in collectivistic countries such as Japan (Eom et al., 2016; Kashima, Siegal, Tanaka, & Kashima, 1992; Savani, Markus, & Conner, 2008; Savani, Markus, Naidu, Kumar, & Berlia, 2010). Broadly, these findings reinforce the importance of a cultural perspective, especially when that approach can yield culturally targeted messages that are more effective due to a match between the message content and the target population (Brick et al., 2016). Indeed, the heterogeneity we observed across our samples in the effects of visibility may be due to contextual differences between the samples based on factors such as age, occupation, or socio-economic status.

Last, the current environmentalist identity measure blurs two groups at the low end and future research would profit by disentangling them (Kashima et al., 2014; van der Werff, Steg, & Kaizer, 2013). Some individuals low in identity are disengaged and indifferent (non-environmentalists), and others actively oppose conservation (e.g., individuals who define themselves in opposition; anti-environmentalists), and these groups may react differently to visibility. We expect anti-environmentalists will vary their behavior more by visibility than disengaged non-environmentalists, because anti-environmentalists are the most motivated to avoid the social

label. Because of this overlap, the above results may actually underestimate the “brown to keep down” effect among anti-environmentalists.

The present studies also raise several theoretical questions that guide future research. One key question is to investigate the precise motivational processes account for the effect of social identity, such as self-verification vs. self-enhancement (Kwang & Swann, 2010). A second question is to measure actual reputational consequences of high- and low-visibility actions, and verify whether strategic behaviors to manage reputation are effective at bolstering positive self-regard and improving social reputation.

### 5.3. Conclusion

Increasing pro-environmental behaviors such as conserving energy and water would bring massive public benefits (Carrico, Vandenberg, Stern, & Dietz, 2015; Dietz et al., 2009). The physical sciences have reached substantial consensus on best practices for managing natural resources and ecologies, and the main obstacle is now changing individual behavior and policy opinions. United States citizens recognize that environmental problems are serious (Leiserowitz, Maibach, Roser-Renouf, Feinberg, & Howe, 2012), but there is a striking lack of voluntary behavior change (Gardner & Stern, 2008).

We investigated this gap and described how identity and visibility combine to predict pro-environmental behavior. Anti-environmentalists do less pro-environmental behavior when being watched (Studies 1 & 2), and environmentalists do more pro-environmental behavior when watched (Study 3). This pattern can help explain the puzzling findings mentioned above. When individuals do not wish to be seen as environmentalists, they may strategically avoid pro-environmental behaviors. The interaction of identity and visibility holds promise for improving our understanding of why individuals seek out and avoid pro-environmental behaviors.

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### Appendix A. Supplementary data

Supplementary data related to this article can be found at <http://dx.doi.org/10.1016/j.jenvp.2017.04.004>.

### Appendix

#### Recurring Pro-environmental Behavior Scale (REBS)

“Now, please respond to these questions about your behavior. Don't feel any pressure, just indicate what you choose to do.” Items are rated 1 (*Never*), 2 (*Rarely*), 3 (*Sometimes*), 4 (*Often*) or 5 (*Always*). Cronbach's  $\alpha$ s = 0.82–0.87 (Studies 1–3, total  $N = 1143$ ). See [Supplementary Materials](#) for scale development.

1. When you visit the grocery store, how often do you use reusable bags?
2. How often do you walk, bicycle, carpool, or take public transportation instead of driving a vehicle by yourself?
3. How often do you drive slower than 60mph on the highway?
4. How often do you go on personal (non-business) air travel?

5. How often do you compost your household food garbage?
6. How often do you eat meat?
7. How often do you eat dairy products such as milk, cheese, eggs, or yogurt?
8. How often do you eat organic food?
9. How often do you eat local food (produced within 100 miles)?
10. How often do you eat from a home vegetable garden (during the growing season)?
11. How often do you turn your personal electronics off or in low-power mode when not in use?
12. When you buy light bulbs, how often do you buy high efficiency compact fluorescent (CFL) or LED bulbs?
13. How often do you act to conserve water, when showering, cleaning clothes, dishes, watering plants, or other uses?
14. How often do you use aerosol products?
15. When you are in PUBLIC, how often do you sort trash into the recycling?
16. When you are in PRIVATE, how often do you sort trash into the recycling?
17. How often do you discuss environmental topics, either in person or with online posts (Facebook, Twitter, etc.)?
18. When you buy clothing, how often is it from environmentally friendly brands?
19. How often do you carry a reusable water bottle?
20. How often do you engage in political action or activism related to protecting the environment?
21. How often do you educate yourself about the environment?

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