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Conditioned stereotypes and social sanctioning: A neural network analysis of environmental behavior in Spain

Estereotipos y sanción social condicionada: Un análisis mediante redes neuronales del comportamiento ambiental en España

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KEYWORDS

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Environmental Behavior
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ABSTRACT

Although environmental sustainability is widely endorsed as a social norm, engaging in everyday environmental behaviors can still entail social costs. Previous research has mainly examined the stigmatization of radical environmental activists, paying limited attention to whether similar social penalties affect mainstream individuals who adopt routine environmental practices. Addressing this gap, we shift the analytical focus from the environmental actor to the observer, examining how sociodemographic identity traits and informational environments shape the social evaluation of individuals performing everyday environmental behavior in Spain. Methodologically, the study draws on survey data from 1,864 respondents and combines regression analyses with interpretable neural networks. The results show that mainstream green individuals are, on average, socially evaluated positively; however, social validation is conditional and unevenly distributed. Negative stereotype attribution varies across observer profiles defined by gender, age, and social class. The social normalization of sustainability is strongest among middle-income and older observers, although exposure to digital information environments is associated with smaller generational differences in stereotype attribution. Overall, the findings indicate that the social acceptance of everyday sustainability varies according to the observer's identity and informational context, highlighting how social evaluation processes contribute to the uneven normalization of sustainable lifestyles.

PALABRAS CLAVE

Estereotipos
Comportamiento ambiental
Identidad del observador
Evaluación social
Redes neuronales

RESUMEN

Aunque la sostenibilidad ambiental se ha consolidado como una norma social ampliamente compartida, la adopción de comportamientos ambientales cotidianos puede seguir implicando costes sociales. La investigación previa se ha centrado principalmente en la estigmatización del activismo ambiental radical, prestando menor atención a si estas sanciones sociales también afectan a personas que realizan prácticas ambientales convencionales. Para abordar este vacío, el presente estudio desplaza el foco analítico del actor ambiental al observador y analiza cómo los rasgos sociodemográficos y los entornos informativos influyen en la evaluación social del comportamiento ambiental cotidiano en España. Metodológicamente, el estudio se basa en una encuesta a 1,864 personas y combina análisis de regresión con redes neuronales interpretables. Los resultados muestran que, en general, los individuos verdes convencionales son evaluados socialmente de forma positiva; sin embargo, la validación social es condicionada. La atribución de estereotipos negativos varía según el perfil del observador incluyendo el género, la edad y la clase social. Los participantes de ingresos medios y de mayor edad presentaron una mayor normalización social de la sostenibilidad, aunque la exposición a información digital sobre sostenibilidad se asocia con menores diferencias generacionales. En conjunto, los hallazgos indican que la aceptación social de la sostenibilidad cotidiana varía en función de la identidad del observador y de su contexto informativo, poniendo de relieve cómo los procesos de evaluación social contribuyen a una normalización desigual de los estilos de vida sostenibles.

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1. Introduction

Environmental sustainability has been established as a normative imperative, driving a global push towards the normalization of pro-environmental behaviors (PEBs) (Zíka et al., 2025). However, despite widespread aspirations to address climate change and the increasing visibility of the green discourse, a persistent dissonance, known in the literature as the green gap, remains between declared positive attitudes and actual behavior (Wittenberg, 2023; Zíka et al., 2025). This failure to translate intention into action extends beyond structural barriers such as affordability or information deficits since those factors cannot explain why individuals reject sustainability even when it is functionally accessible (de Matos et al., 2025; Gifford, 2011; Kollmuss & Agyeman, 2002). This pattern suggests that psychological barriers, including the social dimension of performing PEBs, also influence sustainability-related decisions (Acuti et al., 2022; Besalú et al., 2025). PEBs often function as public signals subject to scrutiny, and individuals frequently avoid them to avert social stigma or protect their group identity (Howard, 2023; Seyfi et al., 2025). Consequently, the anticipation of social judgment acts as a deterrent, inhibiting the widespread adoption of sustainable actions (Miller et al., 2025; Minson & Monin, 2012).

In Spain, environmental awareness has become a standard, with nearly 70% of citizens prioritizing climate action and aspiring to an eco-friendly lifestyle (PwC & Uncommon, 2022). However, the previously mentioned gap remains. For example, recent data shows that 95% of young Spaniards still struggle to translate their concerns into a sustainable lifestyle (Fad Juventud, 2024), and the nation's circularity rate remains at 8.5%, lagging behind the EU average (European Union, 2025). This disconnect is influenced by social signaling, as people often frame practices such as organic consumption as elite, and approximately 13% of the Spanish population adopts PEBs for status recognition (PwC & Uncommon, 2022). Furthermore, the increase in ideological polarization has divided perceptions of ecological measures. Some view them as necessary, others reject them as undesirable threats to current lifestyles, perceiving environmental regulations as barriers to personal freedom and traditional habits (Catena-Fernández & Fernández., 2025; Besalú et al., 2025). When people perceive PEBs as markers of a specific group identity, whether elite or ideological, individuals may reject them to avoid social friction and protect their own social identity (Geiger et al., 2020). Negative stereotyping of environmentally engaged individuals has been consistently documented (Bashir et al., 2013; Brough et al., 2016), with recent evidence showing that these perceptions persist (Kibele et al., 2023; Köhler et al., 2025). Consequently, the Spanish citizen adopting sustainable habits risks associations with negative stereotypes that can trigger active social penalization and inhibit widespread adoption.

While the fear of social stigmatization of performing PEBs is a barrier for the general population, academic literature has disproportionately focused on the figure of the environmental activist, a profile often laden with negative connotations of militancy or eccentricity (Bashir et al., 2013; Köhler et al., 2025; Raynaud et al., 2024). This emphasis on radical environmental profiles has partially overshadowed the profile of the mainstream green individual, whom we refer to in this study as an ordinary citizen who engages in PEBs such as recycling, water conservation, or green purchasing and who integrates these practices into a conventional lifestyle rather than a political identity (Nascimento & Loureiro, 2024; Stern, 2000). Although these everyday PEBs are distinct from activism, negative evaluations associated with radical environmental actors may nonetheless extend to mainstream citizens who adopt similar practices, exposing them to social sanctions (Acuti et al., 2022; Bolderdijk & Cornelissen, 2022; Pryor et al., 2012).

Moreover, although prior research has extensively analyzed the content of these stereotypes and their consequences for green individuals, it has largely neglected the source of judgment: the observer. By neglecting the profile of the perceiver, previous studies have limited our understanding of why performing the same green behavior is socially accepted by some but rejected by others. This omission matters because perception is not a neutral process, but a symbolic construction filtered through the observer's own identity and social environment (Fielding & Hornsey, 2016), where stigma derived from stereotypes is deployed as a defense mechanism to protect the observer's group identity from perceived threats (Minson & Monin, 2012). Thus, identifying the penalizing observer profile is important to move beyond merely acknowledging

that social risks exist to understanding who enforces them. This shift enables us to map the unequal landscape of the ecological transition, by showing how specific social groups actively police the behavior of others to ensure group conformity, constructing eco-friendly lifestyles as a socially validated privilege for some while remaining socially risky and reputationally costly for others (Catena-Fernández & Fernández, 2025; Pearson & Schuldt, 2018). This perspective is grounded in Social Identity Theory (SIT; Tajfel & Turner, 1979; Tajfel, 2010) which provides the main theoretical framework of this study.

Literature about green stereotypes also presents methodological limitations. Quantitative research, including experimental survey designs and experiments, has been effective at identifying the universal dimensions of stereotype content ascribed to green individuals (e.g., Li et al., 2023) and the role of sustainable products as signals of social status and altruistic commitment (Borau et al., 2021). However, these approaches often fail to discern the complex heterogeneity across diverse subpopulations or the specific social groups that attribute stereotypes based on intersecting identity markers (Kibele et al., 2023). This limitation arises because existing research has predominantly focused on investigating the content of the stereotypes of radical activists (e.g., Li et al., 2023), the psychological barriers created by the green-feminine stereotype and its impact on gender-identity maintenance (Brough et al., 2016; Otterbring., 2023), or the impact of those perception in self-reported intentions to perform PEBs (Zíka et al., 2025). Consequently, there is a need for more suitable analytical approaches to detect heterogeneity and complex patterns among subpopulations, enabling the identification of non-linear and multidimensional interactions in stereotype attribution. Such approaches will help us to understand which social segments are more likely to validate or, conversely, hinder the social normalization of everyday PEBs.

To address these gaps, we focus on heterogeneity across observer profiles; methodologically, we use an interpretable machine learning step as a diagnostic to inform inferential models. We apply Interpretable Neural Networks (NNs) (NeuralSens; Pizarroso et al., 2022) to disentangle how the interplay of sociodemographic identity traits of the observer—specifically socioeconomic status (Pearson & Schuldt, 2018), gender (Otterbring., 2023) and age (Besalú et al., 2025); as well as the informational channels individuals use to gather information about sustainability (Ghorbani & Xuan, 2018) configure the social lens through which observers perceive the mainstream green individual. In doing so, the present study provides a more nuanced understanding of the social barriers to sustainable lifestyles, and it provides empirically grounded insights that can inform the design of more socially sensitive public policies and communication strategies to enhance the social legitimization of PEBs.

1.1. Stereotype attribution to green individuals

Stereotypes are not neutral descriptions, but cognitive constructions that simplify reality and often offer a distorted view of a social category (Hilton & von Hippel, 1996). Previous research on stereotypes associated with green individuals has revealed a range of positive and negative labels held by the general public (Kibele et al., 2023; Köhler et al., 2025). Positive portrayals include being principled or trustworthy, and those are linked to the increase of PEBs and environmental policy preferences (Kibele et al., 2023). In the same vein, the prevailing negative associations act as a psychological barrier, dissuading the general population from affiliating with the environmental movement due to the fear of social rejection (Kibele et al., 2023). This social rejection manifests as active social penalties enforced by the observer, ranging from interpersonal ridicule and social exclusion to professional discrimination (Brock et al., 2022; Howard, 2023). Often, Social resistance helps observers manage discomfort triggered by others' more principled behavior and justify their own inaction (Bolderdijk & Cornelissen, 2022; Minson & Monin, 2012). The negative stereotypes depict environmental activists as radical or extreme, morally judgmental, and socially disruptive, framing them as confrontational actors whose demands threaten everyday lifestyles and social order (Raynaud et al., 2024; Żuk, 2023).

However, social penalties derived from negative stereotypes may not be exclusive to those assuming a more radical green identity. Drawing on research on stigma-by-association, negative

evaluations can be transferred to individuals based on shared behaviors, such that individuals connected to a group defined by particular traits or actions are judged based on those associations even when they are not formal members (Moss-Racusin et al., 2024; Pryor et al., 2012). Consequently, it is plausible that mainstream citizens adopting everyday PEBs such as green consumption or recycling, also face the risk of being miscategorized under the negative stereotypes associated with radical environmentalists and suffering the same social penalties (Swim et al., 2019; Whitmarsh et al., 2025).

Importantly, the stereotype attribution process is neither automatic nor universal; rather, it is contingent upon the observer's perspective (Blair, 2002; Kelley & Michela, 1980; Hogg & Reid, 2006). According to SIT (Tajfel & Turner, 1979; Tajfel, 2010), individuals evaluate others through comparison processes aimed at favoring their in-group to protect their self-concept. Thus, the penalty is not only a reaction to moral discomfort but also an identity-based defense mechanism (Zane et al., 2016). If environmentalism is perceived as a threat to the observer's in-group norms, for example, by appearing elitist or unmanly, the observer may penalize the individual to reaffirm their own identity and maintain distance from a dissociative out-group (Catena-Fernández & Fernández., 2025; Brough et al., 2016; Kibele et al., 2023). Therefore, by studying the observer profile, we can confirm if specific groups, such as men or working-class individuals, use negative stereotypes against green individuals to distance themselves from a feminine or elitist image (Otterbring, 2023).

1.2. Sociodemographic factors

Social perception often draws on stereotypes and encompasses features, norms, and behaviors associated with a social category (Hogg & Reid, 2006; Tajfel & Turner, 1979). Research consistently characterizes the stereotypes of environmentalists mapped onto specific demographic traits: femininity (Brough et al., 2016), high socioeconomic status (Pearson & Schuldt, 2018), and youth (Farinha & Rosa., 2022). Since observers perceive in part green individuals through the lens of these specific stereotypes, their evaluation is inherently biased by the interaction between these traits and their own demographic position (Kibele et al., 2023; Pinna, 2020). Consequently, the degree of alignment—or perceived discrepancy—between the observer's own identity and the stereotypes plays a role in social judgment (Kibele et al., 2023; Tajfel & Turner, 1979). Therefore, as the observer's profile diverges from these stereotypical traits, the green individual would be increasingly categorized as a dissociative out-group, potentially triggering identity-protective mechanisms such as social rejection to neutralize moral discomfort or refusing to adopt PEBs to avoid being associated with undesirable out-group (Bashir et al., 2013; Catena-Fernández & Fernández., 2025., Köhler et al., 2025; Minson & Monin, 2012).

In Spain, organic products and sustainable alternatives often carry a premium price (PwC & Uncommon, 2022). Therefore, this economic reality creates a symbolic association between sustainability and privilege, reinforcing the stereotypical image of green individuals as highly educated (Kibele et al., 2023). This framing depicts the performance of PEBs not as acts of civic responsibility, but as conspicuous signals of economic capital and social posturing (Greenebaum, 2018; Griskevicius et al., 2010). Consequently, to distance themselves from this out-of-touch figure (King et al., 2019; Raynaud et al., 2024), observers may penalize green individuals by attributing negative traits and, perceiving them as unconcerned with the economic struggles of the working class (Brock et al., 2022), and interpreting their perceived moral superiority and judgmental attitude as an attack on the majority's way of life (Minson & Monin, 2012; Żuk, 2023). In the same vein, literature suggests that high-income individuals engage in PEBs as a form of conspicuous consumption, signaling both their prosocial intent and their ability to incur high financial costs to affirm their standing within privileged circles (Acuti et al., 2022; Greenebaum, 2018; Li et al., 2023). Rather than viewing these behaviors as pretentious, high-status observers may attribute positive stereotypes to green individuals, perceiving them as cultured or efficient, acknowledging the competence required to manage the perceived financial resources these behaviors demand (Li et al., 2023). Therefore, for this social group, green behaviors serve as a tool for in-group

validation, where individuals reinforce their collective identity through shared markers of prestige (Kibele et al., 2023; Uren et al., 2019).

Parallel to class dynamics, the well-established green-feminine stereotype introduces a gendered asymmetry in the identity implications and social costs of PEBs (Brough et al., 2016; Swim et al., 2019; Otterbring, 2023). This stereotype stems from how cultures traditionally associate environmentalism with feminine-coded traits, specifically, the care and nurturing of the environment, thereby situating environmentalism within the feminine role (Borau et al., 2021; Brough et al., 2016). Consequently, due to this cognitive linkage, women are consistently perceived as more typical environmentalists than men (Kibele et al., 2023). Following this, female observers would thus be likely to perceive PEBs as identity-consistent, facilitating social validation within their in-group and aligning with expected norms (Borau et al., 2021; Swim et al., 2019). In contrast, male observers may experience this feminine stereotype as a threat to their masculine identity, since men face greater social penalties for engaging in gender-inconsistent transgressions than women (Brough et al., 2016; Swim et al., 2019). Consequently, motivated by the desire to maintain their gender identity, men would be likely to react defensively by rejecting a perceived feminized out-group and become more prone to penalize green individuals in order to reassert traditional masculine norms (Brough et al., 2016; Otterbring, 2023; Swim et al., 2019).

Age dynamics introduce a tension between symbolic representation and the actual green behavior. For example, while market data in Spain indicates that older cohorts are the most intensive consumers of organic products (Ministerio de Agricultura, Pesca y Alimentación, 2024), the stereotypical green individual is perceived as young due to the visibility of youth-led activism and media narratives (Besalú et al., 2025; Fonseca & Castro, 2022). For young observers, this symbolic alignment may foster in-group validation; they tend to rate green individuals more favorably, with higher levels of friendliness and recognizing a shared concern and social identity (Farinha & Rosa, 2022). Conversely, despite their sustainable habits, older observers often dissociate from the green label, and they are likely to penalize this green figure, viewing the stereotyped young activist as incompetent by lacking the practical experience to address complex issues or careless regarding the stability and traditions valued by older generations (Farinha & Rosa, 2022). By doing so, they distance themselves from a perceived performative identity, framing their own behavior as a quiet civic duty (Howard, 2023; Uren et al., 2019).

The defensive motivation to protect social identity is likely to be exacerbated when the observer's identity conflicts across multiple dimensions (Kibele et al., 2023; Shapiro & Neuberg, 2007). For example, for an older, low socioeconomic status man, the green individual may represent a simultaneous threat to class, gender, and generational standing, increasing the likelihood of derogating the target and avoiding PEBs to prevent identity misalignment (Brock et al., 2022; Otterbring, 2023; Swim et al., 2019). However, this multidimensional threat does not derive solely from identity-demographic traits; instead, informational ecosystems actively construct it by defining what these identities signify since the symbolic environments in which individuals live reinforce social expectations (Besalú et al., 2025; Gerbner & Gross, 1986; Hansen, 2018; Salancik & Pfeffer, 1978). Recent research on hybrid communication environments further suggests that social evaluation processes increasingly unfold across overlapping offline and online contexts, where norms, visibility, and identity cues are negotiated simultaneously (Barron San Blas et al., 2025). Therefore, understanding the observer's rejection of the green individual requires analyzing not only who the observer is but also how their specific informational exposure frames the green narrative that may (or may not) conflict with their social reality (Besalú et al., 2025; Entman, 1993; Geiger et al., 2020).

1.3. Information sources and media

Stereotype formation and attribution operate within a symbolic environment constructed in part by the informational channels that individuals inhabit (Hansen, 2018; Entman, 1993). These sources do not function as objective mirrors of reality; instead, they act as normative filters, shaping public discourse by selecting and amplifying specific narratives that establish the boundaries of legitimate

norms and behaviors (Lomas Martínez et al., 2025; Entman, 1993). This process operates through framing, whereby informational channels select certain aspects of a perceived reality and make them more salient to promote a specific evaluation (Gustafson et al., 2022; Mack et al., 2025). Over time, consistent exposure to these messages cultivates a perception of social reality that aligns with the specific representations found in each channel (Madriaza et al., 2025; Raynaud et al., 2024). Therefore, the consumption of distinct information sources may influence the repertoire the observer uses to categorize green individuals (Besalú et al., 2025). For example, green fictional characters in television series are often portrayed as eccentric and abnormal, reinforcing the perception of the green individual as socially deviant (Raynaud et al., 2024).

Traditional media frequently reinforce negative stereotypes that widen the social distance between the environmental movement and the general public (Bashir et al., 2013; Raynaud et al., 2024). Journalistic norms often prioritize conflict and spectacle over nuanced policy analysis (Mack et al., 2025), newspapers in some contexts frame environmental issues through political polarization (Besalú et al., 2025), and television amplifies this effect by focusing on the visual spectacle of disruptive protests (Hansen, 2018; Köhler et al., 2025). By disproportionately airing confrontational imagery, traditional media narratives solidify the stereotype of the militant activist, portraying environmentalism as inherently hostile or radical (Fielding & Hornsey, 2016; Köhler et al., 2025).

Simultaneously, the commercial landscape may reinforce these negative perceptions towards green individuals. Advertising promotes material acquisition as the standard for social success, implicitly framing the environmentalist's austerity as an eccentric deviation (Barnhart & Mish, 2017; Shrum, 2017). The pervasive issue of corporate greenwashing further compounds this symbolic exclusion (Koo & Loken, 2021; Moreno & Ruiz-Alba, 2021). The use of deceptive environmental claims fosters widespread consumer cynicism (Koo & Loken, 2021), which may spill over into the interpretation of individual actions. Consequently, observers are likely to decode individual PEBs as inauthentic virtue signaling, dismissing the individual as hypocritical or performative (Bolderdijk & Cornelissen, 2022; Sherif & Simon, 2025).

The contemporary information landscape further reinforces stereotypical interpretations of the green individuals (Arendt, 2023; Cinelli et al., 2021). Digital platforms and social media enable individuals to exert greater control over the messaging they consume, allowing them to tailor their exposure through personalized channels (Arendt, 2023). The echo chamber effect, a process in which algorithmic selection amplifies content consistent with users' prior views while filtering out contradictory information, promotes selective exposure and confirmation bias (Arendt, 2023; Cinelli et al., 2021). Therefore, for observers already inclined to attribute negative (positive) stereotypes toward green individuals, participation in digital spaces can trigger preference-based reinforcement, intensify existing negative (positive) interpretive patterns (Arendt, 2023; Allidina & Cunningham, 2021). This mechanism of selective reinforcement parallels the function of the family as the primary agent of socialization, which constitutes the microsystem that most influences an individual's value system (Kollmuss & Agyeman, 2002). Family acts as a trusted normative filter, transmitting intergenerational values that define acceptable behaviors and social order within a specific group (Alwuqaysi, 2025; Miller et al., 2025; Seyfi et al., 2025). Consequently, both digital algorithms and familial bonds serve to insulate the observer's worldview; by limiting exposure to counter-stereotypical information, these channels stabilize the attribution of specific traits to green individuals, reinforcing the observer's existing alignment or misalignment with the social image of the green individual (Allidina & Cunningham, 2021; Lausi, 2024).

1.4. Research objectives

The preceding literature review establishes that stereotype attribution toward green individuals is a socially constructed process affected by the observer's social identity and informational context. However, previous studies have extensively profiled the stereotypes associated with high-visibility environmental activists (Bashir et al., 2013; Kibele et al., 2023; Köhler et al., 2025); and they have overlooked whether these attributions transfer to mainstream green individuals performing

everyday PEBs. Furthermore, existing research offers limited insight into how specific sociodemographic configurations, such as the intersection of class, gender, or age, interact with informational environments to shape stereotypical attributions. Consequently, a gap remains in identifying which specific social segments penalize (validate) the mainstream green individual, thereby creating social barriers to (facilitating) the widespread normalization of sustainable lifestyles across all social strata.

We expect that observers whose identity configuration misaligns with the green individual stereotypes (e.g., male, lower-income, or older individuals) will be more prone to attribute negative stereotypes as defensive mechanism to protect their group identity and maintain social distinction (Minson & Monin, 2012; Tajfel & Turner, 1979). Regarding the informational environment, we anticipate a divergence based on the channel's logic: reliance on traditional media (TV, advertising, and press) is expected to reinforce negative stereotypes (Shrum, 2017; Raynaud et al., 2024). Conversely, the influence of digital channels and family networks is likely more nuanced. Since these channels function as reinforcing filters that amplify the user's prior views (Arendt, 2023; Cinelli et al., 2021), their impact is likely contingent on the observer's profile. However, given that online channels' content is also more used by younger cohorts (IAB, 2024), who tend to align with green values, we tentatively anticipate that they may facilitate the validation of the social image of the green individual, potentially fostering positive stereotype attribution by highlighting shared concerns rather than conflict (Elgaaied-Gambier & Mandler, 2021; Li et al., 2023)

This research has four main objectives:

1) To determine whether the negative stereotypes associated with radical environmental activism have generalized to the mainstream green individual in the Spanish context, or if individuals who perform everyday PEBs remain socially validated.
2) To determine if the observer's socioeconomic status, gender, and age correlate with stereotype attributions towards mainstream green individuals.
3) To identify if the use of different channels of sustainable information is related to positive and negative stereotype attribution towards the mainstream green individual.
4) Methodologically, to complement traditional linear modeling by using interpretable neural networks as a diagnostic tool to identify potential complex non-linear and heterogeneous patterns between stereotype attribution, demographic identity traits, and information-channel exposure.

By addressing these objectives, this study seeks to contribute to ongoing debates on the social dimensions of sustainability by documenting how social validation of everyday PEBs varies across demographic groups and informational contexts. Theoretically, by shifting the analytical focus from the radical environmental activist to the mainstream green individual, this study examines whether stigma-by-association extends to ordinary citizens engaging in routine PEBs. In doing so, we aim to identify which specific profiles operate as active barriers to the social acceptance of mainstream green individuals, thereby offering a more granular understanding of social resistance to everyday environmentalism. Methodologically, the combination of regression models and interpretable neural networks enables the detection of heterogeneous and non-linear patterns capturing the complexity inherent in social resistance to environmentalism (Besalú et al., 2025; Ciccia, 2025; Gkargkavouzi et al., 2019).

Practically, this study highlights the relevance of identity-based social validation processes for the design of sustainability communication strategies. Rather than relying on broad awareness campaigns, the findings suggest that communication efforts may benefit from framing everyday PEBs in ways that are less tightly associated with polarized identities and more aligned with values that resonate across social groups. Such approaches may help reduce social reactance and the perceived reputational costs associated with adopting sustainable practices, contributing to the positioning of sustainability as a more transversal social norm. In this sense, addressing these social

barriers may support a more inclusive sustainability transition, in which sustainable lifestyles are perceived as socially acceptable across different genders, class, and age groups.

2. Methodology

This study employs a quantitative, cross-sectional, and non-experimental research design to examine the relationship between observers' sociodemographic characteristics and their exposure to sustainability-related information sources, and how these factors are associated with stereotype attribution toward mainstream green individuals. The focus of the study is PEBs that are routine and accessible (e.g., recycling or conserving water) and that are increasingly integrated into daily life (Brick et al., 2017; Zíka et al., 2025).

The study groups the variables into three main blocks: stereotypes toward mainstream green individuals, sociodemographic identity-related traits, and sources of sustainability-related information. To establish a uniform baseline representation of the target individual for all respondents, the survey first presented participants with a set of everyday PEBs. These behaviors included: recycling and proper waste disposal; donating reusable items; giving away items that are no longer needed; reusing products; reusing products whenever possible; water conservation; household energy conservation (lighting and heating/cooling); reducing energy use from household appliances; energy-efficient appliance use; use of low-waste or zero-waste products; use of homemade or traditional cleaning products and use of ecological products. We employed this procedure to ensure that all participants evaluated a standardized mainstream profile, distinct from radical activism, before answering questions related to stereotypes and information sources.

The dependent variables consisted of a set of adjectives measuring stereotype content. We adapted the stereotype dimensions from related studies (Cuddy et al., 2008; Cuddy et al., 2007; Li et al., 2023). The selection included positive traits that reflected perceived altruism and high status (Borau et al., 2021; Griskevicius et al., 2010; Sherif & Simon., 2025), and negative traits reflecting deviance, lack of practicality, or militancy (Brock et al., 2022; De Groeve et al., 2021; Köhler et al., 2025). Positive and negative stereotype items were analyzed as separate evaluative dimensions. All items were measured using five-point Likert scale (1 = strongly disagree; 5 = strongly agree), introduced with the prompt: "When you think of a sustainable consumer, how do you imagine him/her?". An exploratory factor analysis supported a multidimensional structure for stereotype attribution, and the factor scores were used for subsequent analyses. We retained two evaluative factors: positive stereotypes (honest, cultured, sociable, efficient, athletic; $\alpha = .74$) and negative stereotypes (incompetent, lazy, cold, evil, careless; $\alpha = .88$).

The independent variables had two categories. First, sociodemographic identity-related traits included age (numeric), gender (male/female) and annual income which we measured on a 14-point ordinal scale (ranging from <15,000 EUR to >250,000 EUR). We included income as a continuous variable in the analysis. Second, we assessed sources of sustainability-related information using the question: "Where do you find information about sustainable habits?" This item generated six dichotomous variables (yes/no) corresponding to the channels identified in the literature review: internet, family, social media, advertising, newspapers, and television

Prior research indicates that social evaluations linked to identity processes often involve non-linearities and conditional patterns that linear models do not fully capture and that researchers may find difficult to hypothesize in advance (Ciccia, 2025; Gkargkavouzi et al., 2019). Accordingly, to capture the complexity inherent in social evaluations (Besalú et al., 2025; Ciccia, 2025) and answer recent calls for integrating machine learning into social science without sacrificing interpretability (Grimmer et al., 2021; Molnar et al., 2020), the analytical strategy employs both regression-based analyses with interpretable neural network models (Pizarroso et al., 2022). In addition, to overcome the limitations associated with black-box NNs and ensure transparency (Hassija et al., 2024), we employ NeuralSens. This post-hoc sensitivity analysis technique computes the partial derivatives of the model output with respect to each input variable at the observation level (Pizarroso et al., 2022). Following this hybrid analytical strategy successfully applied in recent social research, such as in the analysis of entrepreneurial perception

(Arroyo-Barriguete et al., 2023) or university dropout prediction (Ortiz-Lozano et al., 2024), this design leverages the capacity of NNs to detect complex non-linear patterns to inform and validate the specification of linear models.

2.1. Data collection and participants

We recruited Spanish residents through an online survey administered using the Toluna panel during December 2022. We collected a total of 2,720 responses. After excluding incomplete answers (n = 856), the final sample consisted of 1,864 valid cases. 50.75% of participants were women, with an average age of 40.51 years (SD = 15.17). Participants reported annual income, with the largest share concentrated in low-to-middle income brackets (€20,000–€29,999; 25.38%), close to the national average annual salary in Spain (€28,049; INE, 2025). Although the proportion of participants with a university degree (42.17%) is slightly higher than the national average (41%; INE, 2024), the sample reflects substantial diversity across key sociodemographic characteristics. Participation was voluntary and anonymous, and all respondents gave informed consent prior to participation.

2.2. Procedure: Analytical strategy

We performed statistical analyses using the R programming environment (R Core Team, 2020), utilizing standard packages such as dplyr (Wickham et al., 2022) or car (Fox & Weisberg, 2019) for data management and regression diagnostics, while we employed the NeuralSens package (Pizarroso et al., 2022) specifically for the neural network sensitivity analysis.

We first conducted a descriptive analysis and a comparison of means to examine differences in stereotype attribution as a function of sociodemographic and information-related variables (see Table 1). Normality tests indicated that the dependent variables did not follow a normal distribution. Accordingly, we used non-parametric tests (Mann–Whitney U) to assess group-level differences across categorical independent variables. To evaluate the magnitude of these differences beyond statistical significance, we calculated effect sizes (Cohen's d). Second, we adopted a hybrid analytical strategy combining theory-driven and data-driven approaches (Arroyo-Barriguete et al., 2023). This process consisted of three stages. A) We estimated an initial linear regression model to examine the baseline association between the participant's demographic profile and stereotype attribution. B) We estimated an interpretable neural network model. Unlike linear models that assume a constant effect for each predictor, NeuralSens computes local sensitivities (i.e., marginal slopes) for each observation, yielding a sensitivity distribution for every predictor. Sensitivity plots display these distributions: narrow distributions centered around zero indicate relatively homogeneous effects, whereas wider or multimodal distributions indicate heterogeneous effects across subpopulations. Variables exhibiting higher dispersion were therefore flagged for further inspection, as they suggest non-linear or conditional effects not captured by linear specifications. Three summary metrics were computed: Mean Sensitivity (MS), capturing the average direction of the effect; Sensitivity Standard Deviation (SSD), identifying potential non-linearities; and Mean Squared Sensitivity (MSS), ranking variable importance. C) Because NNs methodologies do not provide formal hypothesis testing or significance assessment, we applied the insights from the NN (interactions and non-linearities) to guide the functional specification of the corrected linear regression model allowing for formal statistical testing (Arroyo-Barriguete et al., 2023). Importantly, the NN analysis was not used to exhaustively test all possible interactions. Instead, we employed the NNs results to identify a limited set of theoretically plausible non-linearities and interactions, which then guided the specification of the corrected regression models.

3. Results

3.1. Descriptive results and bivariate differences

Descriptive statistics indicate that the mainstream green individual is, on average, perceived positively. Participants attributed significantly higher levels of positive stereotypes (M = 3.76, SD = 0.65) compared to negative stereotypes (M = 2.24, SD = 1.02) to the mainstream green

individual. However, the attribution of negative stereotypes exhibited considerably higher variability. Age and income were negatively associated with negative stereotype attribution, with older (ρ=-0.13, p<.001) and higher-income (ρ=-0.08, p<.001) participants reporting slightly lower levels of negative stereotypes.

The bivariate analysis (Table 1) shows that, while men attributed significantly higher negative stereotypes than women, the magnitude of this difference was small and close to the conventional threshold for negligible effects (d = 0.21). Differences by information source were more pronounced. Participants who did not use the internet as a source of information reported significantly higher levels of negative stereotype attribution (M = 2.57, SD = 1.08) than internet users (M = 2.12, SD = 0.97), with a medium effect size (d = 0.45). A similar but substantively weak pattern was observed for social media use (d = 0.22). In contrast, differences associated with the use of television, family, advertising, and newspapers as sources of information, while often statistically significant due to sample sizes, exhibited negligible or small effect sizes (d < 0.20).

Regarding positive stereotypes, the bivariate analysis indicates a similar but less pronounced pattern. Consistent with the lower variability observed in the descriptive statistics, group differences were generally minor, pointing to a widespread social consensus regarding the positive perceptions of the green individual. Nevertheless, digital engagement showed the most consistent, though modest, associations with positive stereotype attribution. Users of social media (M = 3.87, SD = 0.65) and the internet (M = 3.81, SD = 0.64) attributed significantly more positive stereotypes than non-users, with the respective effect sizes (d = -0.27 and d = -0.26, respectively). Conversely, gender, family, ads, newspapers, and television exhibited negligible effect sizes (d < 0.20).

Table 1.

Descriptive statistics, Bivariate Correlations, and Group comparisons of stereotype attributions by gender and media exposure (Stereotypes: 1-5 Scale)

			Positive stereotypes			Negative stereotypes		
		n	Mean (SD)	Difference	Cohen's d	Mean (SD)	Difference	Cohen's d
Gender	Male	918	3.73 (0.65)	W= 412.457	-0.09 (negligible)	2.14 (1.03)	W= 490.493***	0.21 (small)
	Female	946	3.79 (0.65)			2.36 (1.00)		
Internet	Yes	1347	3.81 (0.64)	W= 295.570***	-0.26 (small)	2.12 (0.97)	W= 433.442***	0.45 (medium)
	No	517	3.63 (0.66)			2.57 (1.08)		
Social media	Yes	648	3.87 (0.65)	W= 323.841 ***	-0.27 (small)	2.10 (1.02)	W= 447.76 ***	0.22 (small)
	No	1216	3.70 (0.64)			2.32 (1.02)		
News-paper	Yes	303	3.85 (0.65)	W= 211.639**	-0.17 (negligible)	2.12 (1.04)	W= 259.809**	0.14 (negligible)
	No	1561	3.74 (0.65)			2.27 (1.02)		
Family	Yes	455	3.82 (0.68)	W= 290.492**	-0.13 (negligible)	2.35 (1.08)	W= 300.250*	-0.13 (negligible)
	No	1409	3.74 (0.64)			2.21 (1.00)		
TV	Yes	482	3.79 (0.60)	W= 324.699	-0.06 (negligible)	2.12 (0.99)	W= 365.928**	0.17 (negligible)
	No	1382	3.75 (0.66)			2.29 (1.03)		
Ads	Yes	593	3.82 (0.63)	W= 344.536 ***	-0.13 (negligible)	2.15 (1.00)	W= 408.398 **	0.14 (negligible)
	No	1271	3.73 (0.65)			2.29 (1.03)		

* p<.05, ** p<.01, *** p<.001.

Source: Authors' elaboration.

3.2. Negative stereotype attribution

Table 2 shows the results of the sequential analytical procedure for negative stereotypes as DV. We estimated an initial linear regression model to establish baseline correlations. Younger respondents (b = -0.13, p < .001), men (b = -0.17, p < .001), and individuals who do not use the internet (b = -0.40, p < .001) or social media (b = -0.14, p < .01) as information sources were significantly associated with negative stereotype attribution.

Table 2.

Negative stereotypes as DV: Results of the regression models (initial and corrected) and NNs

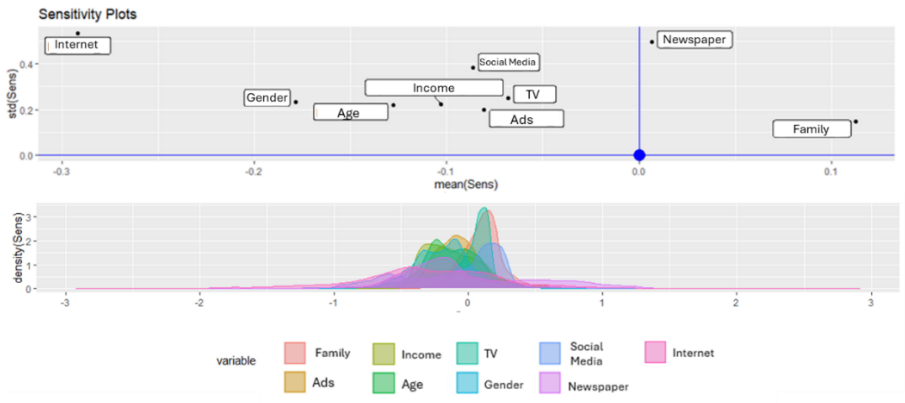
	Regression Models				Neural network model (9-2-1)		
	Initial Model		Corrected Model				
Negative Stereotypes	**b**	**SE**	**B**	**SE**	**Mean sensitivity**	**Sensitivity SD**	**Mean squared sensitivity**
Constant	0.44***	0.05	0.43***	0.05			
Age	-0.13***	0.02	-0.33***	0.04	-0.12	0.21	0.25
Gender	-0.17***	0.04	-0.18***	0.04	-0.17	0.23	0.29
Income	-0.03	0.02	-0.10*	0.03	-0.10	0.22	0.24
Internet	-0.40***	0.05	-0.42***	0.05	-0.29	0.53	0.60
Family	0.11*	0.05	0.11*	0.05	0.11	0.14	0.18
Social media	-0.14**	0.04	-0.12*	0.05	-0.08	0.38	0.39
Ads	-0.06	0.05	-0.05	0.05	-0.08	0.19	0.21
Newspaper	-0.00	0.06	-0.02	0.06	-0.01	0.49	0.49
TV	-0.07	0.05	-0.06	0.05	-0.06	0.24	0.25
Income2			0.04**	0.01			
Interaction Age-Internet			0.26***	0.05			
Interaction Age-social media			0.09	0.05			

* p<.05, ** p<.01, *** p<.001.

Source: Authors' elaboration.

To examine potential non-linearities and heterogeneous effects, an interpretable neural network model (9–2–1) was estimated. The sensitivity analysis revealed greater dispersion for internet (SSD = 0.53) and social media (SSD = 0.38) since showed high sensitivity standard deviations, indicating variability in their impact across respondents. To visually analyze this heterogeneity, we examined the sensitivity distribution plots (Figure 1), which had wide dispersions rather than narrow peaks, indicating that their associations with negative stereotype attribution varied across observations (Pizarroso et al., 2022; Ortiz-Lozano et al., 2024). Similarly, income (SSD = 0.22) and newspaper as a source of information (SSD = 0.49), which were non-significant in the initial linear model, presented a potential non-linear patterns.

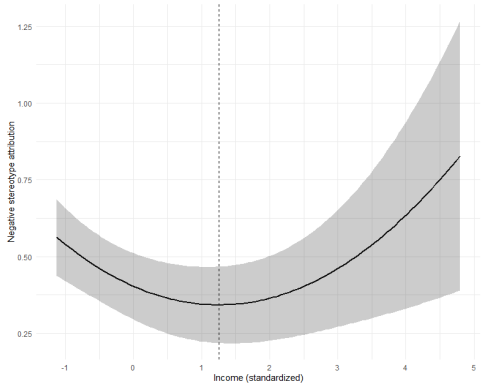
Figure 1



Negative stereotypes: Sensitivity distribution

Consistent with the hybrid analytical strategy described above, interaction and non-linear terms were considered when (i) the diagnostic NN analysis indicated heterogeneous associations across respondents, and (ii) the resulting patterns could be coherently interpreted within the study's theoretical framework. Therefore, we first included the term income squared (Income²) which yields a positive and statistically significant coefficient (b = 0.04, p < .01), consistent with a non-linear association between income and negative stereotype attribution. Figure 2 illustrates this pattern, with lower average levels at intermediate income values and higher levels toward both ends of the distribution.

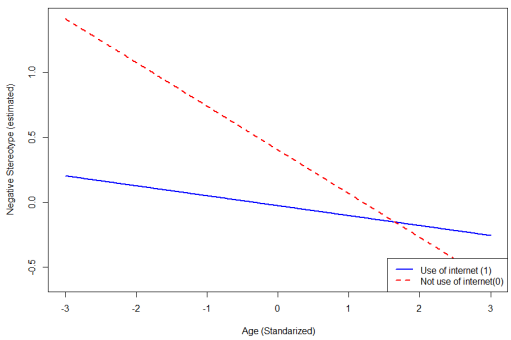
Figure 2.



Estimated levels of negative stereotype attribution across the income distribution based on the quadratic income specification.

Second, we introduced the interaction terms for internet and social media with age since those had a high SSD. The interaction between age and internet use was significant (b = 0.26, p < .001), indicating that age-related differences differed between internet users and non-users. As illustrated in Figure 3, among individuals who do not use the internet as a source of information, age is strongly correlated with the attribution of negative stereotypes. Younger participants have more negative perceptions of green individuals, which decline markedly with age (b = -0.33, p < .001). However, for internet users, this age gap disappears, resulting in lower levels of negative attributions regardless of the observer's age. In contrast, the interaction between age and social media use did not reach statistical significance. This interaction term was retained based on theoretical considerations (Fietkiewicz et al., 2016) and following the NN-guided model specification strategy (see Section 2.2; Arroyo-Barriguete et al., 2023). Finally, although the NN attributed high SSD values to newspaper use, this did not translate into significant interaction effects within the linear modeling framework. We explored interaction specifications involving newspaper use (e.g., age × newspaper, income × newspaper) but lacked both theoretical justification and statistical robustness in the linear regression model; therefore, we did not retain the interactions in the final corrected regression model.

Figure 3.



Age differences in negative stereotype attribution by internet use.

3.3. Positive stereotype attribution

We followed the same sequential analytical procedure to positive stereotypes as a dependent variable. The initial regression model (Table 3) indicated that the use of digital channels—specifically internet (b = 0.20, p < .001) and social media (b = 0.18, p < .001)—along with family (b = 0.12, p < .05) and gender (b = 0.09, p < .05) were positively associated with the attribution of favorable traits to the mainstream green individual. The other variables did not show statistically significant associations.

Table 3.

Positive stereotypes as DV: Results of the regression models (initial and corrected) and NNs

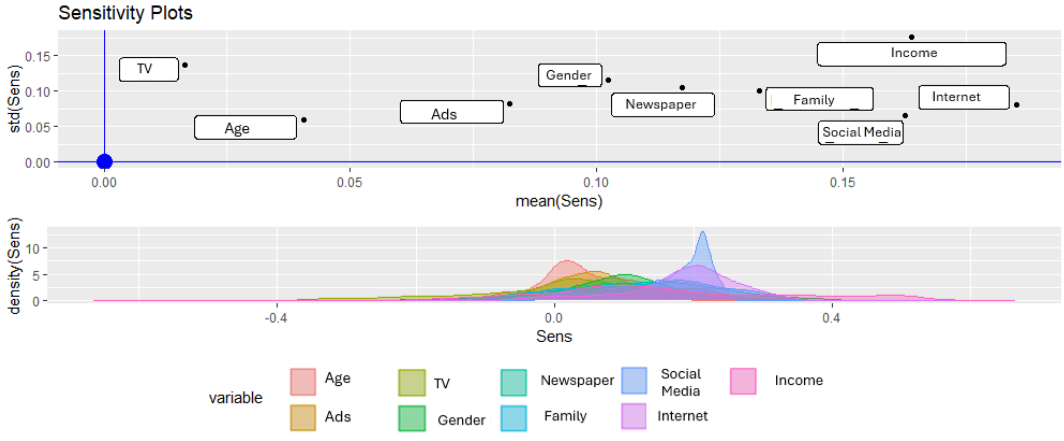
	Regression Models				Neural network model (9-3-1)		
	Initial Model		Corrected model				
Positive Stereotypes	**b**	**SE**	**b**	**SE**	**Mean sensitivity**	**Sensitivity SD**	**Mean squared sensitivity**
Constant	-0.32***	0.05	-0.30***	0.05			
Age	0.04	0.02	-0.04	0.02	0.04	0.06	0.07
Gender	0.09*	0.04	0.10*	0.04	0.10	0.11	0.15
Income	0.11***	0.02	0.14***	0.04	0.16	0.17	0.24
Internet	0.20***	0.05	0.20***	0.03	0.18	0.08	0.20
Family	0.12*	0.05	0.12*	0.05	0.13	0.10	0.16
Social media	0.18***	0.05	0.18***	0.05	0.16	0.06	0.17
Ads	0.06	0.05	0.06	0.05	0.08	0.08	0.12
Newspaper	0.06	0.06	0.06	0.06	0.12	0.10	0.15
TV	-0.02	0.05	-0.02	0.05	0.01	0.13	0.13
Income2			-0.02	0.01			
Interaction Age-Internet			-0.30***	0.05			

* p<.05, ** p<.01, *** p<.001.

Source: Authors' elaboration.

We estimated an interpretable NNs model (9–3–1) to examine the relative importance and dispersion of the variables. Sensitivity analysis from the neural network model identified income as the variable with the highest mean squared sensitivity (MMS =0.24) meaning that income showed greater relevance within the model compared to other variables. The sensitivity distribution plots (Figure 4) show wide and non-unimodal dispersions for income, internet, and social media, whereas age and television present narrower distributions centered around zero sensitivity values.

Figure 4.



Positive stereotypes: Sensitivity distribution

Guided by the sensitivity analysis, we estimated an alternative corrected regression specification including a quadratic income term to assess whether the observed heterogeneity in income sensitivity could be captured parametrically. As reported in Table 3, the squared income coefficient is not statistically significant, and overall model fit remains unchanged. This indicates

that, while income exhibits heterogeneous effects across observations, this heterogeneity is not adequately captured by a quadratic specification. The corrected model therefore confirms the robustness of the linear specification for positive stereotype attribution.

4. Discussion and conclusions

This study aimed to shift the analytical focus from the radical environmental activist to the mainstream green individual, examining how observers' social identities and informational environments shape the social evaluation of mainstream green individuals. Overall, the findings suggest that the Spanish population socially normalizes sustainable practices; however, this normalization remains unevenly negotiated across social groups, indicating that the social acceptance of sustainability is contingent upon who observes and evaluates individuals who display these behaviors.

Addressing the first objective, we anticipated that negative stereotypes attributed to radical activists might extend to everyday sustainable citizens, drawing on the concept of stigma-by-association (Pryor et al., 2012; Swim et al., 2019). However, the present results suggest that this transfer is incomplete. Consistent with recent work on the normalization of sustainability, the mainstream green individual is, on average, evaluated more positively than negatively and is not predominantly perceived through lenses of deviance (Kibele et al., 2023; Köhler et al.,2025; Li et al., 2023). Importantly, this does not imply the absence of social risk. Rather, the coexistence of generally positive evaluations with substantial dispersion in negative stereotype attribution indicates that everyday PEBs, while widely endorsed at the normative level, remain unevenly validated in social interaction, meaning that the acceptance of this social norm vary across situations and audiences (Bicchieri, 2016; Lamont & Molnár, 2002). In this sense, sustainability-related practices in Spain are not fully taken for granted: they may be broadly legitimate in public discourse yet remain socially negotiable and, in some contexts, socially risky.

Regarding the second objective, our work shows that social validation of the green individual in Spain is not universal, reinforcing the idea that the social barrier to PEB engagement does not stem from generalized rejection, but from targeted forms of derogation that serve identity-protective functions (Besalú et al., 2025; Catena-Fernández & Fernández, 2025; Minson & Monin, 2012). Gender differences in the attribution of negative stereotypes are consistent with the green–feminine stereotype, whereby environmental concern is perceived as misaligned with masculine norms, prompting defensive derogation rather than a lack of positive recognition (Kibele et al., 2023; Otterbring, 2023). More substantively, the detection of non-linear income effects for negative stereotype attribution challenges the common assumption that higher socioeconomic status uniformly predicts social validation of sustainability (Griskevicius et al., 2010; Kennedy & Johnston, 2018; Pearson & Schuldt, 2018). Instead, in Spain, the middle class appears as the primary site of social normalization, while both lower- and higher-income groups exhibit greater social resistance. For lower-income observers, this pattern is consistent with research on symbolic exclusion and perceived elitism (Johnstone & Tan, 2015; Reid et al., 2015). Lower-income individuals may be more likely to perceive PEBs as signals of an inaccessible or elitist lifestyle and stigmatizing the green individual may function as a defensive strategy to protect self-worth and neutralize the social identity threat posed by a lifestyle they cannot afford to emulate (Catena-Fernández & Fernández, 2025; Seyfi et al., 2025). For higher-income groups, one plausible interpretation resonates with Bourdieu's logic of distinction, whereby once PEBs lose their exclusivity, they may be symbolically devalued or reframed as performative middle-class norms (Bourdieu, 1984; De Nardo et al., 2017; Kennedy & Johnston., 2018). As an alternative interpretation, these negative attributions may reflect an ideological alignment in which high-income segments associate environmental discourse with threats to economic freedom and industrial growth, thereby derogating the green individual as a symbolic representative of opposing political values (Besalú et al., 2025; Żuk, 2023).

Age-related patterns in negative stereotype attribution indicate that the association between age and negative stereotype attribution is conditional on the informational environment, rather than operating uniformly across age groups. While prior research documents a tension between older

cohorts' sustainable practices and their reluctance to identify with the green label (Cherry, 2019; Howard, 2023), the present findings show that this disconnect may depend on the informational environment. Digital information exposure is associated with weaker generational differences, suggesting that exposure to contemporary sustainability narratives may facilitate the reframing of environmentalism from a youth-led or disruptive movement into a shared civic norm (Elgaaied-Gambier & Mandler, 2021; Fonseca & Castro, 2022). Conversely, non-digital users may be more susceptible to traditional media frames that prioritize conflict and portray activists as militant or extreme (Bashir et al., 2013; Mack et al., 2025; Żuk, 2023).

The third objective was to examine the role of information sources as environments shaping stereotype attribution. Rather than exerting uniform effects, information channels operate as contextual filters whose influence depends on the observer's broader social identity. Digital information exposure, including the internet and social media, emerged as the most consistent correlate of lower negative stereotype attribution. We should not interpret those results as evidence that digital exposure directly causes more favorable perceptions; instead, and in line with selective exposure frameworks and the echo chamber effect (Arendt, 2023; Cinelli et al., 2021), digital environments may function as spaces that reinforce existing orientations toward sustainability. In this sense, in the Spanish population, individuals who rely on digital channels may be already likely to perceive PEBs as more socially legitimate or normalized (Madriaza et al., 2025). Similarly, family played a limited role, suggesting that this source primarily reinforce existing orientations rather than actively shaping social evaluations of mainstream green individuals (Moreno & Ruiz-Alba, 2021; Seyfi et al., 2025). Newspapers, however, exhibited highly heterogeneous effects: while average linear models suggested irrelevance, the neural network analysis suggests a substantial variation across profiles. This pattern is consistent with evidence that traditional press coverage of environmental issues is ideologically and narratively fragmented (Besalú et al., 2025) and suggests that newspaper exposure interacts with unobserved factors in this study, such as political orientation, in shaping stereotype attribution (Arendt, 2023; Besalú et al., 2025).

Finally, the findings provide evidence to support the fourth objective of the study. Several theoretically meaningful patterns in negative stereotype attribution, most notably the non-linear income effects and the interaction between age and internet, would have remained hidden under conventional linear modeling. By combining interpretable NNs with inferential models, this study suggests the usefulness of methodological approaches that allow the exploration of non-linear and conditional patterns without sacrificing interpretability (Arroyo-Barrigüete et al., 2023; Ciccia, 2025; Pizarroso et al., 2022). This hybrid strategy allows for a more nuanced representation of how social perceptions surrounding sustainability are unevenly constructed across social groups, moving beyond average effects to reflect the fragmented and contested nature of social evaluations.

In sum, the findings suggest that the social normalization of everyday environmental practices cannot be assumed, even in contexts where sustainability is widely endorsed as a social norm. Rather than facing uniform acceptance, individuals engaging in mainstream PEBs remain subject to selective and identity-based social evaluation costs due to persistent negative stereotyping (Catena-Fernández & Fernández, 2025; Kibele et al., 2023; Sherif & Simon, 2025). From a policymaker perspective, this implies that sustainability communication strategies may benefit from moving beyond universal messaging (Besalú et al., 2025; Guijarro, 2022) and instead taking into account how environmental cues are interpreted across different social groups and informational environments. Communication approaches that decouple everyday environmental practices from polarized or elitist identities may help reduce the reputational costs associated with adoption and foster a more socially inclusive ecological transition. In addition, the findings highlight the relevance of considering dissemination channels, cautioning against assumptions of homogeneous media effects or reliance on one single channel as a stable lever of social normalization. Identical sustainability-related signals may be interpreted differently across audiences and informational environments (Arendt, 2023; Mack et al., 2025). Taken together, these findings underscore the practical relevance of multi-channel and context-sensitive approaches that remain attentive to

differences across social groups (Besalú et al., 2025; Moreno & Ruiz-Alba, 2021; Seyfi et al., 2025).

Finally, the study presents several limitations. First, the study's cross-sectional design does not permit causal inference. While the results showed systematic associations between informational environments and stereotype attribution, we cannot disentangle whether exposure to specific information contexts actively reshapes social evaluations or whether individuals with pre-existing interpretative orientations selectively engage with specific information sources. Future research using experimental or longitudinal designs could more directly assess how changes in informational exposure affect stereotype attribution over time. Second, some theoretically relevant moderators were not measured. In particular, political orientation (Catena-Fernández & Fernández, 2025; Swim & Geiger, 2018) and trust in media (Mack et al., 2025; Suldovsky et al., 2019) may further condition how sustainability-related information is interpreted, as prior research shows that ideological alignment and perceived source credibility affect environmental evaluations (Besalú et al., 2025; Kibele et al., 2023). Incorporating these variables could help disentangle whether the effects observed, especially for traditional media, reflect differences in political worldviews or media trust. Finally, the study focuses on stereotype attribution toward a standardized profile of a mainstream green individual engaging in everyday, low-visibility PEBs. While this design choice was intentional, it limits the ability to distinguish how stereotype attribution may vary across different types of sustainable actions, particularly along the continuum from private practices to highly visible behaviors. Future research could explicitly compare these profiles to delineate better the boundary conditions under which stigma-by-association extends from radical environmentalism to everyday sustainability practices.

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