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The Functionality of Dissimilarity: Pro-Environmental Behavior through Heterogenous Networks

Robbe Geerts *, Frédéric Vandermoere and Stijn Oosterlynck

Department of Sociology, University of Antwerp, 2000 Antwerp, Belgium; frederic.vandermoere@uantwerpen.be (F.V.); stijn.oosterlynck@uantwerpen.be (S.O.)

* Correspondence: robbe.geerts@uantwerpen.be

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Abstract: This study explores whether social interaction with dissimilar others can lead to pro-environmental behavior. Dissimilar others are people who differ from the person in question (e.g., in terms of lifestyle or culture). While most research focuses on homogenous social networks (e.g., spatial communities), we explore the potential of network heterophily. Specifically, using data (n = 1370) from the Flemish Survey on Sociocultural Shifts, we examine the relationship between network heterophily and pro-environmental behavior (i.e., shopping decisions and curtailment behavior). Building on Granovetter's study on 'the strength of weak ties', we emphasize the importance of social ties that provide novel information and social expectations. Through interaction with dissimilar others, people may create a heterogeneous network in which a diversity of information and social expectations with regard to pro-environmental behavior circulates. We expect that network heterophily may foster pro-environmental behavior. Our findings indicate that pro-environmental behavior may indeed be positively related to interaction with dissimilar others, partly because people with many dissimilar ties know more about environmental problems and are more concerned about them. This study therefore shows that network heterophily promotes pro-environmental behavior. The paper concludes with a discussion of the functionality of dissimilarity and some avenues for future research.

Keywords: social capital; pro-environmental behavior; social networks; heterogeneity

1. Introduction

Today, there is little doubt about the anthropogenic causes of many environmental issues, such as climate change (Field et al. 2014). While numerous people are adopting a more conscious behavioral pattern, it seems that countless others are resistant to behavioral change. Unsustainable behavior often appears to be inert and habitual (Jackson 2005; Russell et al. 2017; Stern 2000; Yuriev et al. 2020). Consequently, explaining pro-environmental behavior is a major research domain (Evans 2018). While the importance of social networks and interpersonal connections should not be underestimated (e.g., Vandermoere et al. 2019), these are relatively neglected subjects in research on pro-environmental behavior (Cho and Kang 2017). In studies on environmentalism, most attention has been paid to values, beliefs, and sociodemographic characteristics (Gifford and Nilsson 2014; Macias and Nelson 2011; Marbuah 2019). Furthermore, previous research has often focused on homogenous groups, such as spatial communities (e.g., Fletcher et al. 2020; Takahashi and Selfa 2015). Less is known about the influence of network heterophily and dissimilar interpersonal ties. Nevertheless, such networks and ties may offer great potential in challenging hard-to-break unsustainable habits and triggering behavioral change (Hao et al. 2019; Jackson 2005). As noted by the famous English philosopher John

Stuart Mill (1848): "It is hardly possible to overrate the value [. . .] of placing human beings in contact with persons dissimilar to themselves, and with modes of thought and action unlike those with which they are familiar", as cited in (Burt 2000, p. 363).

Building on Granovetter's study (Granovetter 1973) on 'the strength of weak ties' (see also, e.g., Macias and Nelson 2011 in the context of environmental issues), we emphasize the importance of social ties that provide novel information and social expectations. Accordingly, our hypothesis is that a varied social network (e.g., in terms of lifestyle or culture) provides access to a wide range of information and social expectations with regard to pro-environmental behavior. Particularly, such interaction increases the probability of contact with people who are environmentally aware. This may, in turn, lead to increased environmental knowledge, environmental concern, and pro-environmental behavior. Given that unsustainable behavior is the rule rather than the exception for many people, dissimilar social ties may be vital in challenging unsustainable perspectives and routines. We acknowledge that this may not hold true for everyone (environmentalists and their behavior may be challenged by a network that is less environmentally aware than themselves). Indeed, heterogeneous networks can provide both valid and invalid views with regard to environmental issues. However, people are not only passive receivers of information (Scheufele et al. 2004). A heterogenous network solely implies that people have a more diverse set of views upon which they can base their own ideas (Macias and Williams 2014). As hypothesized, we show in this article that the general relationship between network heterophily and pro-environmental behavior is positive for the majority of the population.

While the potential of network heterophily has been acknowledged in other research domains, such as political engagement and health studies (e.g., Scheufele et al. 2004; Sehee et al. 2011), empirical evidence about the relationship between network heterophily and pro-environmental behavior is scarce. Against this background, we use Flemish survey data (n = 1370) to examine this underexplored connection. Specifically, we use structural equation modeling techniques to investigate the association between dissimilar ties within one's network and pro-environmental behavior. We focus on two types of behavior: pro-environmental shopping decisions and curtailment behavior. These behaviors were chosen because of their theoretical differences. Pro-environmental shopping decisions are a visual form of behavior related to conspicuous consumerism, while curtailment behavior is inconspicuous and has often been associated with external considerations, such as financial benefits (Evans 2018; Jagers et al. 2017; Shove and Warde 2002). We expect social influences to function differently depending on the type of behavior, with social ties playing a more important role in shaping conspicuous consumption. We also aim to examine whether the relationship between network heterophily and pro-environmental behavior is mediated by knowledge about and concern for environmental problems.

1.1. A Social Capital Approach to Pro-Environmental Behavior

Studies in numerous scientific domains (health behavior, political engagement, consumer studies, etc.) have emphasized the importance of social networks and interpersonal ties in triggering behavioral change (Akar and Dalgic 2018; Latkin and Knowlton 2015; Scheufele et al. 2004). In particular, researchers have analyzed whether our social ties can facilitate pro-environmental behavior (e.g., Macias and Williams 2014; Thoyre 2011; Videras et al. 2012). Previous studies have often pointed to the dissemination of such behavior through social networks (see Axsen and Kurani 2012 for a review). Among others, two prominent perspectives can be distinguished that may be relevant to our research question. From a diffusion perspective, interpersonal influences are described as flows of information (defined as both knowledge and persuasion) that promote pro-environmental behavior (Axsen and Kurani 2012; Rogers 2003; Thoyre 2011). From a conformity perspective, interpersonal influences transpire when we consider what others do and/or expect from us, thus creating social norms and expectations (Axsen and Kurani 2012). The adaptation of pro-environmental behavior then depends on exposure to the pro-environmental behavior of others.

However, not all networks and social ties relate to behavior in the same way (Videras et al. 2012). Therefore, we argue for a social capital approach, which is a growing theoretical development in research on pro-environmental behavior (e.g., Cho and Kang 2017; Macias and Williams 2014; Macias 2016; Miller and Buys 2008; Thoyre 2011). In its most basic definition, social capital postulates that involvement with others and participation in groups can have benefits for both individuals and communities (Portes 1998). While social capital has proven to be a useful concept in many diverse studies, it has acquired different meanings over time (Adler and Kwon 2002; Bjørnskov and Sønderskov 2013; Gannon and Roberts 2018). While some view social capital as a collective asset, for example, community engagement (e.g., Putnam 2000b), our study is rooted in a micro-perspective on social capital (e.g., Lin 1999). We emphasize how individuals utilize their social connections to access resources (e.g., information) within a social network.

Unlike other perspectives on social influences (such as diffusion or conformity), this conceptualization of social capital explicitly proposes that actors benefit more from certain social interactions and less from others. Particular social connections may grant people access to unspecified resources and benefits, while other connections may be less useful (Lin et al. 2001). Moreover, these social connections often function as facilitators of action (Adler and Kwon 2002). Utilizing a social capital approach, we do not focus on the way pro-environmental behavior diffuses through social networks, but whether a specific type of social connection (i.e., dissimilar interpersonal ties) facilitates such diffusion.

In the scholarly literature, there is disagreement about which social ties are most important (Adler and Kwon 2002; Lin et al. 2001). On the one hand, the closure argument (or the bonding capital approach) proposes that strong ties are most beneficial because they promote shared social norms, trust, comfort, etc. (e.g., Coleman 1988; Putnam 2000a) and because members are granted privileged access to resources in closed networks (e.g., Bourdieu 1986). Most social capital approaches to pro-environmental behavior have been positioned in this tradition. Studies have emphasized social norms, trust, and network interactions with friends as a basis for pro-environmental action (e.g., Cho and Kang 2017; Jin 2013; Jones et al. 2009; Macias 2016; Moon 2017; Polyzou et al. 2011; Thoyre 2011).

In this article, we aim to examine the value of open networks (in contrast to closed networks). Such networks include ties with people outside one's immediate social group (e.g., acquaintances rather than friends and family), i.e., brokerage or bridging capital. While information and social expectations circulate better within strongly connected groups (Coleman 1988; Rogers 2003), cross-group circulations are more likely to provide new information and social expectations, potentially challenging one's perspectives and worldviews (Burt et al. 2001; Lin et al. 2001). In-group members often possess a similar informational and normative background (Rogers 2003). Consequently, it has been argued that cross-group interactions promote the diffusion of innovative behavior. Burt et al. (2001), for example, emphasizes the importance of spanning structural holes or gaps between groups. Similarly, Granovetter (1983) emphasizes the functionality of weak ties because they avoid the trap of information redundancy.

Open networks may be of particular importance in stimulating pro-environmental behavior. For people who generally do not adopt pro-environmental behavioral patterns, access to new information and social expectations may be necessary to challenge unsustainable perspectives, habits, and/or lifestyles (Jackson 2005; Macias and Williams 2014). Macias and Nelson (2011), for example, found that people with many weak ties (i.e., neighbors and acquaintances, as opposed to friends and family) in their network are more prone to make economic–environmental trade-offs in favor of environmental objectives, although the evidence is mixed depending on the type of behavior (Macias 2016).

1.2. Network Heterogeneity

While previous studies have focused on open networks by examining contacts with weak ties (e.g., Macias and Williams 2014), we study the impact of network heterophily and dissimilar ties—to our knowledge, for the first time in the context of pro-environmental behavior. Diverse networks provide novel information and social expectations because they create, by definition, groups that are additive, instead of overlapping in terms of information and social expectations (Blau 1977; Renzulli et al. 2000; Rogers 2003). According to Marsden (1987, p. 124), high network diversity implies "integration into several spheres of society, which is deemed advantageous for instrumental actions like gathering information."

Similar judgments have been made in numerous studies. In economics research, diverse networks have been found to stimulate entrepreneurship (Renzulli et al. 2000), inventor performance (Lee 2010), and management performance (Rodan and Galunic 2004). In political science, Scheufele et al. (2004), for example, argued that people with a diverse network are more likely to be politically active. Huckfeldt et al. (2004) concluded that people in heterogenous networks are less likely to hold polarized political attitudes. Such networks have also been proven beneficial in health studies. A diverse support network, for example, appears to reduce the risk of relapse after treatment for substance abuse (Panebianco et al. 2016). Furthermore, people with a diverse network seem to score higher on life satisfaction and happiness (Sehee et al. 2011).

Against this background, we examine the association between network heterophily (i.e., contacts with dissimilar ties) and pro-environmental behavior. Specifically, we investigate the relationship between tie dissimilarity on the one hand, and pro-environmental shopping decisions and curtailment behavior on the other. Furthermore, we inquire whether this relationship is mediated by knowledge about and concern for environmental problems. The findings of our study will provide—to our knowledge, for the first time—empirical support for the theoretical assertions made about the potential of network heterophily in the context of pro-environmental behavior.

2. Materials and Methods

The analysis for this study is based on data (2010) from the Flemish Survey on Sociocultural Shifts (SCV-survey) (Statistiek Vlaanderen 2010). The survey was conducted by the Study Service of the Flemish Government (Carton et al. 2010). The SCV-survey is a measurement instrument to map sociocultural shifts in Flanders, focusing on attitudes, values, and behavior. The questionnaire was performed face-to-face using a representative sample for the Dutch-speaking population above the age of 18 living in the Flemish Region or Brussels Capital Region (Belgium). A total of 1370 participants were included in the dataset. To compensate for selection bias and non-response, sampling weights were used. A total of 157 participants were manually deleted from the data because of item nonresponse. Consequently, 1213 respondents were retained in the final models.

2.1. Research Design

Given the presence of latent variables in our model, we used structural equation modeling techniques (SEM) to investigate the relationship between network heterophily and pro-environmental behavior. SEM contains direct and indirect relationships between observed and latent variables (Kline 2015). In terms of software, Mplus was used. Given the ordered categorical nature of latent indicators, we used a probit link function and a robust weighted least square estimator (WLSMV) to include categorical outcome variables in the model (Muthén and Muthén 2017). The following fit statistics were used for model evaluation: Chi-square test, comparative fit index (CFI), standardized root mean square residual (SRMR), and root mean square error of approximation (RMSEA) (see Hooper et al. 2007; Kline 2015 for reviews). A significant chi-square test indicates a misfit, but this test may be unstable when a large sample is used. SRMR and RMSEA should ideally be below 0.05, or at least lower than 0.08. A CFI above 0.95 is indicative of a good fit, while anything above 0.90 is acceptable.

Following the strategy proposed by Anderson and Gerbing (1988), our investigation was conducted stepwise (see also Schreiber et al. 2006). First, a measurement model was constructed, which served two objectives. On the one hand, the measurement model was used as a confirmatory factor analysis (CFA) to evaluate latent factors, which were judged on reliability and validity (cf. Bacon et al. 1995; Fornell and Larcker 1981). Concerning reliability, a composite reliability (CR) of approximately 0.7 was expected. In terms of validity, an average variance extracted (AVE) of approximately 0.5 was required. On the other hand, the measurement model was used to evaluate bivariate associations between variables based on covariances. In a second step, the measurement model was transformed into a structural model with direct and indirect relationships between the variables. This model was used: (i) to further investigate bivariate associations and (ii) to examine whether the relationship between network heterogeneity and pro-environmental behavior is mediated by knowledge about environmental issues and concern for environmental problems.

2.2. Variables

At the dependent level, two types of pro-environmental behaviors were measured: pro-environmental shopping decisions (indicators: 'buying organic products', 'buying environmentally friendly products', and 'buying reusable packaging') and curtailment behavior (indicators: 'shutting down electronic devices when not using them', 'turning off the lights when not in the room', 'turning off the tap when washing hands, brushing teeth, shaving, etc.', and 'only heating rooms when necessary'). Participants could reply on an item scale ranging from 1 (never) to 5 (always).

Network heterogeneity was measured based on a composite measurement by means of four items with responses on a five-point scale (1. Completely disagree to 5. Completely agree): 'I am often in contact with … new people; … people with other political orientations; … people from a different culture and/or country; and … people from a different social environment.' At a mediating level, environmental concern was measured through the following items, also on a five-point scale (1. Completely agree to 5. Completely disagree): 'Most environmental problems in Flanders are exaggerated', 'All this talking about environmental problems in Flanders worries people more than necessary', 'Today, we worry too much about the future of the environment and too little about prices and employment', and 'People are too worried about progress that would harm the environment.' Familiarity with nine Flemish policy measures was used as a proxy to assess the participants' knowledge about environmental problems (i.e., smog alarm, eco-score for vehicles, soil certificate, water test, subsidies for energy conservation measures, wastewater tax, obligation of acceptance for producers of electric devices, car tiers, environmental permits for cutting down trees, and warm sweater day). We preferred these objective measures over the more commonly used self-assessments (e.g., Rivera-Torres and Garces-Ayerbe 2018). Specifically, a sum-score was calculated for the number of policy instruments the participants were familiar with, resulting in a scale ranging from 0 (unfamiliar) to 9 (strong familiarity).

Finally, we included sociodemographic control variables in our model: monthly household income (1. Less than 500 EUR—42. More than 10450 EUR), education (primary education or less [ref. cat.], secondary or tertiary education), age (range: 18 to 98), and gender (score 0 for male and 1 for female). Household size (range: 1 to 10) was also included to control for household composition when measuring household income.

These sociodemographic control variables are important for two reasons. First, different sociodemographic groups may have differential access to heterogenous networks. Subsequently, sociodemographic characteristics are necessary to control for the presence of spurious relationships between network heterophily and pro-environmental behavior. Second, research also points out that environmental concern, knowledge, and pro-environmental behavior are related to gender, age, income, and education (Gifford and Nilsson 2014). Consequently, controlling for these characteristics is necessary to isolate the influence of network heterophily.

3. Results

3.1. Measurement Model

First, a measurement model was constructed (Figure 1), serving two objectives: (i) to evaluate the latent constructs and (ii) to examine the bivariate associations between the variables in the model. Based on fit statistics, the measurement model seemed to fit well with the data (χ^2 = 387.385 df = 161, $p \leq 0.001$; CFI = 0.979; SRMR = 0.029; RMSEA = 0.032). Furthermore, all latent constructs appeared valid and reliable. The average variance extracted (AVE) and the composite reliability (CR) for pro-environmental shopping decisions (AVE: 0.48 and CR: 0.74), curtailment behavior (AVE: 0.56 and CR: 0.84), environmental concern (AVE: 0.47 and CR: 0.78), and network heterophily (AVE: 0.46 and CR: 0.77) were all satisfactory.

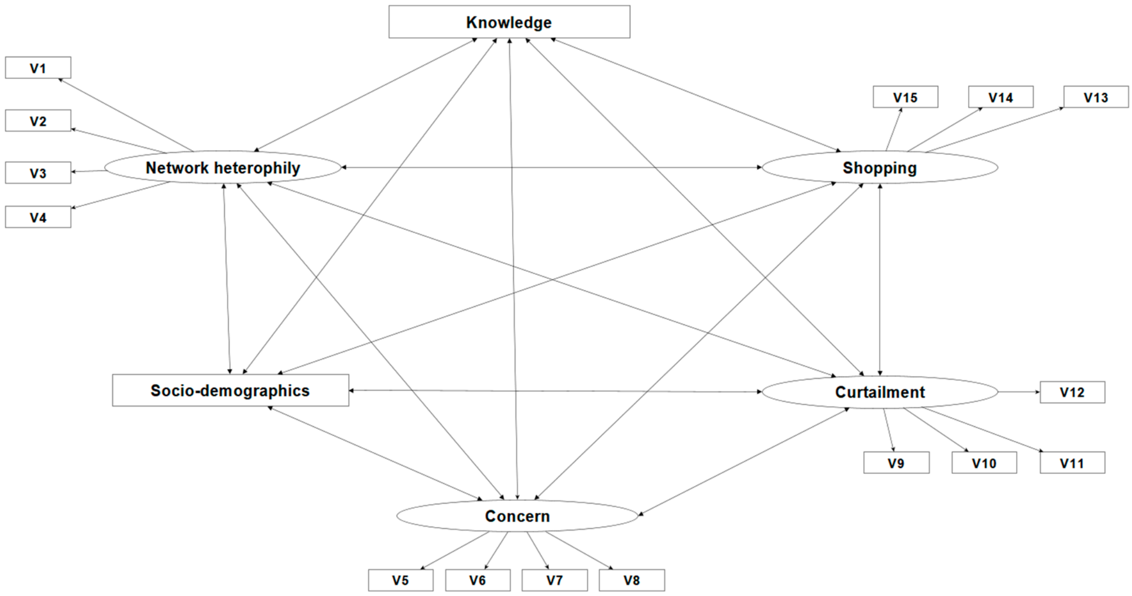

Figure 1. Measurement model used to: (i) evaluate latent constructs and (ii) examine bivariate association. Model fit: χ^2 = 387.385 df = 161, $p \leq 0.001$; CFI = 0.979; SRMR = 0.029; RMSEA = 0.032.

Before conducting a multivariate analysis, we first examined the covariances in the measurement model (Figure 2). The measurement model showed significant covariances between network heterophily and pro-environmental behavior. We found a positive association between network heterophily and pro-environmental shopping decisions (std. cov. = 0.221, $p \leq 0.001$). In contrast, network heterophily seemed negatively related to curtailment behavior (std. cov. −0.122, $p = 0.002$). Furthermore, we found significant associations between network heterophily and the mediating variables. In particular, our results indicated that people with many dissimilar ties have more knowledge about environmental issues (std. cov. = 0.243, $p \leq 0.001$) and are more concerned about environmental problems (std. cov. = 0.249, $p \leq 0.001$). Environmental knowledge and environmental concern were, in turn, positively related to each other (std. cov. = 0.156, $p \leq 0.001$) and to pro-environmental shopping decisions (respectively, std. cov. = 0.253 and 0.390, $p \leq 0.001$ for both). Curtailment behavior was only associated with environmental knowledge (std. cov. = 0.098, $p = 0.007$). We found no significant covariance between environmental concern and curtailment behavior (std. cov. 0.059, $p = 0.132$).

Additionally, we found that men (std. cov. = −0.205, $p \leq 0.001$), younger people (std. cov. = −0.411, $p \leq 0.001$), large households (std. cov. = 0.200, $p \leq 0.001$), more educated groups (std. cov. = 0.082, $p = 0.011$ for secondary education and std. cov. = 0.180, $p \leq 0.001$ for tertiary education), and high-income households (std. cov. = 0.296, $p \leq 0.001$) were most likely to have many dissimilar ties. Our results thus suggest that network heterophily is not equally distributed among sociodemographic groups, which further confirms the importance of a multivariate analysis.

Pro-environmental shopping decisions and curtailment behavior were positively correlated (std. cov. = 0.294, $p \leq 0.001$). In addition, we found significant relationships between pro-environmental behavior and sociodemographic variables. Pro-environmental shopping decisions were most common among tertiary educated groups (std. cov. = 0.181, $p \leq 0.001$), high-income households (std. cov. = 0.212, $p \leq 0.001$), and large households (std. cov. = 0.114, $p = 0.001$). Curtailment behavior was least common among tertiary educated groups (std. cov. = −0.084, $p = 0.011$), while it was most common among low-income households (std. cov. = −0.194, $p = 0.001$), older people (std. cov. = 0.293, $p \leq 0.001$), women (std. cov. = 0.127, $p \leq 0.001$), and small households (std. cov. = −0.116, $p \leq 0.001$).

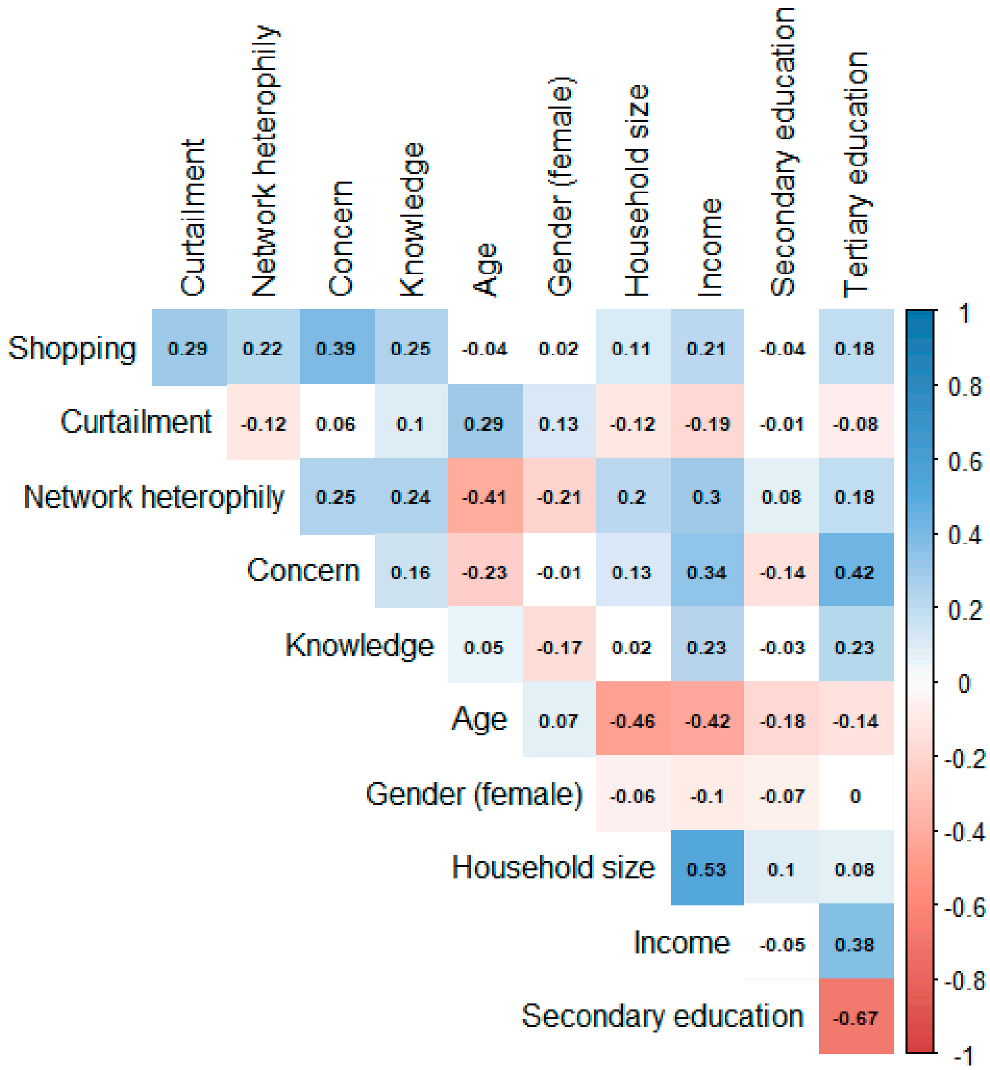

Figure 2. Full covariance matrix: covariances found in the measurement model. Darker cells indicate a stronger relationship between two variables. White cells indicate a non-significant relationship (p-value > 0.05).

Finally, knowledge about environmental problems was highest among tertiary educated groups (std. cov. = 0.226, $p \leq 0.001$), high-income households (std. cov. = 0.234, $p \leq 0.001$), older people (std. cov. = 048, $p \leq 0.043$), and men (std. cov. = −0.169, $p \leq 0.001$). Environmental concern was highest among tertiary educated groups (std. cov. = 0.419, $p \leq 0.001$), high-income households (std. cov. = 0.343, $p \leq 0.001$), younger people (std. cov. = −0.231, $p \leq 0.001$), and large households (std. cov. = 0.131, $p \leq 0.001$).

3.2. Structural Model

In a second step, the measurement model was converted into a structural model (Figure 3). Pro-environmental shopping decisions and curtailment behavior served as fully endogenous variables. These behaviors were explained by network heterophily, controlling for sociodemographic variables. This relationship was partially mediated through environmental knowledge and concern. Finally, we estimated sociodemographic differences in network heterophily to assess whether or not the relationship between network heterophily and pro-environmental behavior was spurious. This secondary model fitted well with the data (χ^2 = 327.065 df = 162, $p \leq 0.001$; CFI = 0.971; SRMR = 0.037; RMSEA = 0.029).

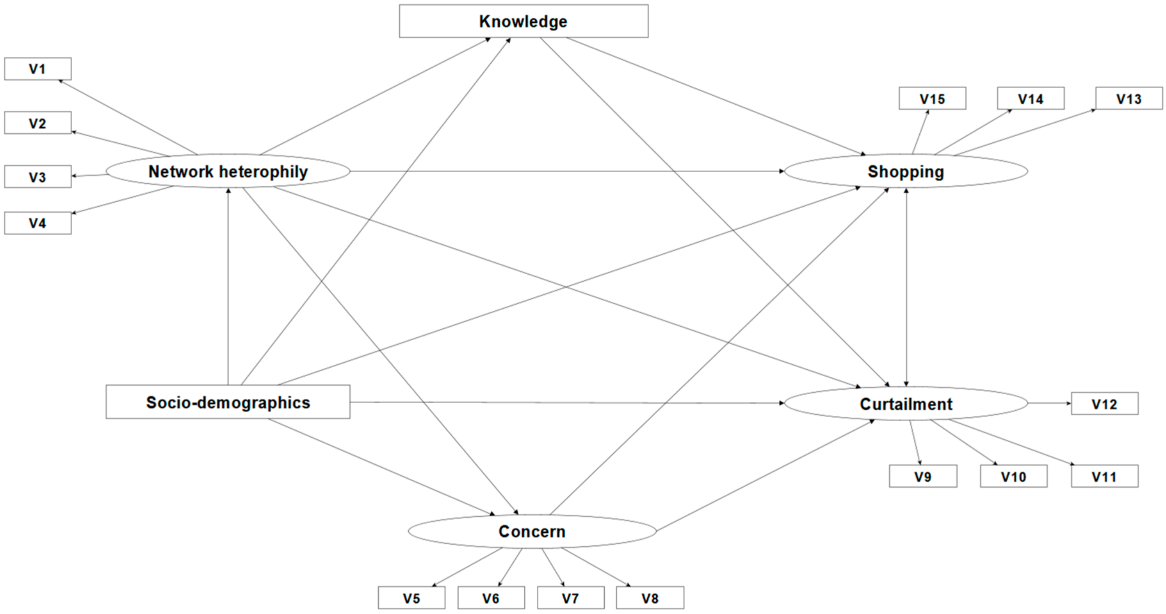

Figure 3. Structural model: visual representation of structural model estimation. Model fit: χ^2 = 327.065 df = 162, $p \leq 0.001$; CFI = 0.971; SRMR = 0.037; RMSEA = 0.029.

Results of the structural model can be found in Figure 4. We found that dissimilar ties were positively related to knowledge about (std. β = 0.194, $p \leq 0.001$) and concern for (std. β = 0.115, $p = 0.002$) environmental problems after controlling for sociodemographic differences. Subsequently, environmental knowledge and concern were positively related to pro-environmental shopping decisions (respectively, std. β = 0.164, $p \leq 0.001$ and std. β = 0.363, $p \leq 0.001$) and curtailment behavior (respectively, std. β = 0.136, $p \leq 0.001$ and std. β = 0.227, $p \leq 0.001$). Both types of behaviors correlated positively (std. cov. = 0.300, $p \leq 0.001$). Furthermore, we found a significant direct relationship between dissimilar ties and pro-environmental shopping decisions (std. β = 0.126, $p = 0.006$). In other words, heterogenous networks are positively associated with pro-environmental shopping decisions for reasons other than environmental knowledge, concern, or sociodemographic characteristics. This was not the case for curtailment behavior.

Consequently, our results suggest that the relationship between network heterophily and both types of pro-environmental behavior is positive, albeit mostly indirect through environmental knowledge and concern. While the measurement model revealed a negative association between network heterophily and curtailment behavior, the structural model suggested that this negative relationship may be spurious. Specifically, we found that the sociodemographic groups with the most diverse networks were least engaged in curtailment behavior. In particular, our SEM model showed that household income (std. β = −0.177, $p \leq 0.001$) and tertiary education (std. β = −0.134, $p = 0.030$) were negatively associated with curtailment behavior, while women (std. β = 0.110, $p = 0.002$) and older people (std. β = 0.248, $p \leq 0.001$) were most engaged in curtailment behavior. In contrast, our results indicate that high-income households (std. β = 0.092, $p = 0.020$), tertiary educated groups (std. β = 0.186, $p \leq 0.001$), men (std. β = −0.174, $p \leq 0.001$), and younger people (std. β = −0.326, $p \leq 0.001$) have more dissimilar ties than their counterparts.

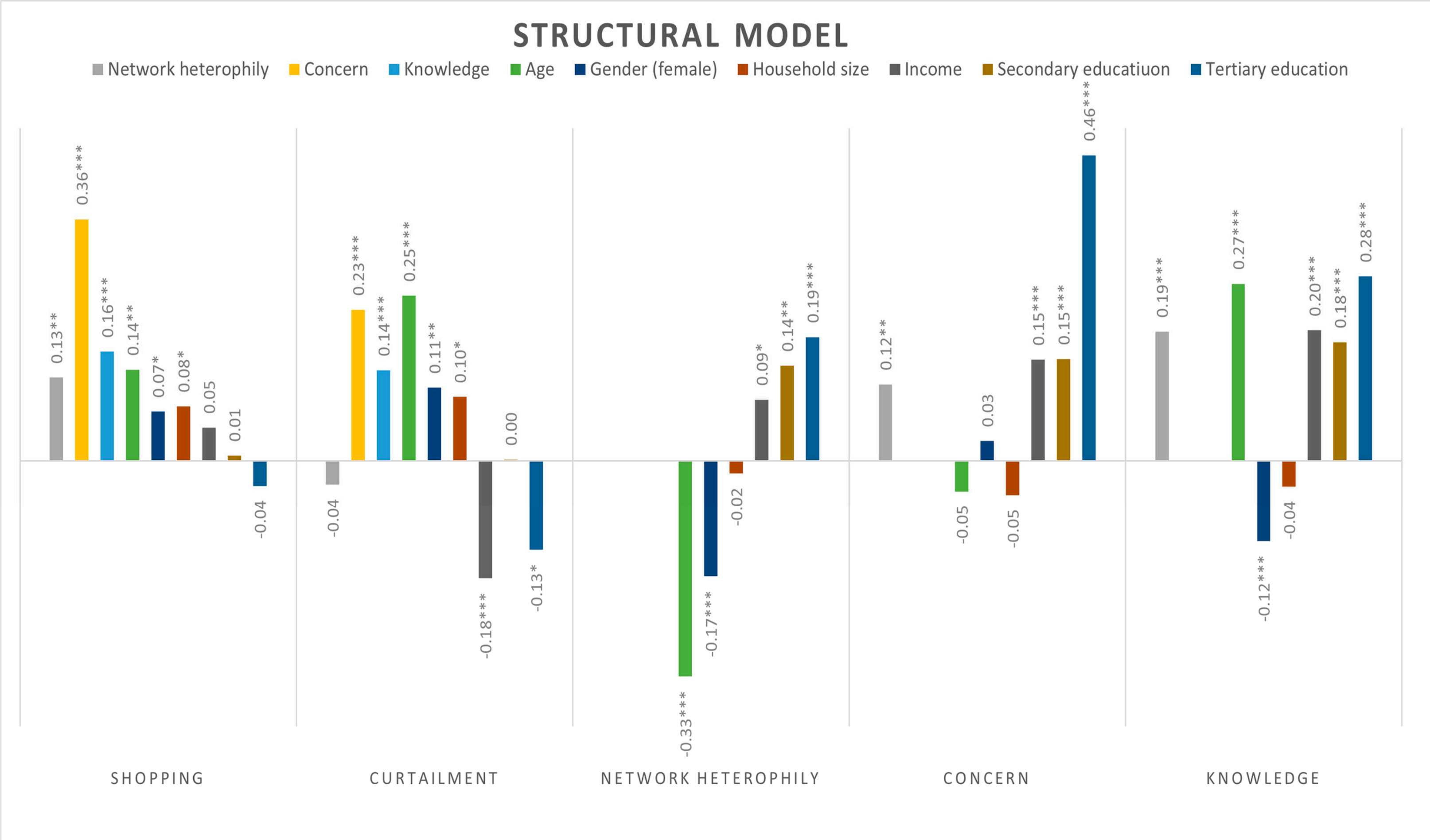

Figure 4. Regression coefficients categorized by their dependent variables. For significance, the following standards were applied: * $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$.

Finally, although not the focus of this article, it is worth noting some findings about the relationship between our respondents' sociodemographic characteristics and their pro-environmental behavior. Women appeared most engaged in curtailment behavior in the measurement model. While women were generally less knowledgeable about environmental problems (std. $\beta = -0.121$, $p \leq 0.001$) and had fewer dissimilar ties (std. $\beta = -0.174$, $p \leq 0.001$), this was compensated for by a positive association with pro-environmental shopping decisions (std. $\beta = 0.074$, $p = 0.033$) and curtailment behavior (std. $\beta = 0.110$, $p = 0.002$). Considering age, younger people were least engaged in curtailment behavior in the measurement model. Although younger participants had more diverse networks (std. $\beta = -0.326$, $p \leq 0.001$), age was positively related to curtailment behavior (std. $\beta = 0.248$, $p \leq 0.001$), pro-environmental shopping decisions (std. $\beta = 0.137$, $p = 0.002$), and environmental knowledge (std. $\beta = 0.266$, $p \leq 0.001$). Household size was positively related to both pro-environmental shopping decisions (std. $\beta = 0.082$, $p \leq 0.047$) and curtailment behavior (std. $\beta = 0.096$, $p = 0.039$). Moreover, income and education correlated positively with pro-environmental shopping decisions, but negatively with curtailment behavior in the measurement model. It appears that household income and education are positively associated with network heterophily (std. $\beta = 0.092$, $p = 0.020$ for household income; and std. $\beta = 0.186$, $p \leq 0.001$ for tertiary education), environmental knowledge (std. $\beta = 0.196$, $p \leq 0.001$ for household income; std. $\beta = 0.178$, $p \leq 0.001$ for secondary education; and std. $\beta = 0.277$, $p \leq 0.001$ for tertiary education), and environmental concern (std. $\beta = 0.152$, $p \leq 0.001$ for household income; std. $\beta = 0.153$, $p \leq 0.001$ for secondary education; and std. $\beta = 0.459$, $p \leq 0.001$ for tertiary education), which translates into more engagement in pro-environmental shopping decisions. However, these positive effects were neutralized in the case of curtailment behavior because both income and education were negatively related to curtailment behavior.

4. Discussion

In this study, we examined the relationship between network heterophily and pro-environmental behavior. Using a social capital approach, we emphasized the importance of network diversity. Such ties, we argued, are especially relevant in triggering pro-environmental behavior. Specifically, we claimed that the diffusion of new information and new social expectations are most likely to occur in heterogeneous networks (Blau 1977; Marsden 1987). Through interaction with dissimilar others, people may create a heterogeneous network consisting of a diversity of information and expectations with regard to pro-environmental behavior. Such interaction increases the probability of contact with people who are environmentally aware, which may be necessary to challenge unsustainable perspectives and lifestyles (Macias and Nelson 2011). Our model appeared to fit well with the data. While chi-square tests were significant, this test may be biased by our large sample size. All other fit statistics met the recommended values (Hooper et al. 2007; Kline 2015).

Consequently, the results largely confirm our hypothesis that dissimilar ties in one's social network are positively related to knowledge about and concern for environmental issues, which, in turn, leads to pro-environmental behavior. While previous research has argued that social networks may facilitate the diffusion of pro-environmental behavior (Axsen and Kurani 2012), our findings indicate that heterogenous networks may be of particular importance for such diffusion to occur. Network heterophily is especially relevant for instrumental action, such as the gathering of environmental knowledge (Marsden 1987), but our findings also show that—although to a lesser degree—this extends to pro-environmental attitudes as well. In line with Rogers (2003), the diffusion of 'information' should not be solely conceptualized as the diffusion of knowledge, but also as effecting behavioral change through persuasion. In our case, people with a heterogenous network appeared to assess environmental issues more seriously and, therefore, felt the need to take action.

While the relationship between network heterophily and curtailment behavior was fully mediated by environmental knowledge and concern, this was not the case for pro-environmental shopping decisions. In order to account for this difference, the work of Shove and Warde (2002), who separate conspicuous (e.g., shopping decisions) from inconspicuous (e.g., energy conservation) consumption, might be of assistance. Conspicuous consumption is visual, while inconspicuous consumption is private and not as “spectacular” (Evans 2018, p. 504). Furthermore, conspicuous pro-environmental behavior, such as consumerism (e.g., buying solar panels), tends to be related more to lifestyle and status, compared to curtailment behaviors, such as conserving energy (e.g., turning off the lights) (Choi and Seo 2017; Griskevicius et al. 2010; Uren et al. 2019). Considering the emerging importance of social status as an aspect of pro-environmental behavior (Brooks and Wilson 2015; De Nardo et al. 2017), conformity mechanisms may be at play when explaining the residual relationship between network heterophily and pro-environmental shopping decisions (Axsen and Kurani 2012). People could be more sensitive to pro-environmental social expectations when consumption is conspicuous, either by internalizing these expectations or as an external conformity mechanism. For empirical evidence, we refer to Babutsidze and Chai (2018), who showed that people tend to adopt the visual pro-environmental behaviors of others, but that this does not spill over to non-visual pro-environmental behaviors.

In terms of sociodemographics, women were most engaged in curtailment behavior, despite having fewer heterogenous networks and less knowledge about environmental issues. One explanation for this might be that women are socialized into being more socially and environmentally responsible than men (Gifford and Nilsson 2014). Considering age, older people are also more engaged in curtailment behavior, partly because they are more knowledgeable about environmental issues than younger people. Moreover, Gifford and Nilsson (2014) suggested a cohort effect instead of an age effect, arguing that older generations have experienced a time where resources were more limited than now and may, therefore, feel the need to conserve them. Finally, our study confirms the ambiguous relationship between social class variables and pro-environmental behavior, with differential associations depending on the type of behavior taken into account (Otto et al. 2016). While income and education were positively associated with pro-environmental shopping decisions, they appeared to be negatively associated with curtailment behavior. We found that high-income households and more educated groups tended to be more knowledgeable about and concerned for environmental problems, and had more heterogenous networks (see also, e.g., Otto et al. 2016; Rhead et al. 2018), which indirectly leads to pro-environmental behavior. The socioeconomically deprived may compensate for their lower base level of environmental knowledge and concern through their social connections (Adler and Kwon 2002). Notwithstanding, capital appears to cluster (Bourdieu 1986) given that high-income households and more educated groups generally had more diverse networks (Adler and Kwon 2002).

However, while increased environmental concern, knowledge, and social connectedness led to pro-environmental shopping decisions for high-income households and more educated groups, this was not the case for curtailment behavior. The negative association between social class variables and curtailment behavior is most likely caused by behavioral considerations other than environmental factors. In the literature, it is argued that the economically deprived may be more conscious of their energy use for financial reasons (Jagers et al. 2017). Furthermore, Diekmann and Preisendorfer (1998) have argued that highly educated groups prefer solutions to environmental problems, such as technology and conspicuous consumption. They may be less willing to give up the comfortable routines of Western society, which often include high energy use.

In this study, we found a general association between network heterophily and pro-environmental behavior, partly mediated by environmental knowledge and concern. However, different subgroups may experience network heterophily differently. For people who are highly environmentally engaged, dissimilar ties may even hamper pro-environmental behavior if their social network would challenge their sustainable behavior rather than support it. Some evidence indeed suggests that negative stereotypes about environmentalists (e.g., aggressive or eccentric) often act as a barrier to pro-environmental behavior (Bashir et al. 2013; Klas et al. 2017). Therefore, we encourage future studies to examine and compare subgroups. Furthermore, we acknowledge that causal inference is difficult using cross-sectional data, and issues of self-selection may also be present. Future research should further investigate the findings of this paper. Specifically, we suggest (i) social network analysis to investigate how pro-environmental information, social expectations, and behavior disseminate though heterogenous and homogenous networks, (ii) longitudinal methods to strengthen causal claims, and (iii) qualitative methods and mixed-method research to allow a more in-depth investigation of the intricacies of social influences.

Furthermore, we remind readers that our emphasis on network heterophily is only one conceptualization of social capital. Consequently, future research could focus on other conceptualizations. Such research would be beneficial because social capital still holds much unexplored potential for research on pro-environmental behavior. The concept has mostly been used with reference to individual advantages, such as employment, education, mental health, safety, and status (Macias and Nelson 2011). However, as our study and many others show, it is reasonable to think of social capital in terms of environmental solidarity and ecological efficiency (e.g., Jones et al. 2009). For Macias and Nelson (2011), this reminds us of the conceptual origins of social capital within sociology, i.e., social interaction and connectedness as a basis for human survival (e.g., Durkheim 1897). A similar interpretation of social capital can be found in the work of Putnam et al. (1994, p. 167): "Social capital here refers to features of social organization, such as trust, norms, and networks, that can improve the efficiency of society by facilitating coordinated actions." This is reflected in research that focuses on the importance of social capital in facilitating sustainable transitions and enhancing the resilience of communities and socioecological systems (e.g., Biggs et al. 2012; Peeters 2016; Pfefferbaum et al. 2017). For future research, connections can be found with system theories, such as "panarchy." Socioecological systems are complex systems wherein many structures and processes on different scales exist and operate (Gunderson 2001). While we have approached social capital through a micro-perspective, further research may focus on interactions between these small-scale social connections and larger systems. Specific to research on social capital, individual-level social capital may interact with collective forms of social capital. Finally, research should also acknowledge that social capital may have adverse effects (Portes 1998) and may hinder pro-environmental behavior (e.g., Jones et al. 2015). "Not in my backyard" community activism has often prevented the development of wind farms, for example (Bell et al. 2005; Shemtov 2003). Consequently, social capital still has a lot of research potential in the context of pro-environmental behavior in terms of both benefits and risks.

5. Conclusions

In conclusion, the results of this study reiterate the importance of our social networks in explaining pro-environmental behavior. Behavioral patterns are not solely determined by individual characteristics, such as sociodemographics, personal capacities, or convictions. Moreover, our social connections may even help to overcome our personal limitations, thus functioning as a type of capital that can enable pro-environmental action. Both researchers and policymakers should take into account social networks and capital in their research and policy interventions. Given the habitual and inert nature of unsustainable lifestyles, social connections may be necessary in order to challenge past assumptions and lifestyles (Jackson 2005). More specifically, our findings showed the potential of dissimilar and cross-group interactions because they provide novel information and social expectations with regard to environmental issues. This may, in turn, stimulate pro-environmental behavior. Therefore, it is suggested that (policy) interventions should encourage situations in which people are connected in heterogenous social environments. As a concrete example, civil society often acts as a source of diversity (Scheufele et al. 2004). Another strategy to promote cross-group social interactions involves the installation of public amenities, such as parks, playgrounds, benches, and community gardens (Macias 2016). Finally, we encourage policymakers to reflect on the value and functionality of pluralism. Policies that prevent heterogenous interactions (e.g., racial segregation) can prevent the dissemination of pro-environmental knowledge, attitudes, and behavior.

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