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Applying the theory of planned behavior and media dependency theory: Predictors of public pro-environmental behavioral intentions in Singapore

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Applying the Theory of Planned Behavior and Media Dependency Theory: Predictors of Public Pro-environmental Behavioral Intentions in Singapore

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Applying the theory of planned behavior and media dependency theory, this study examines the effects of attitude, subjective norms, perceived behavioral control (PBC), media dependency, traditional media attention, Internet attention, and interpersonal communication on two types of pro-environmental behaviors (PEBs)—green-buying and environmental civic engagement. Regression analysis of a nationally representative survey of adult Singaporeans (N = 1168) indicated that attitude, PBC, media dependency, traditional media attention, and interpersonal communication were positively associated with green-buying. Notably, traditional media attention, as well as interpersonal communication, moderated the influence of media dependency on green-buying behavior. In addition, attitude, descriptive norms, media dependency, Internet attention, and interpersonal communication positively predicted environmental civic engagement. Findings suggest the importance of communication factors in the adoption of the two PEBs.

Keywords: *theory of planned behavior; pro-environmental behavior; media dependency; media attention; Internet; interpersonal communication*

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Introduction

Global climate change has contributed to serious environmental disasters that have claimed many lives and led to over US$200 billion in annual losses worldwide (Intergovernmental Panel on Climate Change, 2012). As many environmental problems are related to human activities, individuals have some responsibility to mitigate climate change (Vandenberg, 2004). Individuals can adopt various environmentally responsible behaviors including changes in consumption patterns and environmental activism to sustain the environment (Fielding, McDonald, & Louis, 2008). For example, the increased availability of green consumer products has given individuals more opportunities to purchase ecologically safe products to facilitate environmental protection (Alsmadi, 2007). Despite the urgent need for widespread behavioral changes, interventions to encourage these changes have met with limited success (Ockwell, Whitmarsh, & O'Neill, 2009).

With a few exceptions (e.g., Chan, 1998; Lowe et al., 2006), existing studies have focused narrowly on the role of knowledge in public pro-environmental behaviors (PEBs) and have not considered other factors that may influence behaviors, such as subjective norms, mass media use, interpersonal communication, and media dependency (Semenza et al., 2008). Chan (1998) found that attitudes, subjective norms, and perceived behavioral control (PBC) predicted people's intentions to recycle waste, and demonstrated mass media as an important source of subjective norms among Hong Kong residents. However, the study did not examine media dependency as a predictor of PEB intentions. Moreover, few studies have examined issues regarding environmental communication outside the context of Western societies. Lee (2008) suggests that examining environmental patterns in non-Western societies enables evaluation of how cultural context can influence individuals' PEBs. Thus, differences in sociocultural values and media environments make it worthwhile to examine factors that can motivate individuals to engage in PEBs in non-Western contexts, such as Singapore.

This study applies the theory of planned behavior (TPB; Ajzen, 1991) and media dependency theory (MDT; Ball-Rokeach & DeFleur, 1976)—which considers how attitudes, social norms, and PBC, as well as media use and dependency, influence behavioral intentions. MDT assumes that people will rely more on the mass media for information under certain conditions, such as the ready availability of alternative information sources (Ball-Rokeach & DeFleur, 1976; Loges, 1994). Such dependence on the media has been shown to predict changes in people's attitudes and behaviors (Lowrey, 2004).

We broadly define PEB as a behavior that could make a considerable difference or impact on the environment by either minimizing damages or maximizing benefits to the environment (Steg & Vlek, 2009). Stern (2000) classifies PEBs according to their occurrence in public and private spheres. Public-sphere behaviors include citizenship behaviors such as signing petitions to protect the environment. Private-sphere behaviors aim to affect the environment more directly by changing consumption patterns. Public- and private-sphere behaviors may require different communication

strategies to bring about positive behavioral outcomes. Steg and Vlek (2009) highlight factors such as normative concerns and contexts that could differentially affect various PEBs. To maximize effectiveness of pro-environmental interventions, communication messages should be carefully tailored to the target behavior and address specific underlying factors. This study will examine two categories of PEBs—environmental civic engagement and green-buying—that may further distinguish public- and private-sphere behaviors, respectively.

Study Context

Our study examines PEB in Singapore, a city-state of around 5 million residents, comprising Chinese, Malays, Indians, and several racial minorities (Singapore Department of Statistics, DOS, 2011). As one of the most globalized cities in the world, Singapore is westernized and cosmopolitan (Foreign Policy, 2010). Nonetheless, Singapore retains some of its Asian roots. The ruling government institutes a set of "Asian values," which emphasizes preference for social harmony and consensus, collective well-being, and respect for authority (Dalton & Ong, 2003). Singapore's mix of East and West offers a unique context to study effects of the media system and societal norms on individuals' PEBs.

As an urbanized, low-lying tropical island, Singapore is susceptible to the problem of rising sea levels and other effects of climate change (National Climate Change Secretariat, NCCS, 2012b). The environmental authorities in Singapore have leveraged on the mass media to initiate campaigns aimed at raising awareness and motivating environmentally responsible behavior among the public (e.g. National Environmental Agency, NEA, 2010).

Furthermore, Singapore is one of the most wired countries globally (Kluver & Banerjee, 2005). Government regulation of the Internet has been minimal (George, 2003). New media have given citizens more opportunities to express their political viewpoints (George & Raman, 2008), thus facilitating greater civic engagement among Singaporeans (Skoric & Poor, 2013). Therefore, new media may also influence issue-specific participation in environmental protection.

According to a public opinion poll conducted by the Singapore NCCS, 86% of Singaporeans believe that they play a part in taking action on climate change and 56% believe that individuals are most responsible for taking action (NCCS, 2012a). Rosenthal, Lee, Ho, and Detenber (2013) compared Singapore public opinion with the results of a Pew survey in the U.S., and found that over 90% of Singaporeans believed the Earth is getting warmer, whereas less than two-thirds of Americans expressed the same view. Despite this, Singapore recorded the highest carbon footprint among Asia-Pacific countries (World Wildlife Fund, 2012). Therefore, it is worthwhile to apply the TPB and MDT to examine how social-psychological factors will motivate Singaporeans to engage in PEBs. Findings of this study may benefit the development of pro-environmental intervention strategies.

Theory of Planned Behavior

Ajzen (1991) developed the TPB to understand the psychological underpinnings of volitional behavior. The TPB proposes three key antecedents of behavioral intention: attitudes, subjective norms, and PBC. It assumes that behavioral intention is a good proxy for actual behavior, which researchers have validated (e.g., Ajzen & Fishbein, 2005).

Attitudes are an individual's degree of liking or disliking a behavior object that guides consistent behavioral responses (Fishbein & Ajzen, 1975). Attitudes can reflect *instrumental* qualities (e.g., usefulness) and *experiential* qualities (e.g., pleasantness) of a behavior (Ajzen & Driver, 1992). Perceived utility drives some behaviors (e.g., brushing teeth), whereas enjoyment drives others (e.g., watching a movie); though, many behaviors reflect both orientations (Bellows-Riecken, Rhodes, & Hoffert, 2008).

Subjective norms are people's perception of the occurrence of a behavior among others, and the perception of others' approval or disapproval of certain behavior. Respectively, TPB labels these perceptions as *descriptive norms* and *injunctive norms*. Descriptive and injunctive norms can exist on both personal and societal levels. People can hold perceptions of the level of support of a certain behavior among their important referent groups and in society (e.g., Park, Klein, Smith, & Martell, 2009). Since people often make social comparisons of their behavior with their referent groups, they are more likely to be affected by beliefs about in-group than out-group behaviors (Yanovitzky, Stewart, & Lederman, 2006). Given the general finding that descriptive and injunctive norms have varying impacts on behavioral intentions (e.g., Ho, Poorisat, Neo, & Detenber, 2014; Park & Smith, 2007), it is meaningful to examine them as distinct factors.

PBC is individuals' judgments of their ability to perform specific actions, which can vary across situations (Ajzen, 1991). This concept is similar to perceived self-efficacy from social cognitive theory (Bandura, 1982). PBC predicts environmentally responsible behaviors (e.g., Tang, Chen, & Luo, 2011). A study of 27 countries found that perceived control over PEB significantly predicted people's willingness to sacrifice, which, in turn, predicted recycling behavior, refraining from driving, and environmental citizenship (Oreg & Katz-Gerro, 2006). Tikir and Lehman (2011) found that attitudes toward using public transportation and subjective norms explained about 30% of the variance in individuals' intention to use public transportation as a way of being environmentally friendly.

Numerous cross-cultural studies have shown that the TPB framework is generalizable to most contexts (e.g., Cheng & Ng, 2006; Hagger et al., 2007). Nonetheless, a few studies have demonstrated variations across cultures. For instance, Lee, Hubbard, O'Riordan, and Kim (2006) found that people in more collectivistic societies tend to place greater weight on subjective norms, while those in more individualistic societies tend to emphasize PBC with respect to smoking cessation. Nonetheless, the relative importance of each TPB component seems to rely more on the characteristic of the target behaviors under inquiry rather than cross-cultural differences (Cheng & Ng, 2006).

Since previous studies have shown the usefulness of TPB in describing the antecedents of PEB (e.g., Bamberg, Ajzen, & Schmidt, 2003; Kaiser, Hübner, & Bogner, 2005) and empirical evidence has supported the cross-cultural generalizability of TPB, we posit the following:

H1: Attitude toward pro-environmental behaviors is positively related to (a) green-buying and (b) civic engagement behavioral intentions.
H2: Descriptive norm is positively related to (a) green-buying and (b) civic engagement behavioral intentions.
H3: Injunctive norm is positively related to (a) green-buying and (b) civic engagement behavioral intentions.
H4: Perceived behavioral control is positively related to (a) green-buying and (b) civic engagement behavioral intentions.

Communication and PEB

Communication can play a role in motivating environmentally responsible behaviors, which researchers have noted of both the mass media (e.g., Hansen, 2011; Leiserowitz, 2004) and interpersonal communication (Nixon & Saphores, 2009). Furthermore, the extent to which people rely on media, or media dependency, can motivate behavior change (Lowrey, 2004). Therefore, it is worthwhile to examine the influence of communication factors on PEBs, in addition to the TPB constructs.

Media Attention

Media attention refers to people's tendency to consciously devote cognitive effort to particular types of media messages (Slater, Goodall, & Hayes, 2009). Several models of information processing and persuasion, such as the elaboration likelihood model (Petty & Cacioppo, 1986), propose that attention to message content is a necessary condition for persuasive effects. Eveland (2001) proposed in the cognitive mediation model that attention precedes cognitive elaboration and learning from media content. Thus, people's attention to media messages can affect persuasive and learning effects. Consequently, media attention has been regarded as an important predictor of message influence (Slater et al., 2009).

Recent studies have shown positive relationships between media use and PEBs. Holbert, Kwak, and Shah (2003) found that viewing of public affairs television content and fact-based programs such as nature documentaries generated positive effects on people's PEBs. Similarly, moviegoers reported higher motivation to engage in environmentally friendly behaviors after watching *The Day After Tomorrow* (Leiserowitz, 2004). Lowe et al. (2006) found that watching the film yielded short-term effects on people's attitudes toward climate change and their motivation to take mitigation action.

Pro-environmental media messages include news coverage and public intervention campaigns seeking to promote awareness of environmental issues and adoption of PEBs. We propose that people who attend more to environmental news are more

likely to elaborate on and acquire knowledge from the content. Similarly, attention to campaign messages can increase the likelihood of persuasive effects. Hence, we propose the following hypothesis:

H5: Attention to pro-environmental messages in traditional media is positively related to (a) green-buying and (b) civic engagement behavioral intentions.

We posit that attention to online content can yield similar media effects on PEBs. Zhao (2009) found that frequent users of the Internet tend to be more knowledgeable about environmental issues. The Internet allows environmental institutions to promote their campaigns to a diverse audience, and offers an online platform to deliberate about environmental issues and mobilize action (Zelwietro, 1998). People can easily participate in environmental causes online, for instance, by petitioning for an environmental cause (Schäfer, 2012). Websites with high interactivity and regular updates are particularly effective at enhancing environmental activities of online communities (Park & Yang, 2012). Online participation tends to extend to offline participation as well (Wellman, Haase, Witte, & Hampton, 2001). Therefore, we posit the following hypothesis:

H6: Attention to pro-environmental messages on the Internet is positively related to (a) green-buying and (b) civic engagement behavioral intentions.

Interpersonal Communication

Interpersonal communication can displace mass communication as a source of information to influence people's behaviors (Rogers, 2003). Research suggests that interpersonal discussion of topics such as health issues is related to risk perceptions, but does not offer enough insight regarding the direction of the relationship (Dunlop, Wakefield, & Kashima, 2008). Other research has recognized interpersonal communication as a source of social norms and perceived efficacy and has demonstrated its effects on people's attitudes and behaviors (e.g., de Groot & Steg, 2007; Kahlor, 2007).

Nixon and Saphores (2009) found that people who received information about recycling from family and friends were three times more likely to recycle than were people who received no information. This odds ratio was higher than that for any other information source. Moreover, people who discuss public affairs more frequently with others display higher levels of civic engagement (Ho et al., 2011; Scheufele, 2000). Therefore, we posit the following hypothesis:

H7: Interpersonal communication about the environment is positively related to (a) green-buying and (c) civic engagement behavioral intentions.

Media Dependency

Media attention alone is insufficient to model the effects of media on environmentally responsible behaviors. Some people may pay attention to media, but not feel that it instructs their behavior. The concept of media dependency can explain instrumental

media uses toward forming and performing PEB. Ball-Rokeach and DeFleur (1976) conceptualized MDT for application to multiple levels of analysis. The macro level is concerned with structural dependency relations between audiences, the mass media, and other social systems. MDT proposes that people will rely more on the mass media for information under conditions of uncertainty and societal disruptions, such as during natural disasters.

At the micro level, media dependency has an asymmetrical effect where the attainment of the goals and needs of individuals is contingent on the information resources controlled by social and media institutions (Ball-Rokeach, 1985). MDT suggests that certain factors can increase individuals' reliance on the media and, consequently, message effects, including the availability of alternative information sources and social contextual factors, such as the presence of threat (Morton & Duck, 2001).

However, few studies on media dependency at the individual level have considered these enhanced effects on people's attitudes and behaviors. Lowrey (2004) surveyed residents of a large U.S. city to examine media dependency following the September 11 terrorist attacks. Findings showed that individual-level media dependency significantly predicted changes in respondents' attitudes and behaviors.

Media coverage of contradicting perspectives and choice of news frames has contributed to public uncertainty about the causes and effects of climate change (Schuldt, Konrath, & Schwarz, 2011). Nonetheless, it is plausible that extensive news coverage of environmental issues might cultivate a climate of perceived risk in society by increasing public awareness about the impacts of climate change and other environmental problems (Hansen, 2011). Hence, we posit the following hypothesis:

H8: Media dependency is positively related to (a) green-buying and (b) civic engagement behavioral intentions.

MDT also suggests increased media effects on individuals, when media dependency is intensified due to increased attention during media exposure, as well as the likelihood of communication about the message after exposure (Ball-Rokeach, Rokeach, & Grube, 1984). However, due to the dearth of research on the interaction between media attention and media dependency, and also on the interaction between interpersonal communication and media dependency, we propose the following research questions:

RQ1: Do different levels of attention to traditional media differentially affect the relationship between media dependency and (a) green-buying and (b) civic engagement behavioral intention?

RQ2: Do different levels of attention to the Internet differentially affect the relationship between media dependency and (a) green-buying and (b) civic engagement behavioral intention?

RQ3: Do different levels of interpersonal communication differentially affect the relationship between media dependency and (a) green-buying and (b) civic engagement behavioral intention?

Method

We collected survey responses using random-digit-dialed computer assisted telephone interviews for one week in January 2011. The interviewers were trained undergraduates from a large public university in Singapore. The survey was conducted in the most frequently spoken languages in Singapore—English, Mandarin, and Malay—to ensure the inclusion of most Singaporeans' opinions (DOS, 2011). For each connected household, interviewers asked to speak with the youngest male, aged 18 years or above, who was at home. If no eligible male was present at the time of the call, interviewers asked to speak to the oldest female in the household. This within-household sampling technique has been effective in yielding nationally representative samples comparable with the population parameters in countries including the U.S. (Kennedy, 1993) and Singapore (Ho, Detenber, Malik, & Neo, 2012). In total, 1168 respondents completed the survey, with a response rate of 33.4% using AAPOR Formula 3. The age, gender distribution, and education of our sample were comparable to that of the general population.[1]

Measures

To measure respondents' PEB intentions, we modified nine items from the General Ecological Behavior scale (Kaiser, Doka, Hofstetter, & Ranney, 2003). Maximum likelihood exploratory factor analysis with oblique rotation returned two factors with eigenvalues greater than 1. The pattern matrix showed good simple structure. Items for each behavior had strong loadings on a single factor (mean λ = .72), and weak loadings on the other factor (mean λ = .03). The distinct factors corresponded with the concepts of "green-buying intentions" and "civic engagement intentions." For these and other composite measures, we used item averages.

Green-buying intentions

Five items measured respondents' intentions to engage in green-buying behaviors in the next 6 months. Respondents indicated their agreement with statements (1 = *strongly disagree*, 7 = *strongly agree*) about their intentions to buy products in refillable packages, products with green labels, products that come with minimal packaging, paper and plastic products that are made from recycled materials, and to avoid buying products which have potentially harmful environmental effects (M = 4.88, SD = 1.43, Cronbach's α = .88).

Civic engagement intentions

Respondents indicated their agreement (1 = *strongly disagree*, 7 = *strongly agree*) with four items regarding their intentions to contribute money to support an environmental group or organization, boycott companies known to harm the environment,

write a letter to the editor of a newspaper about the environment, and sign a petition in support of promoting the environment (M = 3.60, SD = 1.42, Cronbach's α = .78).

Attitudes toward PEBs

We adapted four items from a study by Ajzen (2006), which assessed respondents' belief that engaging in PEBs is enjoyable, beneficial, important, and pleasant (1 = *strongly disagree*, 7 = *strongly agree*; M = 5.08, SD = 1.42, Cronbach's α = .91).

Subjective norms

We modified six items from Park and Smith (2007) to measure descriptive and injunctive norms. To measure descriptive norms, respondents were asked to indicate their agreement with the statements that their family members, close friends, and the general public "engage in PEBs on a regular basis" (1 = *strongly disagree*, 7 = *strongly agree; M* = 3.97, SD = 1.26, Cronbach's α = .71). The measure of injunctive norms asked respondents to indicate their agreement with the statements that their family members, close friends, and the general public would approve of their engagement in PEBs (1 = *strongly disagree*, 7 = *strongly agree; M* = 4.67, SD = 1.35, Cronbach's α = .82).

PBC

Respondents indicated their agreement (1 = *strongly disagree*, 7 = *strongly agree*) with the following five statements: "it is possible for me to adopt…," "it is up to me whether I adopt…," "I believe I have complete control over adopting…," "if I wanted to, I could adopt…," and "I have the financial ability to adopt…" PEBs on a regular basis (M = 4.93, SD = 1.25, Cronbach's α = .85).

Attention to pro-environmental messages

Respondents reported how much attention they pay to pro-environmental messages in television, print newspapers, and the Internet (1 = *no attention at all*, 7 = *very close attention*). Three items referenced general pro-environmental messages, news about local environmental crises, and news about global environmental crises for each medium. We computed one variable to reflect *attention to pro-environmental messages in traditional media* (M = 4.45, SD = 1.48, Cronbach's α = .87) and one to reflect *attention to pro-environmental messages on the Internet* (M = 3.62, SD = 1.84, Cronbach's α = .96).

Interpersonal communication

Respondents reported the frequency of their interpersonal discussion with friends, family, and colleagues about environmental issues (1 = *never*, 7 = *all the time*; M = 3.37, SD = 1.47, Cronbach's α = .84).

Media dependency

We adapted eight items from Loges (1994) to measure respondents' reliance on print newspapers and television news. Respondents indicated their agreement with the four statements: Reading newspapers/watching television "helps me find out about climate change," "helps me observe how others deal with climate change," "gives me ideas about how to discuss the issue of climate change with others," and "helps me figure out how I can conserve the environment" (1 = *strongly disagree*, 7 = *strongly agree;* M = 4.81, SD = 1.30, Cronbach's α = .91).

Control variables

We included age (M = 39.39, SD = 14.23), gender (1 = female, 2 = male; 56.8% females), education level[2] (*Mdn* = 6 or "A-level," SD = 2.00), household income level (*Mdn* = 4 or "$3001 to $4000," SD = 3.04), and religious guidance as control variables. A single item measured religious guidance: "How much guidance does religion play in your everyday life?" (1 = *no guidance at all*, 7 = *a great deal of guidance*; M = 4.42, SD = 2.16).

Analytical Approach

We conducted ordinary least squares hierarchical regression analysis in SPSS. We analyzed two criterion variables—intentions to engage in (1) green-buying behavior and (2) environmental civic engagement—and four groups of predictor variables incrementally in the regression model. The four groups of predictor variables were (a) demographic variables; (b) TPB variables—attitudes, subjective norms, and PBC; (c) communication variables—interpersonal communication, Internet attention, traditional media attention, and media dependency; and (d) the interaction terms. We computed the interaction terms by multiplying the standardized scores of the communication variables with the standardized score of media dependency.

Results

Table 1 displays the hierarchical regression model predicting green-buying intention. We report coefficients for the final model and R^2 change for each step. Income was positively related to green-buying intention (β = .06, p < .05). Females were more likely than males to indicate green-buying intention (β = −.10, p < .001). Age, education, and religious guidance were not significantly related to green-buying intention. The demographic variables accounted for 8.20% of the variance in green-buying intention.

Regarding the TPB variables, attitude (β = .28, p < .001) and PBC (β = .08, p < .05) were positively associated with green-buying intention, supporting H1a and H4a. Descriptive and injunctive norms were not associated with green-buying intention. H2a and H3a were not supported. The TPB block explained 27.0% of the variance in green-buying intention.

Table 1. Hierarchical multiple regression predicting green-buying intention.

Variable	Zero-order correlation	Model 1		Model 2		Model 3	
		B(SE)	β	*B*(SE)	β	*B*(SE)	β
Block 1: Demographics							
Age	.07*	.01 (.00)	.07*	.00 (.00)	.01	.00 (.00)	.00
Gender (1 = female, 2 = male)	−.16***	−.43 (.08)	−.15***	−.31 (.07)	−.11***	−.29 (.07)	−.10***
Education	.08**	.04 (.02)	.06	.05 (.02)	.07*	.02 (.02)	.03
Income	.13***	.06 (.02)	.12***	.03 (.01)	.07*	.03 (.01)	.06*
Religious guidance	.19***	.12 (.02)	.18***	.03 (.02)	.05	.01 (.02)	.02
ΔR^2 (%)			8.20***				
Block 2: TPB variables							
Attitude	.53***			.34 (.04)	.35***	.28 (.03)	.28***
Descriptive norm	.42***			.18 (.04)	.16***	.08 (.04)	.07
Injunctive norm	.42***			.03 (.04)	.03	.03 (.04)	.03
PBC	.47***			.11 (.04)	.10**	.09 (.04)	.08*
ΔR^2(%)					27.0***		
Block 3: Communication							
Traditional media attention	.43***					.19 (.04)	.14***
Internet attention	.18***					.03 (.02)	.04
Interpersonal communication	.44***					.11 (.03)	.12***
Media dependency	.42***					.12 (.04)	.08**
ΔR^2(%)							5.60***
Block 4: Interactions							
Traditional media attention × media dependency	−.14***					−.06 (.03)	−.05*
Internet attention × media dependency	−.12***					−.22 (.03)	−.02
Interpersonal communication × media dependency	−.13***					−.07 (.03)	−.06*
ΔR^2(%)							.40***
Total R^2(%)							41.2***

Note: Cell entries are final standardized regression coefficients for Blocks 1, 2, and 3, and before-entry standardized regression coefficient for Block 4.
*$p < .05$. **$p < .01$. ***$p < .001$.

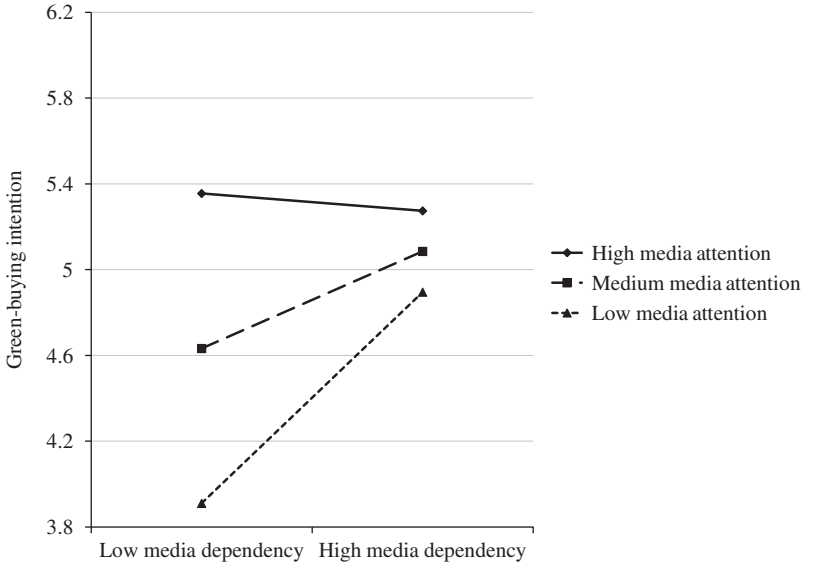

Figure 1. Interaction between media dependency and traditional media attention on green-buying intention.

Next, traditional media attention ($\beta = .14$, $p < .001$), interpersonal communication ($\beta = .12$, $p < .001$), and media dependency ($\beta = .08$, $p < .01$) were positively related to green-buying intention, which supported H5a, H7a, and H8a. However, Internet attention was not associated with green-buying, failing to support H6a. The communication block explained 5.60% of the variance in green-buying intention.

Finally, the model tested for interaction effects. The interaction of traditional media attention and media dependency ($\beta = -.05$, $p < .05$), and the interaction of interpersonal communication and media dependency ($\beta = -.06$, $p < .05$) were significantly associated with green-buying intention. However, the interaction between Internet attention and media dependency on the outcome variable was not significant. Figure 1 depicts the regression of green-buying intention on media dependency at three levels of media attention. The figure shows that media dependency had the strongest positive effect on green-buying when media attention was low. Put simply, the relationship between media dependency and green-buying was stronger for those who pay less attention to traditional media than for those who pay more attention. Likewise, Figure 2 shows the regression of green-buying intention on media dependency at three levels of interpersonal communication. Media dependency had the strongest positive effect on green-buying intention when interpersonal communication was low. The overall regression model accounted for 41.2% of the variance in green-buying intention.

Table 2 shows the hierarchical regression model predicting environmental civic engagement intention. Among the control variables, age ($\beta = .06$, $p < .05$) and religious guidance ($\beta = .08$, $p < .001$) were positively, and education ($\beta = -.07$, $p < .01$) was negatively related to civic engagement. Gender and income were not

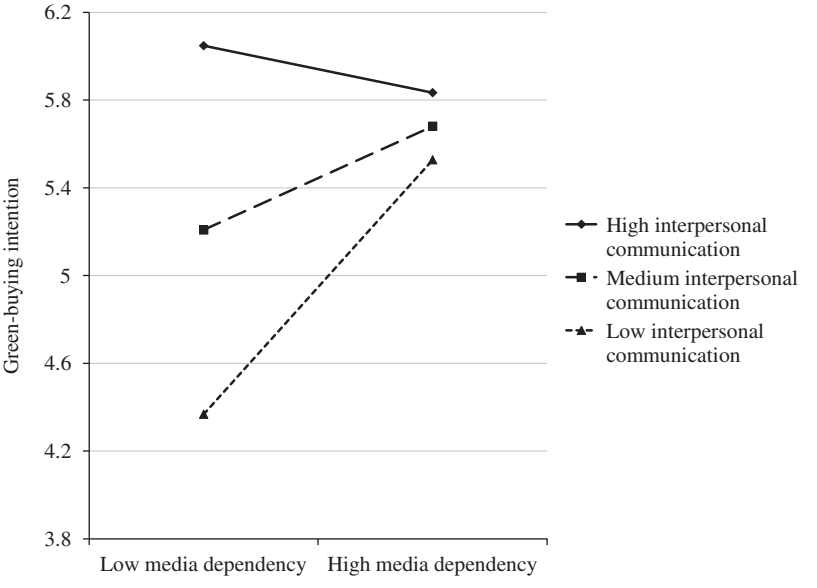

Figure 2. Interaction between media dependency and interpersonal communication on green-buying intention.
Note: Estimated values, which controlled for all the demographic and independent variables, are depicted in the figures. Scale ranges were only partially displayed on the *Y*-axis for both figures.

significantly related to civic engagement. The demographic variables accounted for 8.40% of the variance in civic engagement intention.

Regarding the TPB variables, attitude (β = .23, p < .001) and descriptive norms (β = .20, p < .001) were positively related to civic engagement intention, supporting H1b and H2b. However, injunctive norm and PBC were not significantly related to civic engagement intention. H3b and H4b were not supported. The TPB block explained 25.9% of the variance in civic engagement intention.

For the communication variables, Internet attention (β = .10, p < .001), interpersonal communication (β = .19, p < .001), and media dependency (β = .12, p < .001) were positively associated with civic engagement intention, supporting H6b, H7b, and H8b. Traditional media attention, however, was not associated with civic engagement. H5b was not supported. The communication block explained an additional 6.40% of the variance in civic engagement intention. For RQ1b, RQ2b, and RQ3b, none of the interaction effects on civic engagement was significant. The regression model explained a total of 40.8% of the variance in civic engagement intention.

Discussion

This study contributed to existing research by considering communication variables with TPB variables that might motivate green-buying and environmental civic engagement. Results indicated that attitude, PBC, media dependency, traditional

Table 2. Hierarchical multiple regression predicting environmental civic engagement.

Variable	Zero-order correlations	Model 1		Model 2		Model 3	
		B(SE)	*β*	*B*(SE)	*β*	*B*(SE)	*β*
Block 1: Demographics							
Age	.14***	.01 (.00)	.10***	.01 (.00)	.05	.01 (.00)	.06*
Gender (1 = female, 2 = male)	−.07*	−.10 (.08)	−.04	.07 (.07)	.01	.05 (.07)	.02
Education	−.08**	.04 (.02)	−.05	.02 (.02)	−.03	−.05 (.02)	−.07**
Income	−.02	.01 (.02)	.02	−.00 (.01)	−.01	−.01 (.01)	−.01
Religious guidance	.26***	.16 (.02)	.24***	.07 (.02)	.11***	.05 (.02)	.08***
ΔR^2 (%)			8.40***				
Block 2: TPB variables							
Attitude	.49***			.30 (.04)	.30***	.23 (.03)	.23***
Descriptive norm	.50***			.35 (.04)	.31***	.22 (.04)	.20***
Injunctive norm	.43***			.03 (.04)	.03	.04 (.04)	.03
PBC	.38***			−.03 (.04)	−.02	−.05 (.04)	−.04
ΔR^2(%)					25.9***		
Block 3: Communication							
Traditional media attention	.37***					.02 (.04)	.01
Internet attention	.18***					.08 (.02)	.10***
Interpersonal communication	.48***					.18 (.03)	.19***
Media dependency	.41***					.17 (.04)	.12***
ΔR^2(%)							6.40***
Block 4: Interaction							
Traditional media attention × media dependency	−.07*					−.02 (.03)	−.02
Internet attention × media dependency	−.11					−.06 (.03)	−.04
Interpersonal communication × media dependency	−.05					−.01 (.03)	−.01
ΔR^2(%)							.00
Total R^2(%)							40.8***

Note: Cell entries are final standardized regression coefficients for Blocks 1, 2, and 3, and before-entry standardized regression coefficient for Block 4.
*$p < .05$. **$p < .01$. ***$p < .001$.

media attention, and interpersonal communication were positively associated with green-buying intention. Furthermore, traditional media attention and interpersonal communication moderated the influence of media dependency on green-buying. Attitude, descriptive norms, media dependency, Internet attention, and interpersonal communication positively predicted civic engagement intention.

Overall, our findings partially supported the TPB in predicting PEB intention. Consistent with findings of previous studies (Gatersleben, Steg, & Vlek, 2002; Litvine & Wüstenhagen, 2011), attitude and PBC positively predicted green-buying intention. These results suggest that Singaporeans are more likely to engage in green-buying if they associate green-buying with positive outcomes and feel it is within their control. We suspect that perceptions of behavioral control may reflect the increased availability of green label consumer products in the marketplace, though we cannot be certain of this effect without a longitudinal study.

Contrary to our expectations, we found that descriptive and injunctive norms were not related to green-buying. One possible explanation may lie in how people learn about environmental issues. Since green-buying is a private-sphere behavior, people are often limited in their opportunities to directly observe how other people engage in green-buying. Thus, people's observations of others making environmentally friendly purchases may be indirect, coming largely from the mass media or from hearing other people talk about it. Descriptive norm was significantly correlated with all the communication variables, indicating possible shared variance between the two sets of variables. As observation of others is the basis of a descriptive norm, it is unsurprising that communication variables explained away the effect of descriptive norm on green-buying intention. These findings are consistent with previous studies that show attitude to be a much stronger and consistent predictor of behavioral intention than subjective norm (Armitage & Conner, 2001). Overall, our findings highlight the importance of attitude and PBC in the context of green-buying.

Both attitudes and descriptive norm positively predicted civic engagement, which concurs with previous studies (e.g., Fielding et al., 2008) and suggests that attitude plays a role in motivating environmental civic engagement among Singaporeans. The positive association between descriptive norm and civic engagement suggests that individuals are more likely to engage in environmental activism if they believe that others are doing so. However, our findings showed that injunctive norm and PBC were unrelated to civic engagement. The political climate of Singapore might explain the non-significant association between PBC and civic engagement. Singaporeans might perceive engagement in environmental activism to be challenging—a belief that stems from reluctance to engage in civic activities in general. Hence, perceived barriers might account for the non-significant association between PBC and civic engagement behavior in the context of climate change. Overall, our findings show that the predictive power of the TPB model varies among sub-types of PEBs. Future research might seek to identify characteristics that differentiate various sub-types and clarify antecedents of PEB intention and actual behavior.

We found that various communication factors can influence green-buying and environmental civic engagement intentions. Our analyses yielded mixed results for the effects of traditional media attention and Internet attention on our two outcome variables. Attention to pro-environmental messages in newspapers and on television predicted green-buying, while attention to pro-environmental messages on the Internet predicted civic engagement. These findings suggest that communication factors can be important determinants of PEB, though their influence varies across sub-types of PEB. Nonetheless, our findings corroborate current views of the importance of mass media in shaping public opinion and behavior regarding the environment (Hansen, 2011). The mass media in Singapore frequently run campaigns to raise public awareness of environmental conservation and to offer environmental friendly guidelines to the public. Since research has shown that individuals who pay attention to media content tend to elaborate and learn from media messages (Eveland, 2001; Ho, Peh, & Soh, 2013), it is unsurprising that attention to pro-environmental messages in traditional media predicts green-buying.

However, we found that Internet attention, instead of traditional media attention, predicted environmental civic engagement. This finding comports with prior findings that Internet use for informational purposes promotes higher levels of social capital (Shah, Kwak & Holbert, 2001). Moreover, it is convenient for people to participate in environmental causes on the Internet by donating and signing petitions to support environmental organizations. People who are involved with online political activities tend to be involved with offline political activities as well. Conversely, traditional media messages in Singapore tend to discourage political participation among citizens as a reflection of the local political climate. The traditional media in Singapore is oriented to serve government interests (Lee, 2010). Tight government control over public discourse in Singapore has affected how the citizens engage with political issues (Sim, 2006). Civic engagement is low in Singapore, and Singaporeans feel indifferent and apathetic toward civic participation (Skoric & Ng, 2009). In contrast, the Internet is relatively unregulated in Singapore. With few exceptions (e.g., regarding subjects of race, religion, and politics), the government minimally restricts public discourses online. Such relative laxity might explain the positive relationship between Internet attention and environmental civic engagement.

Our study also found that interpersonal communication is positively associated with PEB intentions, which is consistent with prior findings (e.g., Nixon & Saphores, 2009). Our finding that interpersonal communication predicted green-buying and civic engagement intentions suggests that interpersonal communication may play an integral role in pro-environmental campaigns. Prior research suggests that interpersonal communication can substitute mass media sources in terms of generating attitudinal and behavioral outcomes (e.g., Lee, 2010). Moreover, interpersonal communication can mediate the effect of mass media messages in raising issue awareness (Binder, 2010) and promoting desirable behaviors (Boster, Carpenter, Andrews, & Mongeau, 2012).

Finally, media dependency was positively associated with green-buying and civic engagement intentions, which substantiates the notion that people may turn to the media for informational and behavioral guidance. Perceived threats of environmental risks may heighten people's reliance on media for information about the environment. Such a process would be consistent with MDT (Morton & Duck, 2001). This finding illustrates the instrumental role of media dependency in motivating PEB.

Moreover, media dependency had the strongest positive effects on green-buying intention when traditional media attention and interpersonal communication are low. This suggests that people with high media dependency are likely to surround themselves with media messages, as they believe that the mass media would instruct their behavior and provide understanding. Immersion in a mediated environment gives highly media-dependent people greater opportunities to encounter pro-environmental media messages, without necessarily devoting full attention to the content. Studies have shown that inattentive processing often occurs during mere encounter with television messages (Eveland, 2002; Kosicki & McLeod, 1990). Therefore, it is possible that inattentive processing of media content among highly media-dependent people could enhance their green-buying intention. This implies that instilling a greater reliance on the media for pro-environmental messages among the public may be beneficial for campaigners as it can activate those who pay less attention to traditional media and those who infrequently discuss environmental issues with others to engage in PEBs.

The interaction between Internet attention and media dependency on green-buying intention was not significant. We suspect this null finding partly reflects our measurement of media dependency, in which the items reflected reliance on print and broadcast media, and not on the Internet. Mass media in Singapore typically do not contain messages that promote civic engagement, which could explain why the interaction effects for environmental civic engagement were non-significant.

Some findings from this study may be generalizable to populations in other major Asian cities such as Hong Kong and Shanghai. Like Singapore, these Asian cities are international financial and business hubs, with strong economic fundamentals and infrastructure (World Economic Forum, 2012). These cosmopolitan cities have retained many Asian beliefs and values (Chia et al., 2007). Given that prior research has supported the generalizability of TPB, it is reasonable to generalize our TPB-related findings to some other Asian cities. Additionally, recent studies have shown that the Internet can facilitate online civic engagement among citizens in digital East Asian cities (e.g., Lin, Cheong, Kim & Jung, 2010). Therefore, our finding that Internet attention predicts environmental civic engagement among Singaporeans may be generalizable to some of these Asian cities. Nonetheless, traditional media can vary widely among Asian territories, ranging from high press freedom in places like Hong Kong and South Korea to low press freedom in countries such as Mainland China and Singapore (Freedom House, 2013). Hence, future research might replicate this study in other Asian countries to clarify the role of communication factors in PEB intentions.

Our study has a number of limitations. First, our analysis of cross-sectional data prevents causal inference. Although our regression analyses imply that the variance in the dependent variable is due to its antecedents, we could just as easily analyze the opposite causal sequence. A longitudinal survey or experimental design could clarify causation. Second, our media dependency measures excluded Internet dependency. Future research will need to include it to better understand the effects of Internet dependency and attention on PEBs. Third, our study applied TPB and MDT in the context of PEB without fully integrating both theories. Future studies could better extend the TPB by integrating its key constructs with the communication variables and examining how pro-environmental information-seeking behaviors relate to informational subjective norms and perceived information gathering capacity.

Despite this, our study has practical implications for environmental campaign management. Policymakers might achieve their goals more effectively by using various communication channels to stimulate PEBs among the public. Opinion-leader campaigns, which combine traditional media strategies with the recruitment of opinion leaders, could be developed to raise awareness about environmental issues and to mobilize environmental activism. These opinion leaders could extend their influence in the offline and online contexts. Studies have shown that careful training and monitoring of opinion leaders can produce an effective two-step flow influence to promote more public dialogue and PEB (e.g., Nisbet & Kotcher, 2009). Moreover, our results show that religious guidance may motivate environmental civic engagement. Therefore, religious leaders could be important opinion leaders that campaigners could recruit to mobilize environmental activism.

Environmental groups and policymakers can buttress efforts to organize public engagement efforts regarding environmental issues, since the impact of such public outreach often extends beyond the immediate participants (e.g., Besley, Kramer, Yao & Toumey, 2008). Citizen engagement programs could be initiated, in which participants could disseminate information about environmental sustainability with their friends, coworkers, and family through interpersonal discussion after attending the program. Increasing public dependency on the media can enhance PEB. Elevated media coverage of climate change risk may drive media dependence, which could influence green-buying and other private-sphere behaviors. Practitioners should continue to develop campaigns that aim to cultivate positive attitudes toward PEBs. Campaign messages may instill self-efficacy beliefs by telling the public where they could purchase green products, for instance. Finally, campaigners could leverage on the highly interactive features of the Internet, such as social media, as an effective way of stimulating pro-environmental civic engagement.

Notes

1. Our sample demographics are similar in terms of age and education to the characteristics of the 2010 Singapore population census (DOS, 2011). The median age in our sample was 39 years as compared to 37.4 years in the census. The median education level attained in the census was secondary education while the median education level of our respondents was "A-Level." There

were some differences in the variables of gender and household income. Female respondents in our sample (56.8%) were slightly overrepresented as compared to the census (50.6%). The median household income reported in the Singapore census was $5000, but "$3001 to $4000" among our respondents. These differences are not of major concern, as we will be treating them as control variables in our study.

2. Education levels were 1 = "No formal education," 2 = "Primary 6 or below," 3 = "Some secondary education," 4 = "N-Level/ITE," 5 = "O-Level," 6 = "A-Level," 7 = "Diploma," 8 = "Degree," and 9 = "Postgraduate." A-Level is roughly equivalent to an associate's degree in the USA.

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