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Green consumer segmentation: consumer motivations for purchasing pro-environmental products

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ABSTRACT

The purpose of this study is to segment US green consumers based on their personal, social, and environmental motivations for purchasing pro-environmental products. By using two-step cluster analysis, this study revealed six green consumer segments, each with a distinct combination of motivations. The different segments display a wide range of demographic characteristics, knowledge of pro-environmental products, pro-environmental product use behavior, skepticism, and attitudes toward pro-environmental advertising. This study found that green consumers, who have strong environmental motivations, have high knowledge about pro-environmental products, use a higher number and more varied selection of such products, tend to have less skepticism toward pro-environmental advertising, and have more positive attitudes toward such advertising. The study expands the motivations used in green consumer segmentation, delivering a more detailed analysis of the drivers of green consumer behavior. It also helps to explain the contradictions in the literature as to whether or not green consumers are open to or skeptical of green advertising.

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Green consumption is a social phenomenon in which consumers consider the environmental impacts of products on present and future generations (Carman and Cheng 2016; Mostafa 2006; Yang et al. 2015). In line with this phenomenon, increasing numbers of consumers are showing an interest in pro-environmental products that provide fewer environmental hazards during the production, consumption, and disposal phases (Marcacci 2013; Nastu 2007). Much scholarly work has defined those who consume pro-environmental products as ‘green consumers’ and identified which sociodemographic, psychographic, attitudinal, and behavioral characteristics they have (Baber 2014; Chan 1999; Park and Lee 2014; Shrum, McCarty, and Lowrey 1995).

In addition, green segmentation studies have provided more detailed descriptions of green consumers by highlighting the differences between various groups of green consumers (Chan 1999; Finisterra do Paco and Barata Raposo 2010; Modi and Patel 2013; Wulandari et al. 2012). Most of the studies grouped green consumers based on their greenness, such as environmental concern, environmental knowledge, and pro-environmental behaviors (Barber 2014; Finisterra do Paco, Barata Raposo, and

Filho 2009; Modi and Patel 2013; Mostafa 2009; Park and Lee 2014; Wulandari et al. 2012). The studies consistently provided the following segments of green consumers: non-green, ambiguous/reluctant green, and truly green consumers (Chan 1999; Finisterra do Paco and Barata Raposo 2010; Modi and Patel 2013; Wulandari et al. 2012). Given the segments of green consumers, pro-environmental characteristics are considered important in order to identify them. It is believed that environmental motivation, such as environmental concern, is a strong driver for pro-environmental purchasing.

However, some studies have found that various motivations, such as health concerns, economic benefits, social status, social norms, and collectivism, lead to pro-environmental purchasing besides environmental motivation (Chen and Wei 2012; Jansson, Marell, and Nordlund 2010; Park and Lee 2016; Tseng and Tasi 2011). A variety of motivations raise the possibility that green consumers may purchase pro-environmental products less from environmental motivation, but more from other strong motivations. This means that using only environmental motivation as a segmenting criterion makes it difficult to identify the different segments of green consumers who may be driven by other motivations. For example, a few studies on green segmentation applied self-enhancement motives, which involve a desire to be shown as a better person to other people, as a segmenting criterion and revealed an interesting group of green consumers who purchase pro-environmental products to enhance their personal images (Barber 2014; Yildirim and Candan 2015). Thus, using various motivations as segmenting criteria can contribute to finding unexplored segmentations of green consumers.

Furthermore, green consumer segmentation can offer a new approach to understanding consumer skepticism toward pro-environmental advertising. Green consumers' skepticism toward pro-environmental advertising is an ongoing scholarly debate, with one group of researchers insisting that green consumers are skeptical of pro-environmental advertising (Finisterra do Paco and Reis 2012; Shrum, McCarty, and Lowrey 1995; Zinkhan and Carlson 1995) and the other arguing that green consumers are not (Matthes and Wonneberger 2014; Mohr, Eroğlu, and Ellen 1998). Their contradictory views of green consumers' skepticism are used to support the opposing researchers' assertions regarding how green consumers evaluate pro-environmental advertising, with different findings revealing both positive and negative attitudes toward pro-environmental advertising (Finisterra do Paco and Reis 2012; Johnstone and Tan 2015; Zinkhan and Carlson 1995). These previous studies have mainly focused on whether green consumers are skeptical or not, and have overlooked the possibility that green consumers vary in their skepticism toward pro-environmental advertising. Segmenting green consumers can help demystify the wide spectrum of their attitudes and behaviors, which in turn can influence interpretations of whether green consumers are skeptical of pro-environmental advertising.

This study will therefore apply personal (i.e. health concerns, economic benefits, and social status), social (i.e. social norms and collectivism), and environmental motivations (i.e. environmental concerns and personal environmental responsibility) as segmenting criteria. Based on these criteria, this study will then group green consumers and describe the characteristics of each segment of green

consumers as follows: demographics, pro-environment product use behavior, knowledge of pro-environmental products, skepticism, and attitudes toward pro-environmental advertising. In doing so, the study will reveal new types of green consumers with the combinations of their motivations. With that, this study will also contribute to improving our understanding of the variety of green consumers. Practically, this study will recommend appropriate target consumers for pro-environmental advertising and suggest an advertising strategy for the target consumers.

Green consumers

Green consumers have been described in relation to various factors, including socio-demographic, psychographic, attitudinal, and behavioral factors (Baber 2014; Chan 1999; Park and Lee 2014; Shrum, McCarty, and Lowrey 1995). Early researchers tried to classify green consumers using sociodemographic factors such as gender, age, education, and income (Diamantopoulos et al. 2003; Jain and Kaur 2006; Shrum, McCarty, and Lowrey 1995; Zinkhan and Carlson 1995). To a large extent, while researchers did not provide consistent descriptions of green consumers in terms of gender and age (Straughan and Roberts 1999), they asserted that education and income were significant factors in defining green consumers (Barber 2014; Chan 1999; Park and Lee 2014; Straughan and Roberts 1999). Specifically, green consumers were deemed to have high levels of education (i.e. college degrees or higher) and/or above-average household incomes (Barber 2014; Chan 1999).

Nevertheless, as psychographic and attitudinal factors were considered more relevant in later research to explain consumers' pro-environmental purchasing behaviors (Barber 2014; Diaz-Rainey and Ashton 2011), the importance of sociodemographic factors to identify green consumers decreased (Granzin and Olson 1991). Subsequent research has therefore applied various psychographic characteristics (e.g. locus of control, perceived consumer effectiveness, and altruism) and attitudinal factors (e.g. environmental concerns and perceived environmental responsibility) to describe green consumers (Cleveland, Kalamas, and Laroche 2005; Dagher and Itani 2014). As a result, green consumers are defined as environmentally concerned (Awad 2011; Finisterra do Paco and Barata Raposo 2010), altruistic (Mostafa 2009), high in perceived environmental responsibility (Park and Lee 2014), and perceiving high consumer effectiveness (Apaydin and Szczepaniak 2017; Finisterra do Paco and Barata Raposo 2010).

Some studies have used consumers' actual green purchasing and pro-environmental behaviors (e.g. recycling) to define green consumers (Chan 1999; Finisterra do Paco and Barata Raposo 2010; Modi and Patel 2013; Wulandari et al. 2012). These studies classified green consumers as those who have used pro-environmental products (Chan 1999; Finisterra do Paco and Barata Raposo 2010; Thompson et al. 2009) or those who are engaged in general pro-environmental behaviors (e.g. energy conservation and recycling) (Modi and Patel 2013; Wulandari et al. 2012). According to their findings, such consumers tend to perceive pro-environmental purchasing as one way to protect the environment and are accordingly willing to purchase pro-environmental products (Kim and Choi 2005; Mostafa 2006).

Green consumer segmentation

Using psychographic, attitudinal, and behavioral factors, previous studies have segmented green consumers as well as profiled each segment (Chan 1999; Finisterra do Paco and Barata Raposo 2010; Modi and Patel 2013; Wulandari et al. 2012). These studies provided consistent subgroups of green consumers, for example, truly green consumers, ambiguous/reluctant green consumers, and non-green consumers (Barber 2014; Finisterra do Paco, Barata Raposo, and Filho 2009; Modi and Patel 2013; Mostafa 2009; Park and Lee 2014; Wulandari et al. 2012). In terms of differentiation, truly green consumers are conscious of environmental issues, feel a sense of responsibility toward environmental problems, have positive attitudes toward pro-environmental activities, and engage in various pro-environmental behaviors (Chan 1999; Thompson et al. 2009; Zinkhan and Carlson 1995). From a sociodemographic perspective, truly green consumers are usually highly educated (i.e. college degree or higher) and have high household incomes (Barber 2014; Chan 1999). On the other hand, non-green consumers are described as people who are not interested in environmental issues and thus do not feel the need to protect the environment and tend not to behave pro-environmentally (Park and Lee 2014; Wulandari et al. 2012).

Consumers who have ambiguous/reluctant attitudes toward pro-environmental purchasing generally demonstrate an understanding of the importance of pro-environmental consumption and have both environmental concerns and a desire to protect the environment (Modi and Patel 2013; Barber 2014). However, they hesitate to purchase pro-environmental products because of perceived barriers (e.g. concerns about product quality, high prices, lack of availability, and skepticism toward pro-environmental advertising) (Gleim et al. 2013; Johnstone and Tan 2015; Park and Lee 2014). In a similar vein, Apaydin and Szczepaniak (2017) revealed that potential green consumers are concerned about and have knowledge of environmental issues; however, they perceive their individual behaviors, such as pro-environmental purchasing, as having minor contributions to environmental protection. Thus, potential green consumers tend to engage less in pro-environmental behaviors.

Green consumers' motivations for purchasing pro-environmental products

Consumer purchasing behavior is often complex and may be driven by multiple motivators. Some of these motivators may not be obvious or directly related to the function of a product. We subdivide possible motivators for pro-environmental product purchasing into three broad areas: personal motivation, social motivation, and environmental motivation to illustrate the potential range of motivators discussed in the literature.

Personal motivation

Economic motivation indicates the desire of consumers to derive the maximum economic benefit from their purchases, for example, saving money when using a product. In their decision-making process, consumers consider the price and quality of a range

of products and tend to choose the ones that are most appropriate for their requirements (Osterhus 1997). For instance, they might choose a high-quality product if the product prices are similar or a low-price product if the product quality is similar. Some green consumers choose pro-environmental products (e.g. energy-efficient light bulbs and water-saving showerheads) over regular products when they can obtain a greater benefit from using such products in the short term as well as over the long term (Bonini and Oppenheim 2008; Jansson, Marell, and Nordlund 2010; Peattie 2001; Tseng and Tasi 2011).

The desire for a higher *social status* or to project a particular image can also motivate consumers to purchase pro-environmental products. Some consumers believe that using pro-environmental products will help them develop a socially desirable image in society, leading to the subsequent purchase of such goods (Bertrandias and Elgaaied-Gambier 2014; Dagher and Itani 2014; Park and Lee 2016; Yang et al. 2015). Given their desire for social status, these green consumers prefer purchasing pro-environmental products in public settings (e.g. with other people) rather than privately (e.g. alone or online) (Griskevicius, Tybur, and Van den Bergh 2010). Similarly, they prefer conspicuous pro-environmental products (e.g. hybrid cars and eco-bags) rather than inconspicuous products (e.g. household electronic appliances and recycled toilet paper) (Park and Lee 2016). These green consumers clearly purchase pro-environmental products to show others and create a pro-environmental personal image.

Health concerns were recently identified as one of the primary reasons consumers buy pro-environmental products (Liu, McCarthy, and Chen 2016; Nasir and Karakaya 2014; Teng and Lu 2016). Such consumers worry about the negative health impacts associated with the use of certain products (Bonini and Oppenheim 2008; Chen and Wei 2012; Liu, McCarthy, and Chen 2016), leading them to purchase both health- and environment-oriented products, for example, natural cosmetics, non-toxic laundry detergents, organic foods, and organic cotton clothing (Bonini and Oppenheim 2008; Chen and Wei 2012; Liu, McCarthy, and Chen 2016). By using these products, green consumers hope to obtain health benefits and avoid the potential health risks associated with the use of regular products (Michaelidou and Hassan 2008; Nasir and Karakaya 2014). These green consumers therefore feel more secure about their product purchases.

Social motivation

Social norms dictate which behaviors are deemed appropriate in society and motivate members of society to engage in these behaviors (Ajzen 1991; Liu et al. 2012; Osterhus 1997). When the majority of members of society or powerful members in a group support specific behaviors, other members may feel pressure to follow the behaviors as they perceive the behaviors to be the social norm. By following the social norm, they feel like they are members of the society (Venkatesh and Davis 2000). Pro-environmental behaviors (e.g. recycling and carpooling) can be considered social norms (Macovei 2015; Liu et al. 2012; Sharma and Gadenne 2014) when members of society perceive environmental protection as important and pro-environmental behaviors as requirements to be considered a good citizen. For example, pro-environmental

social norms can be established by peer groups' or parents' pro-environmental activities (Lee 2008). Lee (2008) showed that adolescents with friends who follow pro-environmental lifestyles are more likely to purchase pro-environmental products; the pro-environmental social norms lead them to engage in pro-environmental behaviors (Kim et al. 2016; Liu et al. 2012; Sharma and Gadenne 2014).

Collectivism can motivate people to engage in pro-environmental behaviors (Chan 2001; Mostafa 2006; Schuitema and De Groot 2015). In societies that value collectivism, people support public welfare initiatives and prioritize the happiness of society as a whole (Chan 2001; Leonidou, Leonidou, and Kvasova 2010). In addition, they tend to broadly perceive 'we' as including current and future generations, and even nature. Collectivism thus triggers consumers' positive attitudes toward environmental activities and pro-environmental products (Mostafa 2006), leading to pro-environmental behaviors (Chan 2001; Mostafa 2006; Schuitema and De Groot 2015). Although these prior studies investigated the impacts of collectivism in eastern countries (e.g. China), collectivism is a common value that can also be shared in Western countries such as the US and can thus influence these consumers' pro-environmental product purchasing decisions.

Environmental motivation

By definition, *environmental concern* is 'an individual's general orientation toward the environment and an individual's concern level as to environmental issues' (Kim and Choi 2005, 593). Environmental concern is widely used as a factor to explain why people engage in pro-environmental behaviors (e.g. recycling, the use of public transportation, energy saving, and the purchase of pro-environmental products) (Phau and Ong 2007; Reich and Armstrong Soule 2016). Several prior studies have shown that environmental concerns strongly motivate individuals to invest their energy in the protection of the environment (Mostafa 2006; Newton et al. 2015; Suki and Suki 2015). Consumers with high levels of environmental concern therefore tend to actively engage in a variety of pro-environmental behaviors, including pro-environmental purchasing (Hartmann and Apaolaza-Ibañez 2009; Mainieri et al. 1997; Newton et al. 2015).

Personal environmental responsibility is considered a personal norm in terms of environmental protection. Regardless of social norms, consumers whose internal obligations imbue them with a personal sense of responsibility toward the environment are highly likely to take action to minimize environmental pollution and enhance environmental conditions (Fransson and Garling 1999; Granzin and Olsen 1991). These consumers show a strong willingness to behave pro-environmentally. Indeed, when they do not behave pro-environmentally, they tend to feel guilty since they believe that they have negatively affected the environment (Stern et al. 1999). It follows that consumers with a high sense of personal environmental responsibility tend to purchase pro-environmental products (Carman and Cheng 2016; Dagher and Itani 2014).

Based on the above discussion, green consumers have a wide variety of motivations to purchase pro-environmental products, leading to diverse pro-environmental purchasing behaviors. Nevertheless, previous studies have focused on environmental motivations to segment green consumers and have failed to consider other

motivations. Although the previous studies found different green consumer segments in terms of level of engagement in pro-environmental purchasing, using various motivations can unveil more diverse groups of green consumers with unique sets of motivations. By exploring the more diverse green consumer segments, we gain a better understanding of how different types of green consumers respond to pro-environmental advertising, specifically regarding skepticism and attitudes toward advertising. Furthermore, the understanding of green consumers can support the development of tailored pro-environmental advertising strategies for each segment. The following research questions are therefore proposed:

RQ1: How can green consumers be segmented into subgroups based on their personal, social, and environmental motivations?

RQ2: How are the following characteristics different depending on the subgroups of green consumers?

- a. Demographics
- b. Pro-environmental product use behavior
- c. Knowledge of pro-environment products
- d. Skepticism toward pro-environmental advertising
- e. Attitude toward pro-environmental advertising

Method

Survey procedure

An online survey was conducted. The survey participants were recruited via Amazon Mechanical Turk (hereafter MTurk). MTurk participants' approval rates and approved assignments were used to access qualified survey participants and to obtain high-quality data (Peer, Vosgerau, and Acquisti 2014; Shank 2016). Specifically, only those who had an approval rating of over 95% and more than 100 approved assignments participated in the surveys by using MTurk's qualification functions. Also, since the survey aimed to collect data from US consumers, the country in which the MTurk participants lived was restricted to the US only. The survey took about 20 minutes to complete.

Survey participants

A total of 408 participants who had experience with purchasing and using pro-environmental products responded to the online survey. To find green consumers, the following screening questions were used: the first question queried whether they had ever previously purchased pro-environmental products; the second question sought to determine which categories of pro-environmental products they had purchased by using a 'check all that apply' format; and third, an open-ended question was used to ask the participants to specify all the pro-environmental products that they currently use. Most of the participants were white/Caucasian ($n=328$ or 80.4%). Both males and females were evenly included in the sample; for males, $n=198$ or 48.5%, and for females, $n=210$ or 51.5%. The average age of the participants was 37.75 years ($SD=10.90$), with ages ranging from 19 to 84 years. In addition, more than

half of the participants had attained a four-year college degree ($n=228$ or 55.9%). Last, in terms of household income, most participants were in the \$55,000–\$59,999 range ($n=108$, 26.5%), the \$60,000–\$69,999 range ($n=98$, 24.0%), or the \$90,000 or more range ($n=116$, 28.4%).

Measurement

In terms of consumer motivations, personal, social, and cultural motivations were assessed, specifically, economic motivation, social status, health benefits, social norms, collectivism, environmental concerns, and personal environmental responsibility. To measure consumer motivations, well-developed 7-point likert scales were used (Appendix). To assess pro-environmental product knowledge, a nine-item scale developed by Flynn and Goldsmith (1999) that aims to measure subjective knowledge (i.e. the extent to which consumers perceived their level of knowledge of such products) was used. Consumer skepticism toward pro-environmental advertising was measured using Obermiller and Spangenberg (1998) and Mohr, Eroğlu, and Ellen's (1998) scales. Finally, two questions were used to understand pro-environmental product-using behavior. The first queried whether respondents currently used pro-environmental products. Using a 'check all that apply' format, the second question sought to determine which pro-environmental products they used.

Analysis

A two-step cluster analysis (i.e. hierarchical cluster and K-means cluster analysis) was conducted to segment the green consumers. The two-step cluster analysis is a widely recommended by which to group consumers (Mooi and Starstedt 2011; Park and Lee 2014). As an initial analysis, hierarchical cluster analysis with Ward's method with the squared Euclidean distance equation was conducted to obtain several clustering options (Mooi and Sarstedt 2011; Park and Lee 2014). K-means cluster analysis was conducted to confirm the results of the hierarchical cluster analysis (Park and Lee 2014). For both clustering analyses, seven clustering criteria (i.e. seven motivations for purchasing pro-environmental products) were used. The results of the hierarchical and K-means cluster analyses were cross-checked to examine the membership stabilities.

Results

Confirmatory factor analysis

Confirmatory factor analysis was conducted to confirm both convergent validity and discriminant validity. The measurement model showed a satisfactory fit: $\chi^2 = 5096.976$, $df=2835$, $p < .001$; CFI = .913, RMSEA = .044. In contrast, the one-factor model showed a poor model fit: $\chi^2 = 16,003.023$, $df=2926$, $p < .001$; CFI = .495, RMSEA = .105. The fit of the measurement model was better than that of the one-factor model, and thus, the constructs had convergent and discriminant validity. Additionally, the scale reliabilities of the constructs were calculated. All constructs' Cronbach's α values were between .87 and .97 (Table 2). Thus, the constructs had satisfactory scale reliabilities.

Table 1. Literature on green consumer segmentation.

	Segmentation criteria	Segments of green consumers
Chan (1999)	• Past purchasing behaviors in terms of following items; • Items in reusable containers • Products without over-packaging • Products with refillable packages • Products with recycled contents • Products safe to the environment • Disposable products • Aerosol sprays	• Heavy green consumers • Light green consumers
Mostafa (2009)	• Altruism • Environmental concern • Environmental knowledge • Skepticism toward environmental claims • Environmental attitudes	• True green • Reluctant green • Potential green • Basic brown
Finisterra do Paco and Barata Raposo (2010)	• Environmentally friendly buying behavior • Environmental activism • Environmental knowledge • Environmental concern • Recycling • Perceived consumer effectiveness • Resource saving • Economic factor • Skepticism toward environmental claims	• The uncommitted • The green activists • The undefined (Skeptical green consumers)
Thompson et al. (2009)	• Perceived importance of eco-label for wood products	• Group perceiving eco-label as most important • Group perceiving eco-label as not most important
Wulandari et al. (2012)	• In terms of pro-environmental products, • Interest • Opinions • Activities • Attitudes • Knowledge • Awareness	• Conventional consumers • Green consumers • Greener consumers • Greenest consumers
Modi and Patel (2013)	• Pro-environmental behaviors	• Active green activists • Passive green activists
Park and Lee (2014)	• Personal obligation • Conspicuous environmentalism • Personal importance of corporate social responsibility • Perceived quality of green products	• Cluster 1 (non-green consumers) • Cluster 2 (Brown consumers) • Cluster 3 (Ambiguous green consumers) • Cluster 4 (Green consumers)
Barber (2014)	• Self-transcendence value • Conservation value • Self-enhancement value	• Hunter green • Green • Light green • Not green at all
Yildirim and Candan (2015)	• Personal values • Power • Achievement • Hedonism • Universalism • Benevolence • Consumption values • Functional value • Social value • Epistemic value • Conditional value • Emotional value	• Self-developers-Social environmentalists • Self-challengers-Functional environmentalists
Awad (2011)	• Ecological conscious consumer behavior • Perceived consumer effectiveness • Environmental concern • Liberalism	• Green consumers • Ambiguous consumers • Undevoted consumers • Explorers

(Continued)

Table 1. continued

González et al. (2015)	• Environmentally-friendly behaviors including; • Reduction • Reuse • Recycling • Green product purchase	• Non-ecological • Eco-indifferent • Eco-saver • Eco-fashion • Eco-integral
Apaydin and Szczepaniak (2017)	• Green concern • Perceived consumer effectiveness • Economic factor • Environmental knowledge • Green purchasing behavior • Green habits • Green activism	• True greens • Potential greens • Browns

Table 2. Means and Standard Deviations, Cronbach's α values, and Correlations.

		Mean	SD	α	1	2	3	4	5	6	7	8	9
1	EM	4.21	1.16	.88									
2	SS	4.13	1.30	.92	.44**								
3	HC	5.12	1.23	.92	.44**	.32**							
4	SN	4.56	1.22	.92	.42**	.40**	.51**						
5	CO	5.22	1.05	.87	.25**	.23**	.57**	.45**					
6	PER	5.39	1.13	.92	.39**	.28**	.73**	.56**	.69**				
7	EC	5.15	1.27	.94	.40**	.31**	.67**	.49**	.54**	.79**			
8	PEPK	4.61	1.07	.85	.33**	.23**	.49**	.33**	.38**	.51**	.45**		
9	SKEP	3.42	1.18	.96	-.55**	-.43**	-.51**	-.44**	-.36**	-.51**	-.48**	-.39**	
10	ATT	5.23	1.23	.94	.48**	.32**	.55**	.41**	.40**	.60**	.54**	.38**	-.75**

Note. ** $p < .01$, EM is economic motivation, SS is social status, HC is health concern, SN is social norm, CO is collectivism, PER is perceived environmental responsibility, EC is environmental concern, PEPK is perceived environmental product knowledge, SKEP is skepticism toward pro-environmental advertising, and ATT is attitude toward pro-environmental advertising.

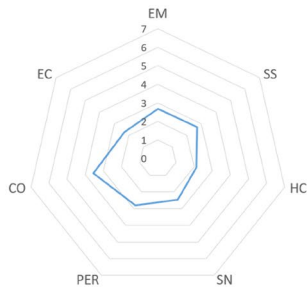
Table 3. Means and Standard Deviations of the Six Segments

	N	EM		SS		HC		SN		CO		PER		EC	
		M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
1	23	2.68	.95	2.69	.93	2.13	.89	2.46	.94	3.55	1.46	2.79	1.03	2.29	.96
2	67	4.10	.67	3.79	.88	4.27	.80	4.05	.78	4.18	.78	4.14	.58	4.00	.66
3	63	3.99	.99	2.69	1.03	5.81	.67	4.71	.98	5.87	.74	5.39	1.14	6.02	.67
4	61	3.13	.83	3.67	1.06	4.73	.91	3.65	1.04	5.21	.79	5.21	.53	4.74	.86
5	84	5.27	1.01	5.42	.76	6.23	.58	5.70	.99	6.05	.59	6.46	.45	6.33	.64
6	110	4.53	.81	4.76	.73	5.81	.66	4.87	.69	5.87	.74	5.52	.55	5.27	.67
Total	408	4.21	1.15	4.13	1.30	5.12	1.23	4.56	1.22	5.22	1.05	5.39	1.13	5.15	1.27

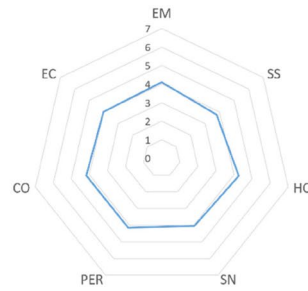
RQ1. Segmenting green consumers

The focus of the first research question was to explore how green consumers can be segmented based on their motivations for purchasing pro-environmental products. Six segments were revealed: Segment 1 (With Nature, $N=23$), Segment 2 (Follower, $N=67$), Segment 3 (My Green Life, $N=63$), Segment 4 (Conspicuous Green Life, $N=61$), Segment 5 (All-Rounder, $N=84$), and Segment 6 (Challenger, $N=110$) (Table 3 and Figure 1). The results of the ANOVA showed significant mean differences between seven consumer motivations among the six segments (Table 4). A post hoc Tukey HSD was tested.

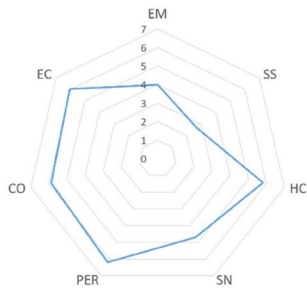
Segment 1 (With Nature). The first segment of green consumers had relatively high collectivism. However, other motivations, such as personal and environmental motivations, were under the mid-point. Based on the results, only the consideration of nature and community motivates these consumers to purchase pro-environmental products.



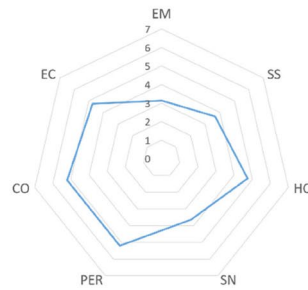
Segment 1: With Nature



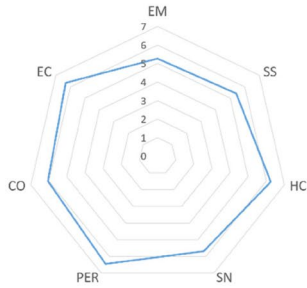
Segment 2: Follower



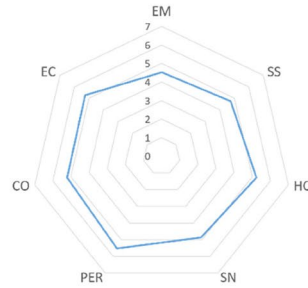
Segment 3: My Green Life



Segment 4: Conspicuous Green Life



Segment 5: All-rounder



Segment 6: Challenger

Figure 1. Radar chart of the six segments.**Table 4.** ANOVA results with seven cluster criteria of six cluster option.

	Cluster		Error		F
	MS	df	MS	df	
EM	46.817	5	.770	402	60.787***
SS	76.136	5	.770	402	98.925***
HB	79.585	5	.553	402	143.890***
SN	58.007	5	.793	402	73.185***
CO	44.272	5	.573	402	77.312***
PER	79.948	5	.320	402	250.216***
EC	90.562	5	.510	402	117.727***

Note. *** $p < .001$.

Segment 2 (Follower). Green consumers in Segment 2 showed modest levels of personal, social, and environmental motivations. Compared to other segments, there were no specific motivations that strongly drove them to purchase pro-environmental products. Yet even without strong motivations, members in Segment 2 reported buying and using such products. One possible explanation of their behaviors is that these green consumers follow green consumerism as a social trend.

Segment 3 (My Green Life). The third segment of green consumers reported feeling very strong health concerns, environmental concerns, and personal responsibility for the environment, and had a collectivistic orientation, but very low social status motivations. The strong motivations to protect their health and the environment make them purchase pro-environmental products and lead to their green life. They also tend to pursue a green lifestyle that is not for show but for their own satisfaction.

Segment 4 (Conspicuous Green Life). Green consumers in Segment 4 reported similar motivations to Segment 3. Nevertheless, there is an interesting difference between Segments 3 and 4. Compared to Segment 3, green consumers in Segment 4 had a higher social status score. In other words, they desire to show to other people their contributions to environmental protection and their green lifestyle. Thus, these green consumers pursue green life not only for their health and for the environment but also for their social status.

Segment 5 (All-Rounder). Segment 5 consisted of green consumers who had the strongest personal, social, and environmental motivations. Their various motivations lead to their pro-environmental product purchasing. In other words, by using pro-environmental products, they tend to maximize their economic benefits, to enhance their social status, to play roles as social members, and to contribute to environmental protection.

Segment 6 (Challenger). The last segment showed similar patterns of motivation to Segment 5. Green consumers in Segment 6 had evenly weighted personal, social, and environmental motivations for purchasing pro-environmental products. However, the difference between Segments 5 and 6 was the level of motivation. Green consumers in Segment 6 had lower personal, social, and environmental motivations than Segment 5. Although members of this green consumer group followed various motivations, their desires did not meet the levels of Segment 5.

RQ2. Characteristics of green consumers

Demographic. In terms of demographics, all six segments showed similar distributions of education and income level; specifically, in all segments, the majority of green consumers had college degrees (i.e. two-year and four-year), and relatively high household incomes (i.e. \$55,000–\$69,999). For gender, half of the segments were almost half male and half female. However, the majority of consumers in the third segment were female ($n=45$, 71.4%). In contrast, about

80% of the green consumers in the first segment ($n=18$) and 70% of green consumers in the second segment ($n=48$) were male.

Regarding age, the six segments showed a wide variance. The second segment was the youngest group of green consumers ($M=32.7$), while the third segment was the oldest group ($M=41.4$). The other four segments' average ages were evenly distributed; in the first segment, the average age was 33.3; in the sixth segment, it was 36.5; in the fifth segment, the average age was 39.7; and in the fourth segment, the average was 40.6.

Pro-environmental product use behavior. The total number of pro-environmental products consumed and the average number of pro-environmental product categories used per person were compared between the six segments. First, there was a significant difference in the total number of pro-environmental products between segments: $\chi^2(50) = 280.058$, $p < .001$. Segment 6 and Segment 5 used the biggest and the second biggest number of pro-environmental products (558 and 520, respectively). On the other hand, green consumers in Segment 1 used the least number of pro-environmental products (55). For this segment, energy saving and recyclable (or recycled) products were popular.

In a similar vein, consistent results were observed for the average number of pro-environmental product categories. Green consumers in Segment 5 and Segment 3 purchased the greatest variety of pro-environmental products. The average number of pro-environmental product categories from which Segment 5 and Segment 3 purchased was 6.02 and 5.92, respectively. These green consumers purchased pro-environmental products from categories such as energy saving, recyclable (or recycled), reusable, organic, renewable energy, and non-(or less) toxic products. Segment 6 and Segment 4 purchased products from an average of 5.06 and 4.95 product categories, respectively. Last, green consumers in Segment 2 and Segment 1 used pro-environmental products from 3.72 and 2.35 product categories, respectively.

Knowledge of pro-environment products. There were significant differences regarding the knowledge of pro-environmental products between the six segments: $F(402, 5) = 33.396$, $p < .001$ (Table 5). A post hoc Tukey HSD was tested. The green consumers in Segment 5 believed that they had in-depth knowledge of pro-environmental products ($M=5.50$, $SD = .95$), followed by Segment 3 ($M=5.01$, $SD=1.15$). In contrast, the participants in Segment 1 showed the lowest perceived

Table 5. ANOVA results with knowledge of pro-environmental products, skepticism, and advertising attitude.

Dependent		SS	df	MS	F
Pro-environmental product knowledge	Between groups	137.941	5	27.588	33.396***
	Within groups	332.089	402	.826	
	Total	470.030	407		
Skepticism	Between groups	208.874	5	41.774	45.876***
	Within groups	366.054	402	.911	
	Total	574.924	407		
Advertising attitude	Between groups	225.003	5	45.001	46.125***
	Within groups	392.002	402	.976	
	Total	617.205	407		

Note. *** $p < .001$ and

* $p < .05$.

knowledge of pro-environmental products ($M=3.62$, $SD=1.00$), with those in Segment 2 having marginally better their level knowledge ($M=3.99$, $SD=.63$). Last, the participants in Segments 4 ($M=4.18$, $SD=.93$) and 6 ($M=4.52$, $SD=.81$) believed that they had modest levels of pro-environmental product knowledge.

Skepticism. The results showed that there were significant differences in skepticism between the segments: $F(402, 5) = 45.876$, $p < .000$ (Table 5). In particular, Segment 5 had the lowest level of skepticism toward pro-environmental advertising ($M=2.37$, $SD=1.12$), while the green consumers in Segment 1 were the most skeptical of pro-environmental advertising ($M=5.15$, $SD=.88$). Those in Segment 2 ($M=4.03$, $SD=.73$) and Segment 4 ($M=3.97$, $SD=.83$) had modest levels of skepticism. Last, the study participants in Segment 6 ($M=3.23$, $SD=.89$) and Segment 3 ($M=3.39$, $SD=1.13$) showed the second and third lowest levels of skepticism of pro-environmental advertising, respectively. In terms of the mean comparisons of skepticism between the six segments, a post hoc Tukey HSD was tested.

Attitudes toward pro-environmental advertising. The results showed significant mean differences between the segments: $F(402, 5) = 46.125$, $p < .000$ (Table 5). A post hoc Tukey HSD was tested. The mean scores of the attitudes of the participants in the six segments showed an opposite pattern to the mean scores of their skepticism. Specifically, those in Segment 5 had the most positive attitudes toward pro-environmental advertising ($M=6.23$, $SD=.95$), followed by Segment 3 ($M=5.64$, $SD=1.00$) and Segment 6 ($M=5.51$, $SD=.90$). In contrast, the participants in Segment 1 did not evaluate pro-environmental advertising positively ($M=3.44$, $SD=1.07$), and those in Segment 2 ($M=4.54$, $SD=.98$) and Segment 4 ($M=4.70$, $SD=1.11$) had relatively positive attitudes toward pro-environmental advertising.

Discussion

The purpose of this study was to group green consumers into segments based on their personal, social, and environmental motivations for purchasing pro-environmental products. This study revealed six segments of green consumers. The six segments consisted of green consumers with a variety of demographic characteristics and showed wide differences in knowledge of pro-environment products, skepticism, and attitudes toward pro-environmental advertising. The results of this study have various theoretical and practical implications.

Theoretical implications

This study both confirms green consumer segments that prior studies revealed and advances green consumer segmentation by identifying new segments based on a wider variety of motivations than had been explored in prior studies. Most of the previous studies revealed the following groups of green consumers: truly green, ambiguous/reluctant green, and non-green consumers (Finisterra do Paco, Barata Raposo, and Filho 2009; Modi and Patel 2013; Wulandari et al. 2012). The six segments

in the present study align with those used in prior research on green consumer segments. Specifically, regarding environmental motivations and knowledge of pro-environmental products, Segment 5 and Segment 6 could be categorized as truly green consumers, and Segment 2 could be categorized as the ambiguous/reliant green consumers.

In advancing our knowledge of green consumers, this study revealed new segments of green consumers, including Segment 1, Segment 3, and Segment 4. Segment 1 was a unique group of green consumers who had the least motivation for pro-environmental purchasing. However, this group showed that relatively strong collectivism can trigger them to purchase pro-environmental products. For both Segment 3 and Segment 4, health concerns, environmental concerns, and collectivism were prominent motivations. The combination of health concerns, environmental concerns, and collectivism led them to engage in health- and environment-oriented product purchasing (e.g. organic products and non-toxic detergents) and to pursue a green life. Nevertheless, because of a desire for social status, Segment 3 and Segment 4 showed a difference in pro-environmental product consumption.

The new segmentation produced by the present analysis provides a more nuanced differentiation among consumer segments based on multiple types of motivations and differences in green product purchasing. The newly proposed groups of green consumers show that green consumers are motivated not only by environmental motivations but also by personal and social motivations. While environmental motivations are mainly related to green consumers' engagement in pro-environmental purchasing, the combination of various motivations can lead to a wide variety of green consumers' purchasing behaviors. Thus, the identification of green consumers' motivations was a more valuable approach to finding a unique group of green consumers and gave a better explanation of their pro-environmental purchasing.

With six segments, this study sheds light on a wide range of green consumers' demographic characteristics. Specifically, regarding gender and age, this study found that green consumers in Segment 1, Segment 2, and Segment 3 had different demographic characteristics. The typical consumer in Segments 1 and 2 can be described as a man in his early thirties, while the typical consumer in Segment 3 can be best characterized as a middle-aged woman. The green consumers' demographic characteristics that this study found are consistent with prior studies' descriptions of green consumers, for example, highly educated young men (Diamantopoulos et al. 2003) or middle-aged women (Hunter, Hatch, and Johnson 2004; Xiao and Hong 2010; Zelezny, Chua, and Aldrich 2000).

However, regarding approaches to define green consumers, previous studies have defined green consumers with a certain age group and gender, and have considered only those who are in that age group and gender as green consumers. While some studies revealed middle-aged female consumers as being potential or actual green consumers (Hunter, Hatch, and Johnson 2004; Xiao and Hong 2010; Zelezny, Chua, and Aldrich 2000; Zinkhan and Carlson 1995), a few studies showed young male adults to have a willingness and/or intention to purchase pro-environmental products (Diamantopoulos et al. 2003). Overall, previous studies have not provided consistent descriptions of green consumers in terms of age and gender. This study, however, showed green consumers in six segments consisting of various age groups and both genders.

By revealing the variety of green consumers, this study explains why prior studies have provided inconsistent descriptions of green consumers, especially age and gender.

Finally, this study showed a wide spectrum of green consumers' skepticism and attitudes toward pro-environmental advertising. It found that green consumers who had stronger environmental motivations, higher knowledge of pro-environmental products, and stronger engagement in pro-environmental purchasing tended to have less skepticism toward pro-environmental advertising than those who did not share these characteristics. Along with their level of skepticism, attitude levels in the six segments showed an inverse relationship with skepticism. For example, Segment 5 had the most positive attitude toward pro-environmental advertising, while Segment 1 had the lowest attitude toward such advertising. These results confirm the negative relationship between skepticism and attitudes toward pro-environmental advertising (Albayrak, Caber, Mountinho, and Herstein 2011; Chang 2011; Chen and Leu 2011) and also show that green consumers have different levels of skepticism and attitudes.

Previous studies have examined green consumers' skepticism by simply focusing on whether or not green consumers are skeptical. However, the six segments showed that green consumers have different levels of skepticism, and the difference is related to their environmental motivations, pro-environmental knowledge, and pro-environmental purchasing experience. In other words, green consumers' skepticism is on a continuum between skeptical and not skeptical. Thus, this study can provide more nuance for the debate about green consumers, suggesting a new approach to explore green consumers' skepticism and contributing to understanding why green consumers have a wide range of skepticism.

When focusing on the relationship between consumer knowledge and skepticism, the inverse relationship between consumer knowledge and skepticism is contradictory to a widely accepted notion: that consumers' knowledge triggers their skepticism toward advertising (Boush, Friestad, and Rose 1994; Taylor and Nelson 2012). Previous studies applied the persuasion knowledge model as a theoretical framework to explain why consumers are skeptical of advertising (Kirmani and Zhu 2007). These studies revealed that persuasion knowledge, which is consumer knowledge about advertising and other persuasive attempts, allows consumers to easily identify misleading and manipulative advertising (Kirmani and Zhu 2007; Scott, Mende, and Bolton 2013). Thus, persuasion knowledge leads to skepticism toward advertising (Boush, Friestad, and Rose 1994; Taylor and Nelson 2012). Nevertheless, Isaac and Grayson (2016) raised the question whether persuasion knowledge always leads to consumer skepticism. They revealed that consumer persuasion knowledge can increase the credibility of persuasive attempts, rather than skepticism, when consumers know that companies use believable persuasive attempts. Thus, it cannot be argued that consumers who have persuasion knowledge are skeptical of pro-environmental advertising.

Additionally, in contrast with the previous studies, which employed consumer persuasion knowledge, this study focused on consumer knowledge about pro-environmental products. This type of knowledge can be regarded as topic knowledge proposed by the persuasion knowledge model (Friestad and Wright 1994). This different type of knowledge can have a role in reducing skepticism toward pro-environmental advertising. Thus, as this study found, through their direct experience with pro-environmental products, green consumers have significant knowledge

of pro-environmental products, including the products' personal, social, and environmental benefits. The knowledge of pro-environmental products can make them more confident in their ability to cope with corporate pro-environmental advertising. Thus, green consumers can be less skeptical of pro-environmental advertising.

Practical implications

The contemporary digital media environment gives marketers ways to target consumers more specifically than ever before. As such, more nuanced segmentations, such as the one presented here, are critical to helping marketers reach green consumers in more targeted ways based on unique motivations and purchase interests.

There are several practical implications in terms of targeting pro-environmental advertising and advertising strategies. First, green consumers, who are included in Segment 5, Segment 6, and Segment 3, are the most appropriate target audience for pro-environmental advertising. Green consumers trust pro-environmental messages and are likely to have positive attitudes toward such advertising. To appeal to green consumers, practitioners can emphasize motivations. Specifically, marketing and advertising professionals can highlight any personal, social, or environmental benefits of the advertised products to stimulate consumer motivations. For the third segment's consumers, considering their health concerns and environmental motivations, advertising needs to focus on how pro-environmental products will improve their quality of health and the sustainability of the environment.

To find those green consumers, advertising practitioners can use their demographic information, for example, middle-aged, highly educated, and above-average income. As green consumers have high knowledge of pro-environmental products and strong motivations for buying such products, they are expected to use media that deliver information about environmental protection, pro-environmental products, and green life, such as pro-environmental magazines and online communities. Thus, advertising practitioners can also find green consumers via the media.

Additionally, marketing and advertising professionals make efforts to establish brand loyalty for green consumers. Green consumers from the above three segments are attractive target audiences to most companies that produce pro-environmental products. However, competition to win over green consumers is fierce. To be competitive, companies should use brand advertising. Through brand advertising, companies try to build specific brand images (e.g. animal protection, sustainable development, or simple life) and form emotional attachments with consumers. Brand advertising can help companies earn the loyalty of green consumers who have emotional connections with their brands and repetitively purchase their various pro-environmental products.

Next, Segment 2 and Segment 4 can be considered as secondary target audiences. The second segment has a modest level of personal, social, and environmental motivation and is not strongly engaged in pro-environmental purchasing. With increasing experience and knowledge, however, these green consumers have the potential to become green consumers at the level of Segments 5 and 6. Additionally, green consumers who are in the fourth segment have relatively high health concerns and environmental motivations as well as a desire for social status. Among health- and environment-friendly products, conspicuous or popular products seem to be most

appropriate for these green consumers. Based on this information, companies that produce widely used conspicuous pro-environmental products, such as tumblers, water bottles, eco-bags, solar energy cellphone chargers, and organic cotton clothing, can easily attract green consumers.

These segments have modest levels of skepticism and attitudes toward pro-environmental advertising. However, the barrier to accessing these two segments through pro-environmental advertising is not high. For the second target audience, recommended advertising strategies include providing information and education. Companies need to provide information about the personal, social, and environmental benefits of their pro-environmental products and educate consumers about these benefits. Companies' efforts can increase green consumers' environmental motivations. The increased environmental motivations can then make green consumers more engaged in pro-environmental purchasing. By providing information to green consumers, companies enhance consumers' confidence in pro-environmental product knowledge, which can play a role in reducing their skepticism.

When advertising pro-environmental products, companies need to use a variety of marketing platforms, such as advertorials, media releases, and e-WOMs. These marketing communications can help increase the credibility of information about the companies' products and can, therefore, help to overcome the fourth and second segments' suspicion of pro-environmental advertising.

Limitations and suggestions for future research

This study has a few limitations. The first limitation is that the study had low external validity because of MTurk's population. Although MTurk has become a popular tool for obtaining high-quality data for academic research, compared to the US population, the MTurk population is generally younger, more highly educated, and has a lower income (Kim and Pittman 2016; Peer, Vosgerau, and Acquisti 2014; Shank 2016). There is a possibility that survey participants with particular demographics are recruited more often, and the skewed participants may lead to biased results. However, the demographics of survey participants in this study are consistent with previous studies' findings. Previous studies indicated that education and income were significant factors in defining green consumers (Barber 2014; Chan 1999; Park and Lee 2014; Straughan and Roberts 1999). Consumers with college degrees (or higher levels of education) or above-average household incomes were deemed to be knowledgeable and concerned about environmental issues (Barber 2014; Chan 1999). They were consequently thought to have more positive attitudes about, and purchase intentions in relation to, pro-environmental products than less educated or lower income consumers (Newell and Green 1997; Roberts 1995; Zimmer, Stafford, and Stafford 1994). Regarding age, previous studies showed mixed results; however, some studies found that young adults are green consumers with a high willingness and/or intention to purchase pro-environmental products (Diamantopoulos et al. 2003). For these reasons, the study samples are considered appropriate for the study population and not skewed.

Additionally, regarding the size of the six segments, Segment 1 consisted of 23 green consumers, and thus the size of segment is smaller than the others. Because of the small size of Segment 1, it might be questionable that this group is reflective

of green consumers in the US and describes their demographics, knowledge, skepticism, and attitudes toward pro-environmental advertising. Although Segment 1 is a unique group of green consumers, which shows no environmental concern, collectivism may be a primary motivation in their purchase of pro-environmental products. Future research should explore green consumers who are in Segment 1, including demographics, knowledge, skepticism, and attitude toward pro-environmental advertising, and provide their findings to expand the current study's findings.

A total of 408 survey participants were conveniently selected through a specific online marketplace. The small number of survey participants seems to be difficult to represent the US population. Thus, the study's results had an issue of generalizability. For future research, other methods should be considered to access green consumers, such as online panels, pro-environmental media (magazines or online communities), and shopping data. The replication of these results in future research would contribute to strong external validity and would result in better generalization to all green consumers in the US.

In addition, based on the results of this study, some suggestions are offered for future research. To expand the current study's findings, it would be beneficial for future researchers to (1) more deeply understand the six segments' characteristics, (2) develop advertising message strategies appropriate to each segment, and (3) reveal the relationship between knowledge of pro-environmental products and skepticism. In terms of the characteristics of the six segments, this study provided basic information regarding sociodemographics, motivation, and knowledge. Although the descriptions of the segments can help marketing and advertising professionals understand these consumers' characteristics, the matter of how to actually access the green consumers in each segment remains challenging. Thus, future research could try to develop specific consumer profiles comprising more detailed information, including green consumers' sociodemographics (e.g. age, gender, education, income, and occupation), political tendencies, psychographics, geographic locations, and lifestyles.

Further, it is recommended that future researchers consider developing appropriate message strategies for each segment. The green consumers in each segment have different motivations and use different types of pro-environmental products; thus, advertising message strategies should also vary depending on their appropriateness for each of the six segments. The literature broadly divides advertising message strategies into two types: (1) informational advertising messages and (2) transformational advertising messages. Based on these categories, prior studies proposed diverse message strategies. For example, Taylor (1999) advocated six advertising message strategies: ego, social, sensory, routine, acute need, and rational. To establish the appropriate advertising message strategy for each segment, future researchers should first consider the two types of advertising message strategies and then apply the specific advertising message strategies suggested in prior studies.

Finally, this study revealed the differences in knowledge and skepticism between the six segments. Based on the different levels of knowledge and skepticism, this study inferred a negative relationship between green consumers' knowledge and skepticism. To support this argument, different approaches should be considered to address the relationships between green consumers' knowledge and skepticism. Thus, future research should use other methods, such as survey or experimental design, to investigate the causal relationships among these variables.

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Data availability statement

Relevant data from the larger dataset can be requested by contacting the corresponding author.

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Appendix: measurements

Personal motivation

Economic motivation (Mittal 1994; Suki and Suki 2015)

- Most green products are reasonably priced.
- Green products offer value for money.
- Most green products are good products for the price.
- Most green products would be economical.
- Green products can save you a lot of money.
- The money one can save by using green products does not amount to much.
- I believe that one helps one's family financially by using green products.

Social status (Lee 2008; Suki and Suki 2015)

- Supporting environmental protection makes me more socially attractive.
- Supporting environmental protection makes me special.
- I will be perceived by others as 'outdated' if I do not support environmental protection.
- Buying green products would help me to feel acceptable.
- Buying green products would improve the way that I am perceived.
- Buying green products would make a good impression on other people.
- Buying green products would give its owner social approval.

Health benefits (Shepherd, Magnusson, and Sjöden 2005)

By purchasing green products, I help to;

- Improve my own or my family's health.
- Avoid risks that may be associated with non-green products.
- Give my children better products.
- Reduce the risk for illness in my family.

Social motivation

Social norm (Gleim et al. 2013; Macovei 2015)

- Most people I know buy green products.
- Most people I know are concerned about issues related to the environment.
- Most people I know think it's important to buy green products.
- Most people I know recycle those items that can be recycled.
- Most people who are important to me support my effort to use green products for environmental reasons.
- Most people who are important to me think I should use green products for environmental reasons.
- Most people who are important to me take steps to use green products for environmental reasons.

Collectivism (Xie, Bagozzi, and Grønhaug 2015)

- Making a lasting contribution to groups that I belong to, such as my work organization, is very important to me.
- When I become involved in a group project, I do my best to ensure its success.
- I feel great pride when my team or group does well, even if I'm not the main reason for its success.
- I would be honored if I were chosen by an organization or club that I belong to, to represent them at conference or meeting.
- When I'm part of a team, I am concerned about the group as a whole instead of whether individual team member like me or whether I like them.

Environmental motivation

Environmental concern (Lee 2008; Straughan and Roberts 1999)

- I am worried about the worsening of the quality of environment.
- Environment protection is my major concern.
- I am emotionally involved in environmental protection issues.
- I often think about how the environmental quality can be improved.
- I am extremely worried about the state of the world's environment and what it will mean for my future.
- Mankind is severely abusing the environment.
- When humans interfere with nature it often produces disastrous consequences.
- The balance of nature is very delicate and easily upset.

Personal environmental responsibility (Gleim et al. 2013; Lai and Cheng 2016)

- Everyone should be responsible for protecting the environment.
- Environmental protection is the responsibility of environmental organizations, not me. (R)
- Environmental protection should start immediately.
- Environmental protection is the responsibility of the government, not me. (R)
- I should take up the responsibility to protect the environment.
- Environmental protection starts with me.