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# Determinants of Individual and Collective Pro-Environmental Behaviors: Comparing Germany and Japan

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**Abstract:** The current study explored the determinants of individual and collective pro-environmental behaviors in Germany and Japan. A self report questionnaire was sent to two random sample respondents by mail in Cologne, Germany ( $N=996$ ) and Nagoya, Japan ( $N=531$ ). Hierarchical regression analyses demonstrated an interaction between country of respondent and both individual and collective behaviors. For individual behavior, subjective norms played an important role in Japan where interpersonal relationship is emphasized, whereas perceived behavioral control played an important role in Germany. Social factors, such as the amount of network and subjective norms, affected collective pro-environmental behaviors in both samples. The results highlighted the importance of social factors in studies of collective pro-environmental behaviors.

**Key words:** pro-environmental behavior, cross-national comparison, collective behavior

## INTRODUCTION

The present study aimed to compare the determinants of daily pro-environmental behaviors which are performed by individuals in Germany and Japan. So far, there are not many cross-national studies on pro-environmental behaviors at the level of the individual although there are comparative studies on the macro level (e.g., Oreg & Katz-Gerro, 2006; Schultz & Zelezny, 1999; Eisler, Eisler & Yoshida, 2003).

Based on this recognition, firstly, this article compares the determinants of pro-environmental behaviors between Germany and Japan. These two countries have very different backgrounds, and they have different social systems. But people in these countries have high concern about environmental issues, and the two countries have comparable GDPs per person and population densities.

Secondly, this article compares the determinants of pro-environmental behaviors between the of pro-environmental behaviors between the individual level and the collective level. Individual

pro-environmental behaviors refer to actions taken by the individual, such as saving energy, practicing the 3Rs (reduce, recycle, reuse), and using public transportation. Collective pro-environmental behaviors are the actions that aim to promote environmental conservation through collective efforts, which include behaviors such as joining environmental group activities, and participating in community environmental events. Although individual behaviors are important to help achieving environmentally sustainable societies, collective behaviors are essential to promote pro-environmental behaviors to other individuals and to society as a whole. We still do not have enough empirical evidence about the determinants of collective pro-environmental behaviors compared to individual pro-environmental behaviors.

In this study, we measure general attitudes, subjective norms, perceived behavioral control (PBC) and the Eco-net (explained below) as determinants of pro-environmental behaviors. These measures are chosen from previous studies on environmental behaviors in social psychology.

General attitude is the same concept as goal

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intention in Hirose's model (1994). Hirose (1994) proposed a two-step model in which pro-environmental behavior is determined by goal intention, feasibility (or PBC), cost-benefit evaluation and social norm. Goal intention is determined by seriousness perception, responsibility attribution, and efficacy.

Subjective norm and PBC was taken from Theory of Planned Behavior (TPB; Ajzen, 1985, 1991). TPB has proven to be a reliable tool in the studies of pro-environmental behaviors in social psychology (Groot & Steg, 2007; Harland, Staats & Wilke, 1999; Heath & Gifford, 2002; Kaiser, *et al.*, 2005; Stern, *et al.*, 1995; Taylor & Todd, 1995, 1997). Subjective norms are defined as summation of the expectation from significant others such as family and close friends and willingness to conform with it (Fishbein & Ajzen, 1975). Since an individual's attitudes are based on his or her personal values, respondent's general attitudes can be regarded as internal factors. Subjective norms are, on the other hand, influences by other people which are independent of one's own values. Fishbein & Ajzen (1975) proposed that internalized attitudes and perceived social norms should be differentiated and they found that the perceived social norms are derived from significant others. So they called it "subjective" norm, in which "subjective" means subjectively significant others for individuals<sup>1</sup>. Furthermore, they confirmed that subjective norm affects the behavioral intention because of the importance of keeping good relationship with others, even though it does not accord with one's own attitudes. PBC is a reflection of behavioral constraints based on the social structures that might differ between countries. PBC is also equivalent to the concept of feasibility evaluation in Hirose's model.

We also measured the Eco-net, which is the measurement of interpersonal network who are concerned with environmental issues because the Eco-net was proven to be relevant in determining individual (Ando, *et al.*, 2007) and collective (Ando & Hirose, 1999) pro-environmental behavior. Several studies have provided evidence

of the importance of broad interpersonal influences in pro-environmental behaviors. In Leonard-Barton's study (1981), the strongest determinant of purchasing solar systems was the number of acquaintances that owned such equipments. Archer, *et al.* (1987) showed that the best predictor of ownership of solar systems was a personal source of information.

#### The differences between countries

In a comparative study between Japan and the U.K. on the effects of subjective norms, Abrams, Ando & Hinkle (1998) found that the influence of subjective norms on intention to leave the companies was greater in Japan than in the U.K. Their study suggested that the expectations from others are more important in Japan. Ando, Ohnuma & Chang (2007) surveyed determinants of pro-environmental behaviors among Japanese and American college students and discovered that the influence of subjective norms was greater in Japan than in the U.S. for water conservation and consumer behaviors. Environmental studies conducted in Japan also suggested that subjective norm play an important role in determining individual pro-environmental behaviors (Nonami, *et al.*, 1997; Ando & Hirose, 1999).

These findings suggest that individuals in Japanese cultures pay more attention to expectation from significant others in order to maintain good harmony with others. Markus & Kitayama (1991) proposed that the interdependent self is predominant in Japan and other Asian countries, which makes the most important task within the culture is to build and maintain good relationship with others.

From the findings discussed above, we predicted that the effect of subjective norms would be stronger in Japan than in Germany.

#### Collective environmental behaviors

We assumed that the determinants of collective pro-environmental behaviors would be different from those of individual behaviors in the following aspects. The structure of collective pro-environmental behaviors represents severer social dilemma aspects than individual behaviors, because the participation in such behaviors costs

time, labor, and emotional involvement, however, the behavior benefits the entire community by improving, or preserving the environment for everyone, but not just for the individual. A study by Oreg & Katz-Gerro (2006) presenting data from 27 countries participating in the International Social Survey Programme (ISSP) showed that collective pro-environmental behaviors occurred much less frequently than individual behaviors. Although individual pro-environmental behaviors also represent a social dilemma, such social dilemma is relatively more salient in the structure of collective pro-environmental behaviors.

In order to overcome the high costs to conduct collective pro-environmental behaviors, people might seek direct encouragement from their interpersonal networks. Interpersonal environment-related network would make common benefits of the society more salient through communication and also, it can reduce psychological costs for participation.

A study by Everett & Peirce (1991), looking at how the density of neighborhood networks in regional communities affected residents' participation in recycling, revealed that participation rates were higher where there were more neighborhood interactions and where volunteers and leaders knew the other residents well. Ando (2002) also found that direct communication through social networks was the most powerful reason for joining collective pro-environmental behaviors.

Previous studies suggested that approval of significant others are also important in determining collective pro-environmental behaviors. Ando & Hirose (1999) found that subjective norms and identification with the group played important roles in determining the intentions to be proactive and to continue participation in environmental groups. Nonami, *et al.* (2002) also found that subjective norms had a significant influence on both individual and collective pro-environmental behaviors in Japan.

These findings suggest that environment-related networks and approval of significant

others help to motivate individuals to participate in collective pro-environmental behaviors.

#### The aim of this study

This study aimed to compare the determinants of pro-environmental behaviors along two axes: cultural differences between Germany and Japan; and behavior type, that is, individual versus collective pro-environmental behaviors. In particular, we examined the role of norms in each culture. It is hypothesized that the interpersonal influence would differ between countries and behaviors. Our hypotheses are outlined below:

#### Differences between countries

In Japan, subjective norms have a stronger influence on pro-environmental behaviors than in Germany because keeping harmonious interpersonal relationship is more important in Japan.

#### Differences between behavior types

First, fewer people would engage in collective pro-environmental behaviors compared to individual pro-environmental behaviors in both countries.

Second, social influences are a stronger determinant of collective behaviors than of individual behaviors. That is, networks and subjective norms would have a greater influence on collective pro-environmental behaviors than on individual pro-environmental behaviors.

In order to test the above hypotheses, we conducted large-scale random sampling in Germany and Japan. We sought to obtain representative samples of the populations by including various age groups and occupations.

## 1. METHODS

### 1.1 Design and samples

#### 1) Setting

We conducted a survey in Cologne, Germany and Nagoya, Japan during a 3 months period (from October to December, 2003). Both cities are industrialized with comparable population (approximately 1 million inhabitants in Cologne and 2 million inhabitants in Nagoya). In terms of population density, Cologne and Nagoya are the

fourth most populated cities in the respective countries. Nagoya started severe waste collection system since 2000 corresponds to Containers and Packaging Recycling Law. Cologne also has severe waste collection system.

It was confirmed in our previous study (Ando *et al.* 2005) that the behavior to avoid buying throwaway products and to participate in the environmental activities in community is possible in both countries.

## 2) Recruitment procedures

### *Cologne*

A random sample of 3000 residents in Cologne<sup>2)</sup>, who are over 18 years old<sup>3)</sup>, identified their nationality as German, and registered as a resident in Germany, was recruited through the Resident's Registration Office.

### *Nagoya*

A random sample of 1000 residents in Nagoya, who are over 20 years old, identified their nationality as Japanese, and registered for local elections, was recruited through the Local Election Register. Selecting the Japanese sample was done by a three steps random sampling method. In the first step, we extracted 8 wards from 16 wards in Nagoya city. From these 8 wards, 50 school districts were extracted, and in the last step, 20 residents from each school district were selected for participation.

## 3) Survey administration

Invitation letters to participate in the survey were sent to the selected samples in both Cologne and Nagoya. The letter included a postcard that offered the possibility to decline participation. Two weeks later, those who did not decline the invitation received the questionnaires by mail. After the deadline for returning the questionnaires has passed, a postcard was sent to the participants to thank them for their cooperation or to remind them to return the questionnaires if they had not done so. This was done to increase the response rate.

## 4) Response rates

The response rate in Cologne was 33.8%. Among the 1,014 respondents, 18 of them contained missing data and were excluded,

leaving 996 respondents for data analysis. The response rate in Nagoya was 53.6%. Among the 536 respondents, there were 5 missing data, leaving 531 respondents for data analysis.

## 1.2 Measures

German and Japanese questionnaires on pro-environmental behavior were developed based on its English version. The joint English version was translated into German and Japanese language, and then back translated to the other language, which was crosschecked carefully by workgroups in both Germany and Japan.

*Pro-environmental behavior.* To measure individual behavior, we inquired how often participants conduct the behavior; 'Not buying throwaway products (reducing behavior)'. Participants responded to the question using a 5-point scale ranging from 1 (*not at all*) to 5 (*always*). To measure collective behavior, respondents were asked to rate on a 5-point scale the extent to which they agree on the statement, "*I take part in meeting and activities that aim to preserve the community environment (e.g. recycling, transportation, beautification)*" from 1 (*not at all*) to 5 (*always*). This statement would include behaviors such as participating in recycling activities in the community, collective clean up of the river bank, or participating in events organized by local government to learn about environmental issues in the community. For both scales, the higher the scores, the more frequently the individuals conducted pro-environmental behaviors. The behaviors were chosen on the basis of our preliminary studies (Ando *et al.*, 2005; Ando *et al.*, 2007) indicating that the differences in perceived difficulty of participating in these behaviors was relatively small between the two countries.

Other cognitive variables such as attitudes, subjective norms and perceived behavioral control asked questions specifically about those pro-environmental behaviors. Questions for these variables were all answered by using a 5-point scale which ranged from 1 (*do not agree at all*) to 5 (*agree extremely*).

**General attitude.** Three questions measured general positive attitudes towards conserving the environment. For example, "*It is good for the society to take on an environmentally-conscious lifestyle.*" Higher scores indicated more positive attitudes towards conserving the environment.

**Subjective norms.** Two questions measured how much the significant others would approve or disapprove of the respondent's pro-environmental behaviors. For example, "*My family and close friends expect me to avoid buying throwaway products/take part in meetings and activities which aim to preserve environment in community.*" High scores reflected higher expectations from the significant others.

**Perceived behavioral control.** Two questions measured how easy or difficult to conduct pro-environmental behaviors. For example, "*Avoiding buying throwaway products would be easy for me*" and "*Taking part in collective environmental actions in my community would be easy for me.*"

**Social Network.** The number of friends who were environmentally minded was measured using a scale named "Eco-net" adopted from our previous research. The scale is composed of four questions, among them two questions asked the number of environmentally-minded friends who the respondents meet more than few times a month. The other two questions asked the number of environmentally-minded friends who the respondents meet less than once a month. They were designed to measure strong tie and weak tie (Granovetter, 1973). However, the result of factor analysis yielded one factor solution. We therefore used the composite scale with four questions as index of the size of one's environmental network. The composite scale score was calculated after logarithm transformation. High scores indicated larger environmental network.

### 1.3 Reliability of measures

Cronbach's alphas were calculated for each measure. The Cronbach's alpha coefficients ranged from .81 to .91 depending on the scale (general attitude, .81; Eco-net, .89; Subjective

norms (reducing behavior, .91, community participation, .90); Perceived behavioral control (reducing behavior, .83, community participation, .81). All scales showed reasonably high internal consistency.

## 2. RESULTS

### 2.1 Demographics

The average age of participants was 47.3 years in Cologne and 48.9 years in Nagoya. In Cologne, 52.3% of participants were female, whereas it was 61.1% in Nagoya<sup>4)</sup>. In the sample, 27.7 % of the people in Cologne and 42.4% in Nagoya were university, or junior college graduates. The difference in university graduates could have been due to the presence of junior colleges in Japan, in which a degree can be obtained within 2 years. In Cologne, 38.1% of participants were employed fulltime and only 6.5% of respondents indicated that their occupation was housewife or househusband. In Nagoya, 28.7% of participants were employed fulltime and 22.2% respondents indicated that their occupation was housewife or househusband.

### 2.2 Mean differences between samples

T-tests were conducted to test if there is any difference between German and Japanese samples on general attitude and Eco-net scores. Concerning the general attitude score, both samples exhibited a high concern regarding environmental issues. German respondents had higher scores on positive attitudes toward environmental conservation ( $M=4.70$ ) when compared to Japanese respondents ( $M=4.52$ ;  $t(1450)=5.87$ ,  $p<.001$ ). Concerning the Eco-net score, the size of the environmental network (Eco-net) was larger among German respondents ( $M=.41$ ) than Japanese respondents ( $M=.20$ ),  $t(1389)=13.40$ ,  $p<.001$ . The mean number of environmentally-minded friends also differed significantly; where German respondents had more environmentally-minded friends ( $M=2.70$ ) relative to Japanese respondents ( $M=1.08$ ),  $t(1389)=9.46$ ,  $p<.001$ .

Analysis of variance (ANOVA) were conducted

Table.2 Correlation between Reducing Behavior and other variables in the model

Variable	1	2	3	4	5	6	7
1. Behavior	--	.08 *	.28 ***	.25 ***	.26 ***	.47 ***	.22 ***
2. Sex	.17 ***	--	-.05	.11 ***	-.05	.05	.01
3. Age	.26 ***	.02	--	.05	.26 ***	.19 ***	.09 **
4. General attitude	.24 ***	.24 ***	.01	--	.16 ***	.27 ***	.13 ***
5. Subjective norm	.42 ***	.15 ***	.37 ***	.20 ***	--	.26 ***	.24 ***
6. PBC	.39 ***	.23 ***	.27 ***	.31 ***	.39 ***	--	.19 ***
7. Eco-net	.17 ***	.00	.18 ***	.18 ***	.32 ***	.22 ***	--

NOTE. Correlations for the Germany sample (N=942) are above the diagonal; those for the Japanese sample (N=514) are below the diagonal.

Sex: male = 1, female = 2. \*\*\*  $p < .001$ . \*\*  $p < .01$ . \*  $p < .05$ .

Table.3 Correlation between Community Participation and other variables in the model

Variable	1	2	3	4	5	6	7
1. Behavior	--	.00	.16 ***	.09 **	.33 ***	.14 ***	.20 ***
2. Sex	.12 **	--	-.05	.11 ***	-.05	-.09 **	.01
3. Age	.32 ***	.02	--	.05	.24 ***	.02	.09 **
4. General attitude	.16 ***	.24 ***	.01	--	.07 *	.09 **	.13 ***
5. Subjective norm	.38 ***	.05	.32 ***	.19 ***	--	.19 ***	.23 ***
6. PBC	.34 ***	.06	.29 ***	.24 ***	.53 ***	--	.09 **
7. Eco-net	.25 ***	.00	.18 ***	.18 ***	.34 ***	.30 ***	--

NOTE. Correlations for the Germany sample (N=942) are above the diagonal; those for the Japanese sample (N=514) are below the diagonal.

Sex: male = 1, female = 2. \*\*\*  $p < .001$ . \*\*  $p < .01$ . \*  $p < .05$ .

## 2.4 Determinants of the environmentally conscious behaviors in two countries

### 1) Analysis

To determine which factors were associated with pro-environmental behaviors, hierarchical regression analyses were conducted. The analysis allowed testing independent contributions of each variable, while controlling the effect of the other variables.

Separate analyses were conducted on reducing behavior and community participation as dependent variables. In step 1 of the regression analysis, we entered age and sex as the independent variables to check the effect of demographic variables. We then entered country as a dummy variable and cognitive variables; general attitude, subjective norms, perceived behavioral control, and the Eco-net. In step 3, we added interaction terms between country and other cognitive variables. This step allowed the examination of whether the effect of each variable

differs between countries systematically. Each cognitive variable was centered before calculating interaction terms to avoid multicollinearity problems.

### 2) Reducing behavior

Regression analysis for reducing behavior showed that variables in step 1 accounted for significant variance although the proportion of the explained variance was not large ( $R^2=.08$ ,  $F(2,1371)=57.4$ ,  $p<.001$ ). Elderly and women were more likely to engage in reducing behavior.

Entering the cognitive variables and country in step 2 increased explained variance ( $R^2=.30$ ,  $F(7,1366)=85.5$ ,  $p<.001$ ,  $\Delta R^2=.23$ ). In this step, all the variables were significant at 0.01 level. Among the independent variables, perceived behavioral control had the highest beta coefficient ( $\beta=.31$ ,  $t(1366)=12.5$ ,  $p<.001$ ). People who perceived higher behavioral control were more frequently engaging in reducing behavior. Beta coefficient of the county was positive, indicating

with pro-environmental behaviors, subjective norms and perceived behavioral control as dependent variables separately and country (Germany and Japan: between subject) and type of behavior (reducing behavior vs. community participation: within subject) as independent variables (Table 1).

#### *Pro-environmental behaviors*

Results indicated that for pro-environmental behaviors, main effects of country,  $F(1,1439)=10.2$ ,  $p<.001$ , type of behavior,  $F(1,1439)=2174.8$ ,  $p<.001$  and interaction effect between type of behavior and country  $F(1,1439)=310.0$ ,  $p<.001$ , were all statistically significant. German respondents reported engaging in reducing behaviors more often than Japanese. Japanese respondents reported community participation more often than German respondents. Both Germans and Japanese engaged in reducing behaviors more frequently compared to community participation.

#### *Subjective norms*

For subjective norms, main effects of country,  $F(1,1438)=115.8$ ,  $p<.001$ , type of behavior,  $F(1,1438)=71.4$ ,  $p<.001$  and interaction effect between country and behavior  $F(1,1439)=85.9$ ,  $p<.001$  were all statistically significant. The main effect of country had the largest F value suggesting that Japanese respondents had higher expectations from significant others than German respondents for both reducing behavior and community participation. German respondents perceived less expectation to conduct community participation compared to reducing behavior.

#### *Perceived Behavioral control*

The main effect of type of behavior,  $F(1,1440)=762.0$ ,  $p<.001$ , and interaction effect between country and type of behavior,  $F(1,1440)=20.2$ ,  $p<.001$ , were significant; but the main effect of country was not significant, evaluated as being easier to conduct than  $F(1,1440)=1.2$ , *n.s.* Reducing behavior was had community participation. German respondents higher perceived behavioral control scores for reducing behavior and lower perceived behavioral control scores for community participation.

Table.1 Means and Standard Deviations by Country and Behavior type

Variable	Germany (N=942)		Japan (N=514)	
	Reducing Behavior	Community Participation	Reducing Behavior	Community Participation
	M (SD)	M (SD)	M (SD)	M (SD)
Behaviors	3.52 (.96)	1.42 (.75)	3.08 (1.00)	2.12 (1.16)
Subjective norms	2.24 (1.04)	1.83 (.86)	2.52 (.95)	2.54 (.88)
PBC	3.72 (.98)	2.67 (1.06)	3.52 (.95)	2.77 (.89)

NOTE: All scales in the table range from 1 (low) to 5 (high).

### 2.3 Correlations among the variables

Before comparing the determinants of the environmentally conscious behaviors in Germany and Japan, zero-order correlations were calculated to address multicollinearity issues (Table 2, Table 3).

For reducing behavior, all of the variables except for sex in German sample had significant correlation with the behavior at 0.1% level. In Japanese sample, subjective norms and perceived behavioral control had correlation coefficient over .30 with the behavior. In German sample, only perceived behavioral control had the correlation coefficient over .30 with the behavior. No correlation coefficient exceeded over .50 in the matrix.

For community participation, only subjective norms had a correlation coefficient over .30 with the behavior in German sample. In Japanese sample, age, subjective norms and perceived behavioral control had correlation coefficients over .30 with the behavior. For Intercorrelations between the independent variables, subjective norms and perceived behavioral control in the Japanese sample had the correlation over .50. It is necessary to be cautious about interpreting the regression analysis for community participation with Japanese samples due to the intercorrelation.



that German respondents conducted reducing behavior more frequently. Beta coefficients of sex and the Eco-net were relatively lower.

In step 3, we entered interaction terms between country and each cognitive variable. This step increased  $R^2$  slightly ( $R^2=.32$ ,  $F(11,1362)=57.0$ ,  $p<.001$ ,  $\Delta R^2=.01$ ). Among the interaction terms, subjective norms  $\times$  country ( $\beta = -.39$ ,  $t(1362) = -4.1$ ,  $p<.001$ ), and PBC  $\times$  country ( $\beta = .25$ ,  $t(1362) = 2.7$ ,  $p<.01$ ) had significant effects on behavior. Subjective norms had stronger positive effects on reducing behavior in Japan than in Germany while perceived behavioral control had stronger positive effects in Germany than in Japan when the other variables were controlled. The main effect of subjective norms still remained significant, indicating that expectation from

**Table.4 Summary of Hierarchical Regression Analysis for Variables Predicting Reducing Behavior (N= 1456)**

Variable	Step 1		Step 2		Step 3	
	$\beta$	t	$\beta$	t	$\beta$	t
Sex	.10	3.70***	.06	2.67**	.06	2.58**
Age	.26	10.13***	.16	6.62***	.16	6.55***
Country			.17	6.95***	.20	7.75***
General attitude			.09	3.79***	.04	.52
Subjective norm			.13	5.25***	.52	5.35***
PBC			.31	12.51***	.07	.72
Eco-net			.08	3.11**	-.10	-.92
General attitude $\times$ Country					.05	.62
Subjective norm $\times$ Country					-.39	-4.11***
PBC $\times$ Country					.25	2.71**
Eco-net $\times$ Country					.17	1.69
$R^2$	.08		.30		.32	
$\Delta R^2$	.08		.23		.01	
F	57.42***		85.48***		57.04***	

NOTE. \*\*\*  $p < .001$ . \*\*  $p < .01$ .

Sex: male = 1, female = 2

Country: Japan=1, German=2

significant others are relevant for engaging in reducing behavior for both Japanese and German respondents, although the effect was stronger for Japanese. The effects of age, sex and country also accounted for significant variance of reducing behavior. Main effects and interaction terms of general attitude and the Eco-net were not significant. Results for the analyses on reducing behavior are shown in Table 4.

### 3) Community participation

The variables of step 1 for community participation accounted for a significant variance ( $R^2=.06$ ,  $F(2,1368)=47.5$ ,  $p<.001$ ). Elderly and women were more likely to participate in community activities. The variables of step 2 explained 21 % variance of the community participation ( $R^2=.28$ ,  $F(7,1363)=74.0$ ,  $p<.001$ ,

**Table.5 Summary of Hierarchical Regression Analysis for Variables Predicting Community Participation (N= 1456)**

Variable	Step 1		Step 2		Step 3	
	$\beta$	t	$\beta$	t	$\beta$	t
Sex	.09	3.55***	.06	2.71**	.06	2.40*
Age	.24	9.15***	.13	5.59***	.13	5.27***
Country			-.28	-10.25***	-.29	-9.64***
General attitude			.05	1.90	.07	.85
Subjective norm			.25	9.07***	.32	3.07**
PBC			.11	4.40***	.37	3.42***
Eco-net			.10	3.96***	.25	2.28*
General attitude $\times$ Country					-.03	-.40
Subjective norm $\times$ Country					-.09	-.90
PBC $\times$ Country					-.28	-2.61**
Eco-net $\times$ Country					-.15	-1.40
$R^2$	.06		.28		.29	
$\Delta R^2$	.06		.21		.01	
F	47.46***		74.00***		49.30***	

NOTE. \*\*\*  $p < .001$ . \*\*  $p < .01$ .

Sex: male = 1, female = 2

Country: Japan=1, German=2

$\Delta R^2=.21$ ). In this step, all variables except general attitude were statistically significant ( $p$ -values at 0.05 level). The beta coefficient of country was negative, indicating that the mean level of participation was higher in Japan.

In step 3, we entered the interaction terms with country. A slight increase in  $R^2$  ( $R^2=.29$ ,  $F(11,1359)=49.3$ ,  $p<.001$ ,  $\Delta R^2=.01$ ) was obtained.

Among the interaction terms, the interaction between perceived behavioral control and country was statistically significant. Perceived behavioral control had stronger positive effects on behavior in Japan than in Germany. This interaction was opposite to that of reducing behavior, which showed that the effect of perceived behavioral control was stronger in Germany for reducing behavior, but it was stronger in Japan for community participation. The main effects of subjective norms, perceived behavioral control and the Eco-net were also significant. Results for the analyses on community participation are presented in Table 5.

### 3. DISCUSSION

#### 3.1 National differences

Our interest was on comparing the determinants of pro-environmental behaviors between countries. The results showed that subjective norms had a greater influence on individual pro-environmental behaviors in Japan, which was consistent with our hypothesis about cultural differences. Markus & Kitayama (1991) argued that since the Japanese self-concept is formed in part by relationships with others, it is important for Japanese to be sensitive to the expectations of others in order to maintain harmonious relationships with them. Although the main effect of subjective norms was also significant for Germany, the effect was stronger in Japan.

Comparison of the means showed that German respondents exhibited more *individual* pro-environmental behaviors than that of Japanese respondents, whereas the pattern was reversed for *collective* pro-environmental

behaviors: Japanese respondents exhibited more *collective* pro-environmental behaviors than their German counterparts. The higher rates for collective pro-environmental behaviors in Japan might be because our survey inquired about "environmental activities in the community." Community activities such as collective clean-up event may be more common in Japan, whereas in Germany, it may be more common to participate, or cooperate with environmental groups as it was pointed out in Ando *et al.* (2005). Ministry of Environment (1994) also reported Germans had higher rate of participation and donation to environmental groups compared to Japanese.

#### 3.2 Individual vs. collective pro-environmental behaviors

Based on results of previous research (Oreg & Katz-Gerro, 2006), we predicted that the mean collective pro-environmental behaviors should be lower than that of individual behaviors regardless of culture. Perceived control of collective pro-environmental behavior was also lower in the previous research; indicating that people considered it more difficult to conduct collective pro-environmental behaviors compared to individual behaviors. The result of the present study supported the hypothesis that the behavioral level and PBC was lower than those of individual behaviors.

Then what determines collective pro-environmental behaviors when the barriers are so large and that very few people conduct the behaviors? Our results showed that subjective norms and the Eco-net have impacts on collective pro-environmental behaviors, which indicated that social factors played an important role in collective pro-environmental behaviors. The rather surprising finding was that the impact of subjective norms and the Eco-net did not differ between countries because the interaction term with country in step 3 was not significant and only main effects in step 2 were significant. PBC was also a significant determinant, and its effect was stronger in Japan. Those who perceived it is easy to participate in environmental activities in community actually performed the behavior in

Japan.

The present research found that the Eco-net is also a significant determinant of collective pro-environmental behaviors. Results indicated that network was more important for collective behaviors than it is to individual behaviors because the Eco-net remained significant in step 3 only for collective behaviors. Environmental networks may transmit information and expectations regarding the environmental issues in the community. The role of environmental networks in the participation of collective pro-environmental behaviors should be pursued in more detail in future research.

## CONCLUSIONS

The result of the present study supported the hypothesis about national differences. Subjective norms had larger influences on individual behaviors in Japan, indicating the relative importance of interpersonal relationship in Japan. Hypothesis about behavior types were also supported. The behavioral level of collective pro-environmental behavior was much lower than that of individual pro-environmental behavior. Only few people participated in environmental activities in the community. The result also showed the importance of social influences, such as the environmental network and expectation from significant others for collective pro-environmental behaviors.

The strength of the present study was that it involved a large-scale random sampling of two cities in Germany and Japan, which enabled us to compare representative samples of the two cities. While participants of cross-cultural surveys are often limited to college students, the current survey allowed us to investigate the general population of all walks of life. A limitation of the present research is that we only investigated two cities in two countries. There are possibilities that the two cities we selected for the survey do not fully represent average cities of Germany and Japan. Comparisons with more countries or more cities would contribute to the understanding of

cultural differences in pro-environmental behaviors in a broader context.

As for the differences between countries, the result showed that the effects of subjective norms on individual behaviors were stronger in Japan, whereas the effects of PBC were stronger in Germany. This finding implies that subjective norms have a greater impact on countries in which people pay more attention to the expectation of others.

Comparison of individual and collective behaviors showed that social influences were more important for collective pro-environmental behaviors, and cultural differences were smaller for collective pro-environmental behaviors. Since collective behaviors require greater costs than individual behaviors, positive attitudes toward the behavior alone may not be sufficient to undertake these behaviors. However, the approval of significant others and broader network played a more important role in promoting collective behaviors.

The cross-over of these two axes suggests that even in Germany, social factors are important in motivating collective pro-environmental behaviors. The current study suggested that pro-environmental behaviors can be passed onto the other individuals through expectations and networks.

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## NOTES

<sup>1)</sup> On the other hand, internalized norm as a personal value is called "personal norm" in psychological literature (Schwartz, S. H. 1977; Schwartz, & Howard, 1981).

<sup>2)</sup> The initial number of samples in Cologne was larger due to our experience of low response rates in Germany, which was often around 10%. On the other hand in Japan, the response rates in our previous surveys were over 50 %. To provide greater incentive to respondents in Cologne for participating, we offered entry into a lottery draw for questionnaire completion.

<sup>3)</sup> Since residents of over 18 years old (in Germany) and over 20 years old (in Japan) are considered as adults and are eligible to vote for the election, we therefore chose German residents of over 18 years old and Japanese residents of over 20 years old to be respondents.

<sup>4)</sup> In social surveys conducted in Japan, it is often the case that women are more willing to participate than men. We therefore controlled the gender when we compared cultural differences between Germany and Japan.

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