

Consumers' Pro-Environmental Behavior In Taiwan—The Examination Of The Vbn Theory Model And The Impacts Of Climate Change Knowledge

Mei-Fang Chen ^{1*}

Department of Business Management, Tatung University, 40 Chung-Shan North Road, Section 3, Taipei, Taiwan

Abstract. The main objective of this study is to examine the predictive power of the complete VBN theory model applied in consumers' pro-environmental behavior by investigating the environmental scales associated with this model. Stern's value-belief-norm theory of environmentalism (VBN-theory) integrates value theory, Dunlap and Van Liere's New Environmental Paradigm (NEP), and Schwartz's moral norm-activation theory of altruistic behavior, suggesting that perceiving adverse effects from global warming could promote mitigation behavior. Pro-environmental behavior can be defined as 'intentionally reducing the negative impact that an action can have on the environment'. Secondly, in view of varying degrees of climate change knowledge, this study will investigate whether or not people with more correct climate change knowledge will engage in more pro-environmental behaviors than their counterparts. A stratified sampling collected in Taiwan, 757 were found useful for this empirical analysis. The results of a series of regression analysis confirm that the causal links proposed by the VBN theory of pro-environmental behavior indeed exist. The results from the ANOVA tests across the two groups of respondents with high or low knowledge of climate change indeed vary in the following components of the VBN theory: New Environmental Paradigm (NEP), one's awareness of the consequences (AC), and one's self-ascribed responsibility (AR)) and for personal norms (PN). The group better informed of climate change has higher mean scores than the counterpart. However, no significant difference is noticed in the respondents' values and their pro-environmental behavior between the two groups.

Keywords: Value-belief-norm (VBN) theory; climate change; climate change knowledge; pro-environmental behaviours; the New Environmental (or Ecological) Paradigm (NEP) box with the same font size as the rest of the paper.

1. Introduction

The disastrous results of global climate change such as the degradation of the environment, heat waves, flooding, and extermination of animals and plants have been regarded as a serious risk to the world. The intensification of the media coverage of environmental issues has served to reinforce and perpetuate environment concerns [1]. There is a need for a radical change in values, behaviour, and institutions towards a paradigm of lower consumption. Psychologists and sociologists are exploring the factors associated with conservation behaviour, particularly recycling, to promote extensive behavioural change [2]. Theoretical models can help identify key drivers and obstacles to achieving behavioural change. Stern's value-belief-norm theory of environmentalism (VBN-theory) [3] integrates value theory, Dunlap and Van Liere's [4] New Environmental Paradigm (NEP), and Schwartz's [5] moral norm-activation theory of altruistic behaviour, suggesting that perceiving adverse effects from global warming could promote mitigation behaviour. Pro-environmental behaviour explicitly aims for a reduction or solution of the environmental problem, which can be defined as 'intentionally reducing the negative impact that an action can have on the environment' [6]. The main objective of this study is to examine the predictive power of the complete VBN

* Corresponding author. Tel.: (886) 2-25925252 ext. 2435 #23
E-mail address: mfchen@ttu.edu.tw.

theory model [3] applied in consumers' pro-environmental behaviour by investigating the environmental scales associated with this model. Secondly, in view of varying degrees of climate change knowledge, this study will investigate whether or not people with more correct climate change knowledge will engage in more pro-environmental behaviours than their opposite numbers.

1.1. The Value-Belief-Norm model

The value-belief-norm model (VBN) [3] is an extension of Schwartz's [5] moral norm-activation theory of altruistic behaviour and Dunlap and Van Liere's [4] New Environmental Paradigm (NEP) used to predict environmental activism. Both the NEP [7] and the moral norm-activation theory [5] have been widely applied to examine environmentally significant behaviour, and have proven to be useful in the environmental context. The causal chain of the VBN model [3] moves from a person's sense of obligation to his/her pro-environmental behaviour, which can be seen as a function of a chain of three beliefs: one's self-ascribed responsibility (AR), one's awareness of the consequences (AC) of a behaviour for the valued object, and one's ecological worldview (i.e., the NEP). These beliefs are further determined by environment-relevant values (i.e., egoistic, altruistic, and biospheric). The proposed hypothesis is as follows.

Hypothesis 1: Each causal link proposed by the VBN theory of pro-environmental behaviour is supported in this case.

1.2. Knowledge

Knowledge of causes of climate change and the severity of negative consequences of climate change can predict the laypersons' general risk perception [8] and their risk perceptions associated with climate change [9]. Such knowledge of the causes of climate change is a powerful predictor of behavioural intentions to act in a more pro-environmental manner to combat climate change, independently of beliefs about the consequences [10, 11]. Although knowledge of climate change relates to behavioural intentions, little is known about whether or not knowledge of climate change has an impact on the VBN theory model of pro-environmental behaviour. For policy makers, it is also important to know whether or not knowledge of climate change will lead to pro-environmental behaviour. In view of the variation in people's knowledge of climate change, this study will investigate whether or not the people with more correct knowledge of climate change will have a higher average score for each variable in the causal chain of the VBN theory of pro-environmental behaviour than their counter-parts, people with less correct knowledge of climate change. The proposed hypothesis is as follows.

Hypothesis 2: In terms of the average score for each variable in the causal chain of the VBN theory of pro-environmental behaviour, the group better informed of climate change outperforms its counterpart.

2. Methodology

2.1. Data Collection and Sample

A stratified sampling based on the area classification (there are four regions and 22 counties (cities) in Taiwan) and general socio-demographic characteristics of the valid sample were collected in April 2011. Of a total of 2000 questionnaires sent out, 757 were found useful for this empirical analysis after excluding incomplete responses, with a successful response rate of 37.85%. Based on the median of the respondents' knowledge of climate change (=35), the sample can be separated into the "high climate change knowledge" group and the "low climate change knowledge" group. Of the respondents, 401 are identified as falling into the "high climate change knowledge" (Means= 37.99; S.D. = 2.41) group and 356 the "low climate change knowledge" (Means= 28.68; S.D. = 5.45) group.

2.2. Measures

The measurement scales and the indicators adopted for this study have been validated in other prior research and studies. According to Steg et al. [12], a total of 12 values were selected. Dunlap et al. [7] updated the instrument developed in 1978 to reflect a broader ecological consciousness. According to Steg et al. [12], a total of 21 beliefs were selected, of which 6 items reflected awareness of consequences (AC), 6 items ascription of responsibility (AR), and 9 items personal norm (PN). A 6-item scale measuring consumers' environmental activism was adapted from Seguin, Pelletier, and Hunsley [13]. The measurement items of consumers' pro-environmental behaviors were adapted from Schahn, Damian, Schurig and Fuchsle

[14] and Homburg and Stolberg [15]; for example, environmental citizenship, the purchase, use and disposal of personal and household products that have environmental impacts. To assess a subject's knowledge of climate change, the respondent was asked to determine whether the 50 statements in the questionnaire is true or false.

3. Data analysis and discussions

3.1. Measurement analysis

Confirmatory factor analysis (CFA) was first performed to assess construct reliability, convergent validity, and discriminant validity in order to ensure the reliability and effectiveness of the measurement model. The purification results of CFA reveal that the overall fit statistics of the measurement model are as follows: the model's fit function is lower than 3.0 (Chi-Square/d.f.= 1341.52/626=2.14), the goodness-of-fit index (GFI)= 0.92, the adjusted goodness-of-fit index (AGFI)= 0.90, the comparative-fit index (CFI)= 0.95, the normed-fit index (NFI)= 0.91, the non-normed Index (NNI)= 0.94, and the root mean squared error approximation (RMSEA)= 0.04. According to Anderson and Gerbing [16], both convergent validity and discriminant validity are also achieved. The coefficient alpha values of the scales in the measurement model are also higher than the recommended level of 0.6.

3.2. Regression analysis and one-way ANOVA tests

The results of regression analysis of the postulated causal chain of the VBN theory are presented in Table 1. All of the standardized regression coefficients from the antecedent variable to the outcome variables, which form the causal paths in the VBN theory, and predict consumers' pro-environmental behaviour, are all statistically significant in a positive direction at $p < 0.0001$. This means that the causal links proposed by the VBN theory of pro-environmental behaviour indeed exist. Therefore, H1 is supported in this case. One-way ANOVA tests were carried out to examine whether there were differences in the mean scores of the components of the VBN theory predicting the respondent's pro-environmental behaviour between the groups with high or low knowledge of climate change. The results from the ANOVA tests and the mean scores and standard deviations for each sub-scale and/or the components of the VBN theory predicting the respondent's pro-environmental behaviour across the two groups of respondents are shown in Table 2. The findings indicate that the respondents across the two groups indeed vary in the following components of the VBN theory predicting the respondent's pro-environmental behaviour: NEP; AC; AR, and PN. However, no significant difference is noticed in the respondents' values and their pro-environmental behaviour between the two groups. Thus, H2 is partial supported.

Table 1. The Main Effects Test Results of the VBN Theory Model

	NEP		AC		AR		PN		BAV					
	β	p	β	p	β	p	β	p	β	p				
VA	0.30	<.0001	NEP	0.58	<.0001	AC	0.54	<.0001	AR	0.54	<.0001	PN	0.41	<.0001
R^2	9.14%		R^2	33.76%		R^2	29.46%		R^2	29.63%		R^2	17.16%	
Adj. R^2	9.02%		Adj. R^2	33.67%		Adj. R^2	29.36%		Adj. R^2	29.54%		Adj. R^2	17.05%	

Note: VA=Values; NEP=the New Ecological Paradigm; AC= Awareness of Consequences; AR= Ascription of Responsibility to Self; PN=Personal Norm; BAV=Pro-environmental Behavior

Table 2. One-way ANOVA Test Results

Constructs	Mean	S.D.	Mean	S.D.	F-Value	Pr > F
	Low Knowledge (n=356)		High Knowledge (n=401)			
VA (F1)	5.25	0.93	5.30	0.82	0.63	0.4278
Egoistic Values	4.18	1.53	4.01	1.58	2.24	0.1346
Altruistic Values	5.71	1.04	5.76	0.96	0.53	0.4677
Biospheric Values	5.86	1.10	6.13	0.91	13.52	0.0003
NEP (F2)	5.25	0.70	5.75	0.69	97.07	<.0001
AC (F3)	5.79	0.74	6.04	0.62	24.50	<.0001
AR (F4)	5.24	0.83	5.64	0.83	42.15	<.0001
PN (F5)	5.69	0.72	5.87	0.64	13.89	0.0002

BAV (F6)	2.90	0.61	2.85	0.55	1.75	0.1865
ACT	2.26	0.92	2.12	0.79	5.28	0.0219
PACT	3.62	0.73	3.72	0.72	3.19	0.0743
OACT	2.26	1.00	2.07	0.93	7.33	0.0069
WACT	3.47	0.70	3.48	0.64	0.08	0.7719

Note: VA=Values; NEP=the New Ecological Paradigm; AC= Awareness of Consequences; AR= Ascription of Responsibility to Self; PN=Personal Norm; BAV=Pro-environmental Behavior; ACT= Environmental Activism; PACT=Private-sphere Environmentalism; OACT=Non-activist Public-sphere Behavior; WACT=Organizational Behavior (Direct and Indirect Environmental Behavior in the Workplace).

4. Conclusions

This study represents one of the first attempts to examine the complete causal links of the VBN theory model in Taiwan, which not only corroborates previous studies on other nations but also confirms the findings of this Taiwan case are in line with previous those abroad. The empirical results and findings from this study should be helpful for the policy makers in the governmental and non-governmental organizations advocating the pro-environmental cause in formulating more effective communication strategies to educate consumers and employees to practice more pro-environmental behaviour in Taiwan. The main limitation of this study is that the questionnaires relied on subjective self-reporting on pro-environmental behaviour without objectively assessing pro-environmental behaviour activities in real settings. The second limitation of this study is that with the use of cross-sectional data, a longitudinal approach is clearly needed to do further investigation into consumers' pro-environmental behaviour and climate change knowledge overtime.

5. Acknowledgements

This work was supported by a grant from the National Science Council, Republic of China (NSC 100-2410 - H - 036 - 001 - MY3).

6. References

- [1] Hannigan J. *Environmental Sociology*. Routledge, New York; 2006.
- [2] Chen M-F, Tung P-J. The moderating effect of perceived lack of facilities on consumers' recycling intentions. *Environment and Behaviour* 2010; **42**: 824-44.
- [3] Stern PC. Toward a coherent theory of environmentally significant behaviour. *Journal of Social Issues* 2000; **56**, 407-24.
- [4] Dunlap RE, Van Liere KD. The "New Environmental Paradigm": a proposed measuring instrument and preliminary results. *Journal of Environmental Education* 1978; **9**:10-9.
- [5] Schwartz SH. Normative influences on altruism. In L. Berkowitz (Ed.). *Advances in experimental social psychology*, New York: Academic Press; 1977 p. 221-79.
- [6] Kollmuss A, Agyeman J. Mind the gap: why do people act environmentally and what are the barriers to pro-environmental behaviour? *Environmental Education Research* 2002; **8**: 239-60.
- [7] Dunlap RE, van Liere KD, Mertig AG, Jones RE. Measuring endorsement of the new ecological paradigm: A revised NEP scale. *Journal of Social Issues* 2000; **56**: 425-42.
- [8] Sjöberg L. Consequences matter, "risk" is marginal. *Journal of Risk Research* 2000; **3**: 287-95.
- [9] Böhm G, Pfister H-R. Mental representation of global environmental risks. *Research in Social Problems and Public Policy* 2001; **9**: 1-30.
- [10] Bord R J, O'Connor RE, Fisher A. In what sense does the public need to understand global climate change? *Public Understanding of Science* 2000; **9**: 205-18.
- [11] O'Connor RE, Bord RJ, Fisher A. Risk perceptions, general environmental beliefs, and willingness to address climate change. *Risk Analysis* 1999; **9**: 205-18.
- [12] Steg L, Dreijerink L, Abrahamse W. Factors influencing the acceptability of energy policies: A test of VBN theory. *Journal of Applied Psychology* 2005; **25**: 415-25.
- [13] Seguin C, Pelletier, LG, Hunsley J. Toward a model of environmental activism. *Environment and Behaviour* 1998; **30**: 628-52.
- [14] Schahn J, Damian M, Schurig U, Fuchsle C. Konstruktion und Evaluation der dritten Version des Skalensystems

zur Erfassung des Umweltbewusstseins (SEU-3) [Construction and evaluation of the third version of scale system for assessing environmental awareness (SEU-3)]. *Diagnostica* 2000; **6**: 84-92.

- [15] Homburg A, Stolberg A. Explaining pro-environmental behaviour with a cognitive theory of stress. *Journal of Environmental Psychology* 2006; **26**: 1-14.
- [16] Anderson JC, Gerbing DW. Structural equation modeling in practice: A review and recommended two-step approach. *Psychological Bulletin* 1988; **103**: 411-23.
- [17] Nunnally J.C. *Psychometric theory* (2nd ed.). New York: McGraw-Hill: 1978.