Determining Impacts of Attitude on Household Recycling Behavior using Path Analysis: A Case Study in Can Tho and Ho Chi Minh City, Vietnam

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ARTICLE INFO   ABSTRACT

In the last decades scientists around the world have come to a consensus that the survival of humanity is threatened by rising climate changes if people continue to consume and produce in the same way as it has been. According to different analyses including those commissioned by the World Bank, Vietnam is among the countries to be heavily impacted by a rise in sea level caused by the melt of Northern and Southern ice caps. Therefore, as a member of the global community, the Vietnamese government and people must also share the responsibility to address the problem of climate change and act accordingly. Recycling to reduce landfill development, saving energy and water consumption, and curtailing CO2 emission are examples of behavior attributable to the alleviation of environmental degradation. This current study, funded by NAFOSTED, aims at exploring impacts of consumers' attitude on their household recycling behavior. The study contributes to the existing general discussion about possible attitude-behavior relationship by exploiting structural equation modeling (SEM) with data from the two major cities in Southern Vietnam. This method allows for an examination of multiple complex relations among various factors, mediators, and the dependent variable. This current research study, in addition, is among few ones that take on this approach, especially in the Vietnamese context. Among important findings, a person's attitude toward recycling may affect his or her reported recycling behavior. Social norm has also been found to influence recycling behavior indirectly via recycling attitude. Therefore, city governments may consider investing more in public policies that nurture and cultivate the favorable attitude toward recycling behavior.

1. Introduction

Humans have witnessed various climate anomalies and extreme weather conditions at the end of the 20th and the beginning of the 21st century. According to different analyses including those commissioned by the World Bank (2010, 2011), Vietnam is among the countries to be heavily impacted by a rise in sea level caused by the melt of Northern and Southern ice caps. Scientists believed that agricultural production in developing countries would be heavily disrupted because of global climate change (Keane et al., 2009; and Rosenzweig & Parry, 1994). According to the UNDP Human Development Report Occasional Paper - Climate Change and Human Development in Vietnam (Chaudhry & Ruysschaert, 2007), a 30 cm rise in sea level will increase salinity of the main tributaries of the Mekong River up to 10 km inland. A report by the World Bank Group (2010) indicates that Vietnam may lose 590,000 hectares of rice cropland due to inundation and saline intrusion. Another report by the World Bank Group (2011) estimated that Vietnam's rice production can be severely impaired with a loss of as much as over 9 million tons by 2050. In a more recent news article published on the Jakarta Post, the researchers at the Center for Non-traditional Security Studies (NTS) at Nanyang University of Technology in Singapore report that Southeast Asia is increasingly losing food due to climate extremes (Tian & Lassa, 2015). They project that Vietnam's annual rice production can be reduced by as much as 3 million tons due to future flooding. The figures reported by those researchers have corroborated other findings and forecasts made over the years, raising high alert of the gravity of the situation.

Unfortunately, the existing Vietnamese policies to address different environmental issues are either inadequate or ineffective. The issue of municipal solid waste taking up landfill space, for example, remains one of the major problems to municipalities from North to South such as Ha Noi, Ba Ria – Vung Tau, and Ho Chi Minh City (Thu Hang & Quang Duan, 2011; Nhat Linh, 2012; and Le, 2012). Like other developing countries in Southeast Asia, landfills and dumpsites are common solid waste disposal and treatment in Vietnam (AIT/UNEP RRC.AP 2010). However, the development of designated sites for waste treatment has been slow and not sufficiently managed due to the lack of financial resource. Only 12 of 61 cities and provincial capitals have engineered or sanitary landfills (AIT/UNEP RRC.AP 2010). The amount of solid waste in those urban areas has increased to the point that the municipal governments have to

consider zoning additional landfills. Landfill development and expansion is gradually consuming land that could be used for farming or other purposes; and furthermore, landfill pollutes the aquifer below it and the air surrounding it (Thanh & Matsui, 2011).

There is evidence of a lack of awareness among a large number of Vietnamese people of the solid waste problem that the country is facing. Thanh et al. (2010) find that recyclable content in Vietnamese household solid waste accounts for 12% while food waste accounts for 80% of total waste. Non-recyclable waste only accounts for an insignificant percent of solid waste. It is reasonable to assume that average consumers should recycle more and learn how to treat food waste more effectively. It is crucial that government adopt additional policies that provide incentives for consumers to change their unfavorable behavior toward doing more recycling and reducing more waste.

The purpose of this current study, therefore, is to examine any possible impacts of recycling-related attitudes and subjective norms on recycling behavior among householders in Can Tho and Ho Chi Minh City. The findings will contribute to the decision making process and environmental public policies. They also improve existing scholarly knowledge on complex relations of human behavior and attitudes, which effectively benefits future research in other social and behavioral fields.

2. Literature review

The area of green behavior of consumers has received attention from researchers in different disciplines including marketing, psychology, and economics (Schultz & Oskamp, 1996; Sterner & Barteling, 1999; Yi et al., 1999; Laroche et al., 2001; Nixon et al., 2009; Tang et al., 2011; Ferrara & Missios, 2012; Miafodzyeva et al., 2013; Sharma et al., 2013; Zhao et al., 2013; Nguyen, 2014; Pakpour et al., 2014; and Schwab et al., 2014). Marketers want to know which group of consumers is more likely to purchase environment-friendly products such as those with green labels (e.g. fridges and TV with green energy labels, or food with organic labels). People in psychology and economics are interested in the subject because they want to know how to make favorable behavioral outcomes more popular (Laroche et al., 2001; and Schwab et al., 2014). The literature on waste recycling behavior can be categorized into two main areas of environmental psychology and economics (Nixon et al., 2009). Researchers focusing on the economic side of the topic adopt the willingness to pay approach (Sterner & Barteling, 1999; Ferrara & Missios 2012; and Sharma et al., 2013).

This current study takes advantage of the other approach that relies on human psychology to explain recycling behavior of householders. A number of scholars (Schultz & Oskamp, 1996; Yi et al., 1999; Tang et al., 2011; Miafodzyeva et al., 2013; Zhao et al., 2013; Nguyen 2014; Pakpour et al., 2014; and Schwab et al., 2014) attributed the growth of literature in this field to earlier works by Ajzen & Fishbein (1977) and Ajzen (1991) of reasoned action and, subsequently, of planned behavior. Those theories predict that any behavior is determined by the intention to execute it, which in turn is a function of the attitude toward that behavior and any subjective norm (Ajzen, 1991). The approach is appropriate for this current study due to the contextual condition of Vietnamese major cities. As informal itinerant junk/recyclable buyers are widely available and accessible in those cities, household recycling and recovery is high and does not cost much to individuals and households (Nguyen et al., 2007; and AIT/UNEP RRC.AP, 2010). Furthermore, the garbage collection fee accounts for a small fraction of household income and does not vary significantly across a city (Nguyen et al., 2007), which makes the willingness to pay approach less desirable.

Several socio-demographic features of consumers have been identified to influence recycling behavior. Via a meta-analysis of international studies of recycling behavior during 1990–2010, Miafodzyeva et al. (2013) identify the most commonly used socio-demographic variables including age, gender, income, housing, and education. However, the results of those variables are not consistent across the examined studies. And as a result, the meta-analysis indicates that this group of variables remains a "poor collection of predictors." A review of a number of related studies published after 2010 (Halvorsen, 2010; Sidique et al., 2010; Dalen & Halvorsen, 2011; Tang et al., 2011; Fiorillo, 2013; Zhao et al., 2013; Byrne & O'Regan, 2014; Ferrara & Missios, 2014; Pakpour et al., 2014; and Schwab et al., 2014) confirms that the socio-demographic characteristics may or may not be statistically significant but they remain important control variables. It is also important to note that they may take different signs depending on particular types of recyclable. They include household size (Fiorillo, 2013), age (Sidique et al., 2010; Fiorillo, 2013; Byrne & O'Regan, 2014; Ferrara & Missios, 2014; and Pakpour et al., 2014), gender (Sidique et al., 2010; Fiorillo, 2013; Ferrara & Missios, 2014; Pakpour et al., 2014; and Dalen & Halvorsen, 2011), income (Halvorsen, 2010; Sidique et al., 2010; Fiorillo, 2013; and Ferrara & Missios, 2014), and education level (Fiorillo, 2013; and Ferrara & Missios, 2014).

In addition to the socio-demographic characteristics of householders, this current study also examines their attitudinal features. The attitude of a person toward his or her recycling behavior is one of the important components in the theory of planned behavior (Ajzen, 1991). This notion refers to the degree to which he or she has a "favorable or unfavorable" evaluation of the behavior of interest, i.e. recycling. So the more favorable a person feels about recycling, the more likely he or she carries out his or her intention to recycle. The aforementioned literature indicates that researchers may include multiple variables to capture recycling attitude and may label it under different names such as moral norm and moral motives (Miafodzyeva et al., 2013). Most studies find the variable to be statistically significantly correlated with recycling (Halvorsen, 2010; Nixon et al., 2009; Tang et al., 2011; Miafodzyeva et al., 2013; Zhao et al., 2013; Ferrara & Missios, 2014; Pakpour et al., 2014; and Schwab et al., 2014).

Subjective norm refers to the social pressure that a person perceives to perform or not to perform a behavior (Ajzen, 1991). It is also referred to as normative belief or social norm (Miafodzyeva et al., 2013). Subjective norm is a person's belief that others think him or her to behave in a particular way and the person's motivation to comply with these expectations (Ewing, 2001). Subjective norm is also positively correlated with recycling (Halvorsen, 2010; Dalen & Halvorsen, 2011; Tang et al., 2011; Ferrara & Missios, 2014; Pakpour et al., 2014; and Schwab et al., 2014) but compared with attitude, subjective norm has less predictive power (Miafodzyeva et al., 2013).

Although not part of the original theory of planned behavior, knowledge of and general concern about the environment have also been included in a number of recent studies of recycling behavior (Miafodzyeva & Brandt, 2013; Tang et al., 2011; and Byrne & O'Regan, 2014). Knowledge of environmental benefits of recycling contributes to the shaping of a person's intention by allowing him or her to use available information and reasoning. However, only several of the studies reported significant relationship (Miafodzyeva et al., 2013; Tang et al., 2011; and Byrne & O'Regan, 2014). It may be possible that knowledge of and concern about the environment may affect not only the recycling attitude but also norms and the person's other attitudes. Those two factors may not be strong predictors but may be important to be included in attitude-behavior analysis due to their role.

3. Methods and data

3.1. *Structural Equation Modeling*

The literature review suggests that while the consumer's attitude toward recycling may influence his or her behavior, their relationship may be mediated by other factors. For example, the person's general concern toward environmental issues and schooling may influence his recycling attitudes and his subjective norm. His attitude toward recycling may directly influence his recycling behavior, which may be similarly influenced by his subjective norm. In addition to the attitude factors, socio-demographic characteristics of the consumer such as income, education, and gender may partly explain how much he recycles or how often he does it. In order to tease out the complex relationship among attitudes, attitudes as mediators, and the recycling behavior, researchers have an option to use structural equation modeling (SME) techniques. In fact, this approach has been adopted in studies of recycling behavior (Tang et al., 2011) thanks to available software packages such as STATA™, SPSS™, and SAS™.

Structural equation modeling allows for social scientists to deal with latent variables and complex path analysis. The technique involves simultaneously estimating multiple structural and measurement regression models (Hox & Bechger, 2007). The structural model theorizes causal relations of multiple observed and latent variables. In the measurement model, a latent construct and variable, which cannot be observed and measured directly, is indicated by a group of observable factors. The two models may be included in the same structural equation model to analyze complex relations among different variables.

The estimation model can be graphically described in Fig. 1. It illustrates the conceptual model of the present research by using common SEM symbols. The constructs in circles represent latent variables and those in rectangles are observed variables. The arrows show direction of the hypothesized relation between any two variables for structural equations. The structural equations and the measurement equations will be estimated simultaneously using Maximum Likelihood estimation.
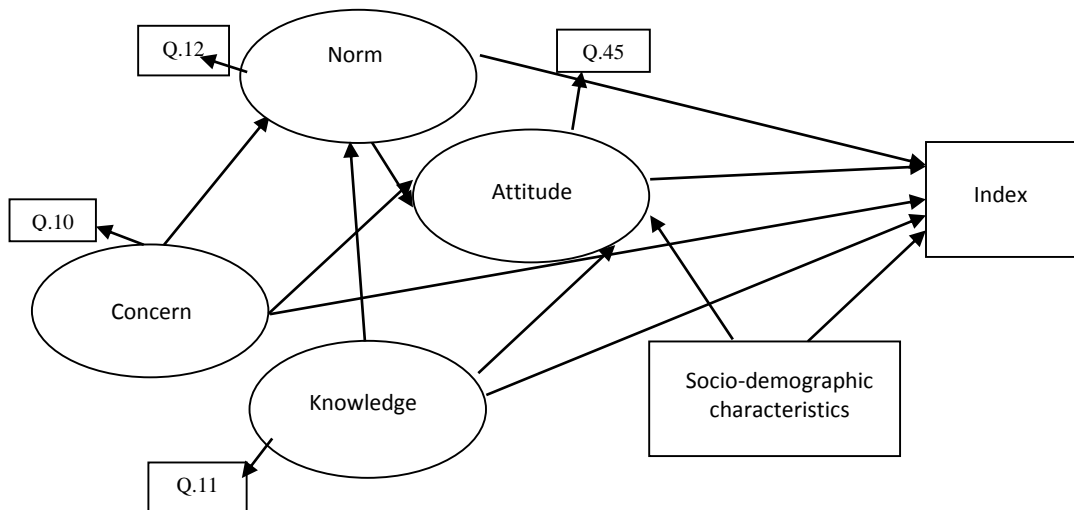
Fig. 1. Conceptual model of attitude-behavior relationship for recycling

3.2. Data

This study is based on the 2014 Nafosted-funded research No.II4.5-2012.09 that explored factors attributable to consumer's environment-friendly behaviors. A group of researchers at the University of Economics-Ho Chi Minh City developed and conducted the survey questionnaire from April to June 2014 in Can Tho and Ho Chi Minh City. In each city, the interviewers tried to obtain sample sizes of 200 participants for Ho Chi Minh City and 150 for Can Tho by using stratified sampling of residents from different districts. Specifically, the sample for Ho Chi Minh includes participants from districts 1, 3, 4, 9, 10, Binh Thanh, Tan Binh, Go Vap, Phu Nhuan, and Thu Duc while the sample for Can Tho includes those from Cai Rang, Thot Not, Binh Thuy, O Mon, and Ninh Kieu. The first section of the questionnaire retrieved socio-economic information of the participants. The section also includes household size and size of the housing unit. The variables to be used in the analysis will include gender, age, educational attainment, household size, housing size, and average monthly income in the last year (See Table 1). The researcher uses the log form of monthly household income. In addition, a dummy variable (Dummy) was created for the interviewees residing in Ho Chi Minh City.

Table 1

Socio-economic characteristics of interviewees (variable names in parentheses)

	Mean	Std. dev	Max	Min
Gender (Gender)	0.47	0.5	1	0
Age (Age)	40.9	11.8	75	18
Educational attainment – 8 levels of education (Education)	4.88	1.92	8	1
Household size (Household)	3.31	1.57	10	0
Average monthly household income in the last year in million VND (Income)	24.95	64.83	600	1
Housing size in square meter (Housing)	83.27	90.36	700	6

The second section asks questions about the general attitude of the interviewee toward the environment. The last section asks questions about specific attitude and related behavior of the interviewee in regards to his or her energy usage, water consumption, waste management practice, and use of transportation. For this study of recycling behaviors, the researcher takes advantage of the questions pertaining to the household waste treatment practices.

As the investigators were not able to observe or record true behavior, they rely on self-reported behavior as a proxy to determine true behavior. Question 44 asks the interviewee to indicate all types of items he recycled or sold to informal itinerant buyers and junkshops, those item types include a) Plasticware; b) Metal items; c) Glassware; d) Paper, newspapers and magazines; e) Carton packages; and f) Old clothes. With the assumption that the interview reported his true behavior, the researcher aggregated the number of recycled materials for each interviewee to create his Recycling Index. Consequently, a survey participant who receives 5 scores for this question recycles more types of material than the one whose index score is 2. This Recycling Index (Index) reflects the recycling behavior of the interview participants.

The second section of the questionnaire composed of three sets of questions that can be used to construct the predictors of recycling behavior (Table 2). Those questions are based on a 4-level Likert scale with an addition of an alternative for anyone to say "I don't know/I don't care." This 5th choice is not equivalent to the mid-range point of a typical 5-level Likert scale, thus the researchers must drop cases in which answers to any of four questions contain "I don't know/I don't care." Question 10 asks the interviewee to register his or her degree of interest in nine environmental issues. A higher

degree of interest indicates a high degree of general concern about the environment, allowing for the researchers to construct variable Concern. Question 11 asks the interviewee to indicate his or her level of agreement with different statements made about the environment. An answer to this question should disclose how much information related to the environment that a person should have. Therefore the researchers can create a proxy for the interviewee's knowledge of the environment. Question 12 asks the interviewee to indicate his or her agreement with the willingness to carry out certain act of environmental protection. The question exposes the person to social pressure, which is also categorized as subjective norm or environmental altruism in other studies. In the current study, the authors will name this variable as Norm. Estimation of those latent variables will be carried out simultaneously with structural equation.

Table 2

Question 10, 11, and 12 and their Chronbach's alpha test results (variable names in parentheses)

Q.10. Variable: General concern (Concern)	Cronbach's alpha: 0.9094
Deforestation	
Climate change	
Decline in natural resources	
Bio-diversity reduction	
Clean water shortage	
Household and business waste water treatment	
Air pollution	
Water pollution	
Noise pollution	

Q.11. Variable: Knowledge of environment (Knowledge)	Cronbach's alpha: 0.8196
The environment is important to the life of human	
We must protect the environment for our future generation	
Protecting the environment helps sustain life on earth in the future	

Q.12. Variable: Subjective norm/Altruism (Norm)	Cronbach's alpha: 0.7190
To trade off some of my present benefits to make the environment better	
To save energy to protect the environment	
To save water consumption to protect the environment	
To treat household waste properly to protect the environment	
To limit usage of private transport to protect the environment	

Question 45 in the third section of the questionnaire asks the interviewee to indicate level of his or her agreement with the importance of recycling. Answers to the question regarding four items of recycling related attitude allowed the researchers to create variable Attitude in order to capture recycling attitude of the interviewee.

Table 3

Question 45 and its Cronbach's alpha (variable name in parentheses)

Q.45. Variable: Recycling attitude (Attitude)	Cronbach's alpha:0.6954
Recycling protects the environment	
Recycling helps earn extra income	
Recycling is the citizen's responsibility	
All individuals should regularly recycle	

The structural equation models will take the form as follows:

Attitude = f(Gender, Age, Education, Household, Income, Housing, Concern, Knowledge, Norm)

Norm = f(Concern, Knowledge)

Index = f(Gender, Age, Education, Household, Income, Housing, Concern, Knowledge, Norm, Attitude, Dummy)

4. Results and discussion

4.1. Results

The model was estimated using SEM procedure of STATA™. The total number of observations that STATA™ actually employed to run SEM was 170. Table 4 reports

the modeling results with standardized coefficients and Fig. 2 shows significant paths. Not all paths are significant. For those that are, signs of the coefficients are consistent with the expectation. In the first structural equation, Knowledge ($\beta = .26$, p<.05) and Norm ($\beta = .535$, p< .01) may positively and statistically significantly influenced Recycling Attitude. The standardized coefficient magnitude also suggests that the influence exerted by Subjective Norm tends to be more pronounced. In the second structural equation, Concern ($\beta = .268$, p<.01) and Knowledge ($\beta = .535$, p<.01) may make a positively and statistically significant effect on Norm. In the last equation, Education ($\beta = .262$, p<.01) and Attitude ($\beta = .409$, p<.01) are the only factors that may change one's recycling behavior.

Table 4

Modeling results with standardized coefficients

Independent Variable	Recycling Attitude model	Subjective Norm model	Recycling Index model
Constant	.02 (0.29)		.767 (1.74)
Gender	.02 (0.29)		-.095 (-1.29)
Age	.032 (0.37)		-.001 (-.001)
Education	.121 (1.58)		.262 (2.97)**
Household	-.018 (-0.21)		-.012 (-.15)
Income	.059 (0.77)		.015 (.17)
Housing			.068 (.77)
Dummy	-.075 (-0.81)		.117 (1.45)
Concern	.26 (2.29)*	.268 (3.60)**	.011 (.12)
Knowledge	.535 (4.81)**	.535 (7.40)**	.006 (0.05)
Norm			-.235 (-1.61)
Attitude			.409 (3.43)**
Wald's Test: Chi2	52.79	52.72	36.01
R-square	0.48	0.48	0.21

( ): z-statistics, ** significant at p<0.01, * significant at p<0.05

Table 5

Findings of significant indirect effects for main models

Independent Variable	Recycling Attitude model	Subjective Norm model	Recycling Index model
Gender	***		
Age	***		
Education	***		
Household	***		
Income	***		
Housing	***		
Dummy	***		***
Concern	.075 (2.61)**	***	
Knowledge	.23 (3.54)**	***	
Norm	***		1.11 (4.17)**
Attitude			***

( ): z-statistics, **significant at p<0.01, *significant at p<0.05, ***indirect path was not specified

Fig. 2 illustrates the paths and Table 5 presents the STATA ™ results of path analysis focusing on identifying significant indirect effects stemming from any specific variables. Table 5 shows that Concern and Knowledge will indirectly affect Attitude via Norm. In other words, changes to the level of Concern and Knowledge will trigger changes in Norm, which consequently leads to according changes in Attitude. Also, Norm will indirectly affect Behavior via Attitude. The model, however, does not establish that Concern and Knowledge indirectly affect the behavior of interest via Attitude, nor does it suggest any indirect impacts of any of the socio-demographic characteristics on the behavior of the interviewee.
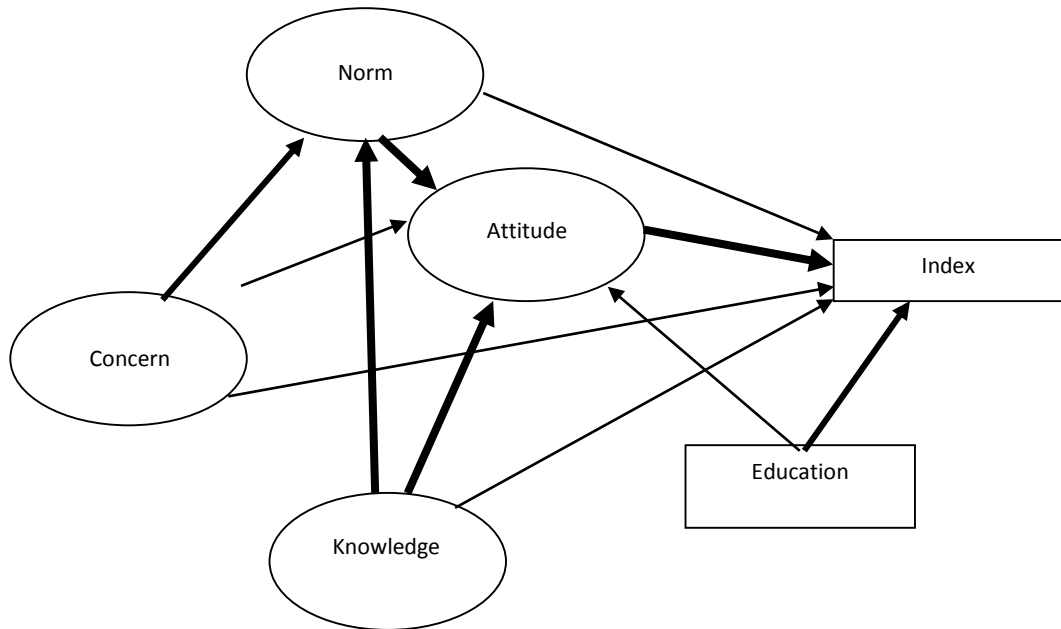
Fig. 2. Significant paths

Table 6 shows model fit criteria, the test statistics and the cut-off values based on similar studies of recycling behavior and attitude. Out of five criteria, the SEM model only meets the requirement set by three including RMSEA, CFI, and SRMR. Therefore, the proposed model fits the existing data at an acceptable rate and as the model fit is not very strong, one must be cautious to draw policy implications from the model.

Table 6

Model fit

Criteria	Test statistics	Cut-off values
Chi2 (p > chi2)	520.0 (0.00)	< 3 (Tang et al., 2011)
Root mean squared error of approximation RMSEA	0.064	< 0.08 (Brown & Cudeck 1993, Tang et al. 2011)
Comparative fit index CFI	0.916	> 0.9 (Tang et al., 2011)
Tucker-Lewis index TLI	0.894	> 0.9 (Tang et al., 2011)
Standardized root mean squared residual SRMR	0.057	< 0.08 (Tang et al., 2011)

4.2. Discussion and limitations

The role of education is consistent with some of the literature as extensively discussed by Miafodzyeva et al. (2013). Specifically, higher education level, which is associated with the number of years of schooling may increase the number of material types being recycled at household, similar to what Ferrara and Missios (2014) and Fiorillo (2013) found in their studies.

The model also establishes the relationship between one's attitude toward recycling and his or her reported behavior, which is also the core of the theory of planned behavior proposed by Ajzen (1991). As suggest by this literature that also includes empirical studies, attitude should be statistically significantly correlated with recycling (Halvorsen, 2010; Nixon et al., 2009; Tang et al., 2011; Miafodzyeva et al., 2013; Zhao et al., 2013; Ferrara & Missios, 2014; Pakpour et al., 2014; and Schwab et al., 2014). In fact, the finding is consistent with the theoretical and empirical studies in that literature.

It is interesting that attitude toward recycling appears to be more important than education when recycling behavior is of concern. However, because education attainment was measured in eight levels, the result does not necessarily mean that investment in education will be less efficient compared with investment to change people's attitude. Therefore, although not a direct one as suggested by the literature, policy makers should consider this factor when they think of long term strategy.

The findings also indicate that improving one's knowledge of the environment and the concern about different environmental problems may not change his or her recycling behavior. However, those factors may help form his or her attitude toward recycling; and thus by affecting them, public policies may create desirable changes in the attitude, resulting in favorable action and behavior. It is also important to note that those factors and norm do not correlate with or influence the behavior directly as indicated by statistically insignificant coefficients in the structural model.

The explanatory power of the structural equations remains weak but is consistent with the existing literature concerning recycling behavior (Tang et al., 2011). This is possible due to the fact that the survey questionnaire did not clarify whether the same person who answered the questionnaire also made recycling decisions in the household. The overall SEM model fit is lower than expected. The level of model fit for SEM depends largely on several factors including data normality and sample size (Hox & Bechger, 2007), of which this current study may have not met minimum requirement.

The survey did not ask the respondents about their efforts to recycle household waste, which has been considered as a possible moderator in some earlier studies (Schultz & Oskamp, 1996). In other words, attitudes more strongly affect recycling behavior when the amount of effort, the degree of difficulties in executing the behavior, is higher. Although this contextual condition of recycling behavior was not recorded in the survey, it is noted that the recycling of household waste in Ho Chi Minh City and Can Tho requires a similar amount of effort. This is largely attributable to the active role that the informal sector including waste pickers, itinerant buyers, and junkshops plays in Vietnam and other developing Asian countries (Nguyen et al., 2007; Thanh & Matsui, 2011; AIT/UNEP RRC.AP 2010).

Other future studies need to address the limitation in sample size and should include questions identifying those who are mainly responsible for recycling in the household. Also the Vietnamese context may need further refinement and perhaps, more qualitative analysis so that their behavior can be better captured and explained. For example, recycling behavior needs to be observed instead of being reported to control for face-saving, an indispensable component in Vietnamese culture and behavior. In another example, the formation of the norm-related and recycling attitude questions deserves further scholarly attention to avoid possible misinterpretation and inconsistency as indicated by low Cronbach's alphas (0.71 and 0.69 respectively). An improved way to do this is to conduct focus group discussion sessions with sociologists and psychologists.

The findings reveal the dummy variable for Ho Chi Minh City being not significant. However, this result does not mean the identified attitude-behavior relationship is regardless of location. The data only consists of ten of 24 districts of Ho Chi Minh City and five of nine districts of Can Tho. All studied districts are highly urbanized and central to urban economic activities. Therefore, this paper has overlooked a proportion of the population who reside in other areas of the cities, including the rural and suburban areas. Future studies should be conducted at the national level and draw samples from the rural areas where the majority of the Vietnamese population is.

Finally, the nature of SEM modeling may not lend it the best tool to capture the causal relationship among different attitude and behavior variables (see Hox & Bechger, 2007; Chen et al., 2008; and Pearl, 2012 for the complete discussion and debate). The authors remain cautious to make conclusion about the results and their policy implications.

Thus, future studies of recycling behavior may consider examining the relationship by using time series modeling techniques.

5. Conclusion

This study aims at exploring impacts of consumers' attitude on their household recycling behavior. It contributes to the existing general discussion about possible attitude-behavior relationship by exploiting structural equation modeling (SEM) with data from two major cities in Southern Vietnam. This method allows for an examination of multiple complex relations among various factors, mediators, and the dependent variable. Among important findings, a person's attitude toward recycling may affect his or her reported recycling behavior. Social norm has been found to influence recycling behavior indirectly via recycling attitude. Moreover, knowledge of the environment helps change the person's attitude toward recycling and how he or she feels he or she needs approval from other people. Therefore, city governments of Ho Chi Minh City and Can Tho may consider including increasing the amount of information and knowledge on the environment and environmental degradation in their communication with the public. They may also consider policies that target creating desirable "greening" behaviors via setting supporting social norms.

6. Policy implications

The study finds that recycling related attitude, i.e. expression in favor of recycling, is important to recycling behavior of urban consumers living in Ho Chi Minh City and Can Tho. Furthermore, social pressure, general concern of different environmental issues and problems, and the knowledge of environment do have a certain role in shaping the behavior via their effects on the attitude. As the findings suggest, knowledge of the environment and general concern about the environment will contribute to changes in how a person feels he or she has to meet the expectation of society. The idea of performing up to other people's expectation will result in positive changes in the attitude of the consumer associated with recycling. Moreover, when induced changes take place in the attitude of the consumer, it is expected that certain changes will take place in his or her recycling action and behavior. Therefore, public policies need to take account all of those factors to create desirable changes.

In Vietnam, the national and local governments and part of the public are well aware of the situation and their responsibilities to contribute to the global efforts to slow down or divert climate change. To create the preferable attitude toward recycling among the rest of the public and increase the intensity of this attitude among those who already have it, it is important to note the role of knowledge about the environment. This knowledge helps shape one's social norm, i.e. how much he or she needs social approval, and this knowledge also helps create one's attitude toward recycling.

Knowledge and information about the current conditions of the environment can be published in newspaper, magazines, information campaigns, academic activities, and TV. The broadcast information will provide most, if not all, updates on the current conditions in Vietnam and perhaps other parts of the world. The city government should emphasize important facts about environment degradation, which has become an imminent threat to human civilization in general and increasing nuisance to daily lives of urban dwellers in Ho Chi Minh City and Can Tho.

In addition, the city government should also consider setting greening behavior as a norm to generate social pressure, which in turn becomes individuals' subjective norm. By appropriating resources to populating the norm over social networks, the media, and education, the government effectively takes advantage of the existing communication channels for multiple purposes including environmental ones. For example, by awarding students with high level of engagement in environmental preservation and protection, the city government may influence the attitude of other students and the public. Coupled with the knowledge of current affairs in relation to the environment, this norm may help create drastic positive change in consumers' attitude■

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