DETERMINANTS OF A HOUSEHOLD'S WILLINGNESS TO PAY FOR A RECYCLING SERVICE: AN EMPIRICAL STUDY IN BANGKOK, THAILAND

ปัจจัยที่มีอิทธิพลต่อมูลค่าความเต็มใจที่จ่ายสำหรับการบริการรีไซเคิล: การวิจัยเชิงประจักษ์ในกรุงเทพมหานคร

Karnjana Songwathana[1] and Suthathip Suanmali[2]

[1]Faculty of Economics, Bangkok University

[2]School of Management Technology, Sirindhorn International Institute of Technology,

Thammasat University

Abstract

As urbanization rapidly increases in Thailand, the amount of solid waste is accelerating. However, less than 20 percent of household solid wastes are being recycled each year. This research aims to encourage recycling behaviours by assessing household preferences toward recycling. Factors influencing household recycling behaviour are derived and evaluated. The results show that approximately 58.50 percent of respondents are willing to pay for recycling, and the average of willingness to pay is about 149 Baht/month. The results indicate that age, income, the level of conservation attitude, and the frequency of grocery shopping affect the probability of a person's willingness to pay for recycling. These significant factors give significant insight for the policy makers.

Keywords: discriminant analysis, recycling service, sorting, willingness to pay

บทคัดย่อ

การขยายตัวอย่างรวดเร็วของเขตเมืองในประเทศไทยส่งผลให้ปริมาณขยะเพิ่มขึ้นอย่างน่าตกใจในช่วงที่ผ่านมา อย่างไรก็ดีไม่เกิน 20% ของขยะเหล่านี้ถูกนำกลับมารีไซเคิลใหม่ในแต่ละปี งานวิจัยนี้จึงจัดทำขึ้นเพื่อส่งเสริมพฤติกรรมการรีไซเคิล และการแยกขยะในครัวเรือน โดยการประมาณค่าความเต็มใจต่อการรีไซเคิลในระดับครัวเรือน ซึ่งปัจจัยต่างๆ ที่ส่งผลต่อพฤติกรรมการรีไซเคิลจะถูกนำมาศึกษาและวิเคราะห์ ผลการวิจัยพบว่า 58.50% ของกลุ่มตัวอย่างยินดีที่จะจ่ายสำหรับการรีไซเคิล โดยมีมูลค่าความเต็มใจที่จะจ่ายเฉลี่ยประมาณ 149 บาทต่อเดือน นอกจากนี้ผลการวิจัยบ่งบอกว่า อายุ รายได้ ทัศนคติต่อการอนุรักษ์ และความถี่ในการซื้อสินค้าอุปโภคบริโภคล้วน

Corresponding Author

E-mail: ssuanma@gmail.com

มีผลต่อความเต็มใจจะจ่ายเพื่อรับบริการรีไซเคิล

คำสำคัญ: การจำแนกกลุ่ม การแยกขยะ มูลค่าความเต็มใจที่จะจ่าย การบริการรีไซเคิล

Introduction

Municipal solid waste (MSW) is the most visible and pernicious by-product of a resource-intensive, consumer-based economic lifestyle. According to the US Environmental Protection Agency (2014), MSW is referred to as trash, everyday items that humans use and dispose of (e.g. grass, clothing, bottles, food scraps, newspapers, etc.). As both economics and urban areas have expanded in the past decades, new consumption patterns have emerged that result in excessive waste. The study of Mavropoulos (2011) indicates that the population in a given area and their consumption patterns are two determinants of the amounts of waste in that area. It is estimated that from the present to 2025, the population of the world will increase by 20 percent and reach 8 billion inhabitants. Waste is still a major problem in many countries around the world because of mass production and consumption of products. The final disposals of these products need to be considered in order to reduce the problems of waste.

According to the Environmental Protection Agency (2014), on average, humans can recycle only 1.53 pounds of waste per person. In Thailand, some of the waste that comes from the community and industry has been separated for recycling such as glass bottles, plastic bottles, or paper. Waste from other parts of the community, such as organic waste is made into compost or bio gas and used to produce renewable energy. According to the Thailand State of Pollution Report (2015), the total amount of MSW generated across the country in 2014 was 26.19 million tons, which is 10 million tons more than the amount of waste in 2011. Of these amounts, 15 percent of MSW or about 4 million tons are waste from just one city, Bangkok. Only 18 percent of MSW was recycled in 2014 (Pollution Control Department, 2015). The current government of Thailand has put waste disposal high on their list; they recognize that poor planning and inadequate management will push Thailand toward a waste crisis. Opening more dumping sites or landfills are quick and only short-term solutions because severe environmental problems and long-term health issues caused by contaminated water and land remain unsolved. Improving the landfills up to best practice standards is one of the long term solutions, but it is more important to address this issue through recycling and effective waste management. Currently, Thai households pay about 16 baht a month to get rid of their waste (34 Baht is equivalent to $1US), and waste separation and recycling are not required by law. Nearly half of the daily 1.1 kilograms of household waste produced per person in Thailand is biodegradable (Pollution Control Department, 2015).

Better facilities to compost organic waste is another long term solution, but this is not just a government issue. In fact, it is an individual, household, and community responsibility to tackle garbage problems. Therefore, Thai people should turn to self-segregated recycling or more waste segregation, in order to support sustainable waste management and reduce the amount of improperly disposed waste, and increase the amount of waste that is able to go to recycling. This research aims to encourage recycling behaviours by assessing a household's willingness to pay for recycling service among Thai people.

Literature Review

Willingness to Pay (WTP) is a concept for determining the price of goods and services. It is the maximum amount that someone is willing to give up or pay to acquire or avoid something. This concept is useful when the price is unknown. It has been used to measure the benefit of publicly provided goods, and most of the time it is employed to determine the amount that people are willing to pay for environmental goods. Increasing environmental concerns are driven by global trends and awareness of pollution. The studies of Awunyo-Vitor, Ishak & Jasaw (2013: 1-8), Hagos, Mekonnen & Gebreegzabher (2012), and Jesdapipat (2012) are to determine a household's willingness to pay for improved solid waste management services and the amount of money they are willing to pay. WTP is affected by various factors, including income, time spent in the area, the quantity of waste generated, responsibility of solid waste management, education, being the owner of the house, age, and other explanatory variables.

The Contingent Valuation Method (CVM) is applied in this research as a tool to estimate the WTP for recycling service in Bangkok, Thailand. CVM was first introduced by Ciriacy-Wantrup in the 1950s as a questionnaire-based method for measuring the value for different product attributes (Venkatachalam, 2004: 89-124). Boman et al. (2003) presented that CVM is the dominating method for evaluating the value of nonmarket items. The purpose of CVM is to measure the variation of goods and services by a questionnaire based technique with respect to either the compensating or equivalent variation (World Bank Institute, 2002). It can be employed for the measuring of both used and non-used values, and it is accepted as an appropriate technique for evaluating the WTP valuation (Sriwaranun et al., 2015: 480-510) with a straightforward technique, and ease of conduction (Whittington, 1998: 21-30). Moreover, it has been used widely to evaluate the value of all kinds of ecosystem and environmental services (non-market goods and services), including value of climate protection through the WTP of biomass, water and sanitation services, and recycling (Fujita et al., 2005; Solomon & Johnson, 2009: 59-87; Tiller, Jakus & Park, 1997: 310-320; Lake, Bateman & Parfitt, 1995; Menegakia, Hanleya & Tsagarakisb, 2007: 62).

In summary, CVM is an appropriate tool for

evaluating the value of non-market goods and services related to environment. CVM directly asks an individual though a questionnaire on the WTP for the environment attributes.

Methodology

1. Data Collection and Questionnaire Design

In order to examine household recycling behavior, this study uses the concept of willingness to pay for recycling service which is developed from a theoretical framework. The survey aims to investigate a respondent's willingness to pay for their recycling service in Bangkok Metropolitan area, Thailand. Hence, the sample for the study is drawn from a Bangkok city area, which is purposively selected, based on the ten most densely populated districts, and the fact that Bangkok produces about 10,000 tonnes of waste a day, a substantial portion of the waste collected across the country. Two hundred households were randomly selected, and the questionnaire collection is done by the face-to-face interview. This questionnaire is comprised of three sections. The first section asks about demographic characteristics and socioeconomic conditions in the households, such as gender, age, family size, income, and education level. The second section asks about a respondent's green attitude regarding environmental protection. In order to determine a respondent's green attitude or motivation for environmental protection, the study includes questions concerning the point of views toward environmental protection. The respondents are asked if they participate in environmental

friendly activities or a green service or if they are aware and want to contribute to a better environment. In addition, the study also asks respondents whether they think that recycling contributes to a better environment, and if they think that recycling has advantages or disadvantages.

The last section is about a respondent's WTP for recycling household wastes. The questionnaire also proposes a hypothetical recycling condition and asks how each household would pay for the recycling service. The questionnaire starts with a question on whether respondents would be willing to pay for a recycling service. Then, respondents who would be willing to pay are asked the maximum amount that respondents are willing to pay for a recycling service per month.

2. Econometric Model Specification

Two main models are estimated in this study in order to estimate determinants of household willingness to pay for recycling in Bangkok. The dependent for the first model is based on on whether the household is willing to pay for recycling; while the dependent for the second model is based on the amount of the willingness to pay. The econometrics model shows the role of socioeconomics and demographic factors in explaining household willingness to pay for recycling. The first and second models are estimated in equation (1) and (2), respectively.

$$D_{wtp} = X'\beta + e \qquad (1)$$
$$WTP = X'\beta + e \qquad (2)$$

D_{wtp} represents a vector of values of a dummy response variable; hence, D_{wtp} = 0 if the respondent is not willing to pay for recycling and D_{wtp} = 1 otherwise. Whereas, WTP represents a vector of amount that a household is willing to pay. X represents a matrix of values of explanatory variables; β represents a vector of regression coefficients, and e represents a vector of residuals.

The explanatory variables of willingness to pay (X) can be shown as followed.

i. Respondent's age (AGE): Age is assumed to have an influence on the willingness to pay for a recycling service. Many studies showed that the younger generation tends to be more concerned about environmental quality than the older generation (Manning & Ryan, 2004; Mission Australia, 2005). Hence, the younger generation will pay for recycling;

ii. Respondent's education (EDU): Education is also assumed to have an influence on the willingness to pay for recycling service. Higher education is associated with a higher concern of the environment since it is directly related to the access to information on the environment and the ability to process the information into knowledge. Hence, highly educated people will pay for recycling;

iii. Respondent's income (INCOME): A household with higher income is likely to join an environmental program. Hence, higher income people will pay for recycling;

iv. Respondent's gender (GENDER): Willingness to pay for recycling service is proposed to be affected by gender. A female is assumed to be more willing to pay for recycling than a male;

v. Respondent's period of stay (YEAR): People who stay for a longer period in an area tend to be attached to the area and are willing to pay for any service that improves the area's ambience;

vi. Respondent's conservation conscious (ATTITUDE): People who feel responsible or concerned about the environment tend to express willingness to pay for a recycling service;

vii. Respondent's number of household member (MEM): It is expected to have a positive effect on the willingness to pay for recycling. The more members in a household, the more people would prefer their members to have a clean environment, which leads to the more willingness to pay for recycling;

viii. Respondent's frequency of grocery shopping (BUY): Frequency of grocery shopping represents the quantity of waste a respondent generates within a week. Hence, people with higher frequencies of grocery shopping tend to express willingness to pay for recycling;

ix. Respondent's frequency of taking trash out (LEAVE): Frequency of taking trash out also represents the quantity of waste a respondent generates. Hence, people with higher frequencies of taking trash out tend to express willingness to pay for recycling;

x. Respondent's perception toward recycling (PER): The positive perception toward recycling contributes to a better environment and is related to willingness to pay for a recycling service.

Hence, the first and second models can be

expressed as indicated in equations (3) and (4).

(3) $D_{wtp}(0/1) = f$(AGE, EDU, INCOME, GENDER, YEAR, ATTITUDE, MEM, BUY, LEAVE, PER)

(4) $WTP = f$(AGE, EDU, INCOME, GENDER, YEAR, ATTITUDE, MEM, BUY, LEAVE, PER)

Results and Discussion

The results show that 58.50 percent of respondents are willing to pay for recycling; while 41.50 percent of respondents are unwilling to pay for recycling. In Table 1, the demographic and socioeconomic of survey respondents are presented. It shows that the average age of the respondents is 38.3 years old with an average income of 34,745 Baht per month. In addition, 76.5 percent of respondents have at least a college education, and 51.50 percent of respondents have been living in the area about 1-15 years. 50.50 percent of respondents go grocery shopping 1-2 times per week; whereas 34.50 percent of respondents take their trash out every day. About 47.50 percent of respondents believe that recycling is the most important. Respondent's conservation conscious attitudes were measured in four score levels from low to high level (0-3 points). The results indicate that 63.50 percent of respondents achieve the highest level of conservation conscious at 3 points which show that most respondents are extremely concerned about environmental issues and conservation. The average of the amount of money respondents is willing to pay for recycling service is approximately 149 Baht/month.

Table 1 Demographic and Socioeconomic of Survey Respondents

Variable	Description	% / Mean
Age	The respondent's average age (year)	38.3
Education	Primary school	10.00%
	Secondary school	7.00%
	Vocational school	6.50%
	College graduate	43.50%
	Higher than college graduate	33.00%
Income	The respondent's average income per month (Baht)	34,745
Gender	Male	46.50%
	Female	53.50%
Length of Stay	Less than 1 year	3.00%
	1-5 years	29.00%
	6-15 years	22.50%
	16-20 years	7.00%
	Over 20 years	38.50%

Table 1 Demographic and Socioeconomic of Survey Respondents (cont.)

Variable	Description	% / Mean
Attitude	0 point	18.50%
	1 point	6.00%
	2 points	12.00%
	3 points	63.50%
Household Member	The average number of household member (people)	3.79
Frequency of Grocery Shopping	1-2 times	50.50%
	3-4 times	25.00%
	5-6 times	7.00%
	everyday	17.50%
Frequency of Taking Trash Out	1-2 times	28.50%
	3-4 times	29.50%
	5-6 times	7.50%
	everyday	34.50%
Perception toward Recycling Service	Somewhat important	2.50%
	Important	11.00%
	Very important	39.00%
	Most important	47.50%
Willingness to Pay	The maximum amount that the respondent is willingness to pay for recycling service	149 (baht)

Table 2 presents the estimated coefficients in the logit regression model and the log-likelihood ratio. The logit regression give a McFadden Squared of about 0.73 whereas the log likelihood ratio (LR) statistic is significant at one percent, which implies that at least one of the independent variables is significant and different from zero. Hence, the logit regression model is appropriate for estimating willingness to pay for recycling. The coefficients of AGE, AGE Squared, INCOME, ATTITUDE, and FREQUENCY OF GROCERY SHOPPING show significant relationships with the willingness to pay for recycling. Age shows a negative relationship with the willingness to pay; whereas age squared shows a positive relationship with the willingness to pay. This means that the probability of the willingness to pay for recycling service decrease with age at an increasing rate. This may be explained by the fact that the younger generation tends to become concerned with the environment and is most likely to pay for recycling. Income shows a positive relationship with the willingness to pay, as expected.

An additional income increases the likelihood of a person's willingness to pay for recycling by 0.1 percent. The higher level of conservation attitude (ATTITUDE) leads to the higher the probability of the willingness to pay for recycling. Frequency of grocery shopping also has a positive relationship with the willingness to pay for recycling. The marginal effect of ATTITUDE represents that an additional level of conservation attitude would increase the likelihood of a person's willingness to pay for recycling by 1.16 percent whereas the marginal effect of frequency of grocery shopping represents that an additional level would increase the likelihood of a person's willingness to pay for recycling by 1.08 percent. This confirms the fact that a person who is concerned about the environment tends to express the willingness to pay for recycling. The coefficients of education, gender, length of stay, the number of household members, frequency of taking trash out, and perception toward recycling are not statistically significant.

Table 2 Logit Regression Results of Determinants Influencing WTP For Recycling Service

Paying/Not Paying	Coefficient	Std. errors	p-values	Marginal effect
AGE	-1.2798**	0.6251	0.04	-0.0237
AGE2	0.0203**	0.0091	0.03	0.0004
EDUCATION	-0.3652	0.3949	0.36	-0.0068
INCOME	0.0002*	0	0	0.0001
GENDER	-0.1561	0.6871	0.82	-0.0029
LENGTH OF STAY	-0.1501	0.2443	0.54	-0.0028
HOUSEHOLD MEMBER	-0.3229	0.2136	0.13	-0.006
ATTITUDE	0.6284***	0.3305	0.06	0.0116
FREQUENCY OF GROCERY SHOPPING	0.5817***	0.3362	0.08	0.0108
FREQUENCY OF TAKING TRASH OUT	-0.2336	0.2959	0.43	-0.0043
PERCEPTION	-0.1152	0.139	0.41	-0.0021
Log Likelihood = -36.3956 and McFadden R-Squared = 0.73				

Note: *, ** and *** indicate statistical significant at 1%, 5% and 10% respectively

Table 3 shows the results from the second model that shows determinants of the amount of willingness to pay for recycling. The significant determinants that influence the higher amount of money respondents are willing to pay for recycling are income and the level of conservation attitude, as expected; however, the number of household members has a negative relationship with the amount of money respondents are willing to pay for a recycling service. This could be because a person with many household members may prefer to let other members do recycling activities instead of paying for a recycling service.

Table 3 Determinants of the Amount of Money Respondents are Willing to Pay for Recycling

Amount of WTP Model	Coefficient	Std. errors	p- values
AGE	17.4694	11.78	0.14
AGE2	-0.1469	0.14	0.28
EDUCATION	-13.0373	16.13	0.42
INCOME	0.0057*	0	0
GENDER	-9.4199	34	0.78
LENGTH OF STAY	-6.725	13.64	0.62
HOUSEHOLD MEMBER	-17.1853***	10.24	0.09
ATTITUDE	45.2834*	14.96	0
FREQUENCY OF GROCERY SHOPPING	23.4354	17.33	0.18
FREQUENCY OF TAKING TRASH OUT	-11.4729	14.85	0.44
PERCEPTION	-2.8466	6.82	0.68

Note: *, ** and *** indicate statistical significant at 1%, 5% and 10% respectively

Conclusion and Policy Implication

This paper examines determinants influencing the willingness to pay for recycling in Bangkok, Thailand. Two hundred households were selected for the survey, which was done by face to face interviews based on questionnaires. The results show that age, income, the level of conservation attitude, and frequency of grocery shopping, affect the probability of a person's willingness to pay for recycling. A younger person will likely pay for recycling; a person with higher income is also likely to pay for recycling. The additional level of conservation attitude and frequency of grocery shopping increases the likelihood of a person's willingness to pay for recycling.

The results show that approximately 58.50 percent of respondents are willing to pay for recycling, and the average of willingness to pay is about 149 Baht/month. The results give

significant insight for policy implications. The level of conservation attitude has a positive impact on the willingness to pay for recycling. Hence, the study recommends for an increase in conservation attitude or an environmental awareness campaign, in order to promote environmental responsibility for people in society, which can lead them to engage more in environmental activities; consequently, increase their willingness to pay for recycling. Income is also another important factor that influences the willingness to pay for recycling.

The results show that respondents with higher income are more likely to pay for recycling, and they are willing to pay more as their income increases. Hence, a flat rate payment for recycling service may not be an effective policy. A policy maker should consider a subsidy or discount for lower income people who would like to participate in recycling in order to encourage them to join recycling activities, which can reduce waste and lead to an environmentally sustainability society.

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Name and Surname: Karnjana Songwathana
Highest Education: Ph.D. in Natural Resources and Environmental Economics, North Carolina State University, U.S.A.
University or Agency: Bangkok University
Field of Expertise: Environmental economics and health
Address: Department of Economics, Bangkok University, Rama IV Road, Klongtoey, Bankok 10110

Name and Surname: Suthathip Suanmali
Highest Education: Ph.D. in Mathematics, North Carolina State University, U.S.A.
University or Agency: Sirindhorn International Institute of Technology (SIIT), Thammasat University
Field of Expertise: Applied Linear Algebras; Regional Trade Analysis
Address: SIIT, 131 Moo 5, Bangkadi, Pathum Thani 12000