THE RELATIVE IMPORTANCE OF SELFISHNESS AND SOCIAL CAPITAL MOTIVES IN EXPLAINING RECYCLING BEHAVIORS

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ABSTRACT

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Based on previous studies on social capital, this thesis aims to further understand social capital motives and their application in recycling behaviors in a university community.

An on-line survey about people's recycling behaviors reached out people from 66 buildings on the Michigan State University campus. Information from the survey was combined with previous research on social capital and a literature review related to environmental behaviors and values.

The conclusions of this study support the rejection of standard neoclassical utility (SNU), which assumes that the decision maker's well-being depends on his own consumption bundle. The analysis results showed that besides selfness motive, some other motives are also found to be significant motivations for driving people to recycle at both individual and building level.

The study also uncovers some reliable relationships between the social motives (and the selfness motive) and demographic characteristics.

Based on analysis results, some recommended strategies are provided for promoting recycling behaviors at MSU at the end of this thesis.

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CHAPTER ONE

INTRODUCTION

1.1 Purpose

This study focuses on understanding what motivations explain recycling behaviors in a college community and compares the relative importance of the selfishness motive and the social capital motives (defined as goodwill, self-respect, caring and belonging). The study also researches the determinants of people's selfishness motive and social capital motives for recycling. By understanding people's recycling motivations, there is potential to improve recycling activities on the campus.

1.2 Research Context

MSU has been taking efforts to improve the university's ecological profile since 1988 when the MSU Board of Trustees started an administrative task force to develop plans for waste reduction (Mission, Michigan State University Recycling website).

The goal of MSU recycling is to keep the community as green as possible by keeping materials out of landfills. In the 2013 RecycleMania Tournament, MSU met and exceeded its goal of collecting 1 million pounds of recyclables. The university's overall recycling rate has increased to 35.84%. To date, the accumulated amount of recyclables at MSU ranks first among the Big Ten participants (2013 RecycleMania Results, Michigan State University Recycling website).

MSU utilizes the principle of "Highest and Best Use"[1], which helps MSU reduce 5.5 million pounds of materials going to landfill each year. The university plans to reduce campus waste by 30 percent by 2015 (MSU recycling website).

1.3 Research Questions

The analysis was conducted at an individual and a building level. The following research questions guide this study:

Individual Level Analysis

1. Do the five motives explain people's recycling behaviors (measured by self-reported recycling rate)?
2. How do demographic factors affect people's recycling motives?

Building Level Analysis

3. Do average motives of people from each building affect actual building recycling rates?
4. Do average motives of people from each building affect average self-reported recycling rates?

Correlation Calculation Analysis

5. Are individual motives correlated with the actions designed to incentivize recycling?

1.4 Procedures

[1] Which means every item is evaluated and determined if they can be reused or repurposed; donated or shared; recycled or composted before they are dumped into landfill.

In this study, data was collected through an online recycling survey, combined with weight data of the recycling and waste from 66 targeted buildings on campus. The buildings were chosen based on building recycling rates (the ratio of recycling weight over the total recycling and waste weight). In order to have a representative sample, about one third of the subject buildings were measured in high rates, about one third were in medium rates, and one third in low rates. Survey participants were then randomly selected after those buildings were decided. People were contacted through email to take the recycling survey.

The Seemingly Unrelated Regression (SUR) model and the Ordinary Least Squares (OLS) model and were used to analyze the survey data. SUR was used to estimate five regression equations of the 2nd research question. OLS was used for addressing all the other research questions. The assumptions of the OLS model were tested for each regression model. The data was analyzed both at individual and building level. Two data sets were estimated to conduct analysis.

CHAPTER TWO

LITERATURE REVIEW

This chapter discusses background information of this study in five aspects. The five aspects explain research motivation of this study and how this study can potentially make contributions to the social capital theory. The five aspects are:

- Recycling and college recycling
- Social capital theory and selfishness theory
- The impact of social capital on recycling
- Social capital motives
- The determinants of social capital

2.1 Recycling and College Recycling

The idea of recycling has been appreciated for centuries. It is by far the most common practice people undertake to help the environment. Recycling is defined as “the process of collecting and processing materials that would otherwise be thrown away as trash and turning them into new products” by the United State Environmental Protection Agency (EPA) (Recycling Basics, EPA website).

Recycling is a key component of modern waste reduction, and the importance of recycling is becoming more apparent. As the volume of waste has increased, there is a need for more recycling efforts. The municipal waste

of the U.S. had reached 245 million tons in 2005; the amount had almost tripled since 1960. In Western Europe, the amount of municipal waste increased by 23% between 1995 and 2003. As the waste increases, so do recycling efforts. While the U.S. recycled only 9.6% in 1980, the country was recycling 32% of its municipal rubbish in 2007 (The truth about recycling, The Economist, 2007).

There are arguments for and against recycling reflecting environmental and economic priorities. While facts do not support that recycling is always profitable in the short term, it is beneficial to the environment in the long run. Recycling benefits the environment and communities in many ways, such as reducing carbon emissions, reducing waste that is buried or burnt, conserving natural resources and saving in energy. According to Ackerman, recycling is not just an economic issue and explaining recycling activities purely with economics is incomplete. He suggested a different decision-making process for recycling. That is to take social issues and future resource needs into the consideration of the overall value of recycling (Ackerman, 1997). Nowadays, recycling is more integrated into the industrial supply chain; recycling not only brings cost efficiency questions but also opportunities.

Today the average recycling rate on waste is twice as much as it was two decades ago in the U.S., but many colleges are proving that much more can be done. Some colleges across the country are leading the recycling movement to reduce, reuse, and recycle on campus. For example, Kalamazoo

College won first place in two categories in the RecycleMania in 2008 and took first in the bottles and cans category in 2012. The core idea of the school's recycling is resource exchange. The resource exchange program houses hundreds of donated items, like textbooks, pens and pencils, lamps and more that can still be treasured by the right beholder. Further, their recycling department transports a ton of food waste to a local pig farm every week. The school also recycles different kinds of e-waste, such as batteries and electric motors.

2.2 Needs Create Motivations

According to Robison, people's ignored needs define new goods; new goods define new motives; and the new motives explain what was considered irrational behaviors before.

People all have social emotional needs and thus need social emotional goods. Social emotional goods are produced in sympathetic relationships. This kind of sympathy in a relationship is called social capital. Thus, social capital and social capital motives, which produce social emotional goods, are invested.

2.3 Social Capital Theory and Selfishness Motive

Social capital integrates economic and sociological sciences, resulting in an appeal based on social capital research. Existing studies have suggested that social capital has considerable benefits on economical and sociological outcomes.

The concept of social capital started to be widely used in the 1990s (Putnam, Robert. 2000). Social capital has a wide range of definitions partially because different authors approach the concept from different disciplines and from different points of view. According to Tristan Claridge, the development of the concept of social capital is still in its early stage. Many authors are confronted with the dilemma that there is not a commonly accepted definition of social capital. Consequently, they review various definitions before they talk about their own definition for the purpose of their study (Claridge, 2004). A few well-known definitions were proposed by Butnam(1995), Woolcock(1998), Coleman(1988), Lin (2001), Butt (1922) and Portes (1998).

Robison et al. defined social capital as “sympathy or sense of obligation that one person or group of persons has toward another person or group of persons.” They use sympathy to refer to the relationship between person i and person j and how that relationship influences economic choices. The capital property of social capital is emphasized in their definition.

In spite of its applications in different sciences, the definitions of social capital share a core idea, which is social network has value. The social capital theory assumes that the relations among people affect their economic choices. Furthermore, the impact of relationships on people’s economic choices varies with the strength of the relationships (Robison, 2012).

The foundation of social capital theories can be traced to Smith, who proposed that one person’s economic choices could be influenced by his or

her perception of other people's well being. As he wrote, "How selfish soever man may be supposed, there are evidently some principles in his nature, which interest him in the fortune of others, and render their happiness necessary to him, though he derives nothing from it, except the pleasure of seeing it" (Smith, 1759, p. 3). There is an increasing body of literature to support the fact that what an agent considers to be in his self-interest is influenced by his relationship with others, social bonds and views (Swedberg, 1991).

In contrast to the social capital theory, the literature to support selfishness is famous. A 19th century economist, Edgeworth, wrote that "the first principle of economics is that every agent is actuated only by self-interest" (Rescher, 1975).

The Standard Neoclassical Utility model (SNU) assumes agents' motives are selfish: with stable preferences and given income, rational agents choose bundles of goods and services for their own consumption to maximize their utilities (Quirk and Saposnik, 1968).

Etzioni summarized the selfishness motive: "The neoclassical paradigm, we have seen, attempts to show not merely that there is an element of pleasure (self-interest) in all seemingly altruistic behavior, but that self-interest can explain it all."

2.4 The impact of Social Capital on Recycling

Many previous studies have analyzed recycling behaviors and explored

strategies to encourage public participation in recycling programs. Factors associated with social capital, such as social pressure, personal contact and the recycling behaviors of friends and neighbors were researched in previous studies.

It has been argued that recycling is not a naturally formed behavior since it involves a focus and appreciation of long-term planning, whereas human beings have evolved to be sensitive to short-term survival goals. To overcome this nature, social pressure is thus considered an effective way to compel people to recycle (Schackelford, 2006). However, recent studies question the effectiveness of social pressure in terms of encouraging recycling because social pressure only works well in small communities, like those with populations ranging from 50 to 150. Also, individual recycling does not always takes place in public view (Pratarelli, 2010).

One study has focused on the impact of personal contact on recycling activities within a community. In this study, ten block leaders were asked to talk to their neighbors individually to promote recycling. Meanwhile, a comparison group was sent fliers for promoting recycling. It was found that the first group recycled much more than the comparison group. Through this experiment, Shawn Burn concluded that individual contact is an important factor for encouraging recycling in a small community (Burn, 2006).

Another study explored the effect of the recycling behaviors of neighbors and friends. Stuart Oskamp found that the people whose neighbors and

friends recycle are more likely to also recycle than the people whose neighbors and friends do not (Oskamp, 1995).

As recycling is directly associated with the definition of pro-environmental behaviors, the findings on what motivate pro-environmental behaviors also apply to recycling. Anja and Julian illustrated that what shapes pro-environmental behavior is a complex issue and that no definitive result has been found though many studies have been conducted. A few of the most influential analytical models, such as linear progression models, altruism, empathy and prosocial behavior models and sociological models only validate to explain pro-environmental behaviors in certain circumstances. Thus, they summarized that pro-environmental behaviors cannot be explained by one single framework or diagram (Anja Kollmuss, 2002).

However, some factors have been proven to have positive or negative influence on forming pro-environmental behaviors, for example, demographic factors, external factors (like social, economic and cultural) and internal factors (like motivation, values, attitudes, emotion, and responsibilities and priorities).

While the reasons that people recycle or conduct pro-environmental behaviors was researched, the question of why other people do not do so was also explored. Pelletier summarized that although people have become increasingly concerned about the environment in recent decades, some people remain inactive about environmental protective behaviors (Pelletier et

al. 1999).

According to research review and some recent studies, Oskamp (1995) indicated that about 40% of people would choose to recycle when they have access to curbside recycling. However, when they don't have the access, this number drops to 10% even though they have a good knowledge (people recognize 8.1 items of 9 curbside recycling items) about curbside recycling (Oskamp, 1995).

2.5 Social Capital Motives

Using data of resource allocation collected from hypothetical surveys and non-hypothetical experiments, Robison and colleagues measured the relative importance of social capital motives and selfishness motives. The four social capital motives they proposed are:

1) Seeking to be validated by others
2) Validation of acting consistently with one's ideal self
3) Our sympathy or social capital towards another person still motivate us to act in the interest of other people
4) Seeking to belong to an institution or organization

Through their study, they concluded that relationships alter resource allocation decisions (Robison, 2012). This study further measures the relative importance of the selfishness motive and the four social capital motives in the context of recycling behaviors.

2.6 Determinants of Social Capital

Claridge points out that there is a lack of consensus on the determinants of social capital. While some researchers think that it takes centuries of cultural evolution to develop social capital, other researchers believe that social capital can be created within a short period of time to support political and economic development. (Claridge, 2004)

Aldridge, Halpern et al (2002) suggested that the main determinants of social capital include: history and culture; whether social structures are flat or hierarchical; family environment; education; the built environment; residential mobility; economic inequalities and social class; the strength and characteristics of civil society; and patterns of individual consumption and personal values.

A different set of determinants includes: family and kinship connections; wider social networks of associational life covering the full range of formal and informal horizontal arrangements; networks; political society; institutional and policy framework; and social norms and values (Pantoja, 1999).

However, these findings were based on empirical research in similar subjects such as network analysis, education, and psychology. Thus these results lack appropriate validity, according to Claridge (Claridge, 2004).

This study examines whether some demographic factors affect social capital and selfishness motives. The five motives are analyzed individually. This analysis method is different from the previous studies.

CHAPTER THREE

SURVEY EXPERIMENT

This chapter explains how the recycling survey was designed and conducted. The implementation of the online survey in this study was approved by the MSU Human Resources Department.

3.1 Survey Overview

An online survey was designed to learn about people's motivations behind their recycling behaviors. This survey consists of four parts and has 33 questions. The survey was conducted online among people from 66 buildings on the MSU campus. 2,629 people were contacted to take the survey by email. An initial communication email letter was sent to the targeted survey participants and two reminder emails. The survey was implemented through a survey software called FluidSurvey.

3.2 Survey Content

The first question on the survey asks the percent of recyclable materials people recycle on average. The next question is a motivation question, which asks participants to allocate percent weights for five motives (described in Chapter 2) as well as any other motives (if people think there are other motives), based on the relative importance of the motives. And the five (or six if they allocate any percent number in "Other motives") responses should sum up to 100 percent.

The first recycling rate question was designed to learn about people's self-reported recycling rates. The data may not be the actual or accurate recycling percent rates at which the survey participants recycle. However, the numbers are their best estimates, so they are probably close to people's actual rates; or at least the numbers reflect how much they would like to recycle, which is associated with their recycling motivations.

The motivation question is a primary question on this survey. Through this question, people's motivations on recycling can be learned. The motivation data will be analyzed to predict people's self-reported recycling rates.

Also, an optional explanation of the five motives is provided on the survey for survey participants to better understand the concepts of the five motives. The explanation appears if people click the 'additional explanation' box.

Lastly, the motivation question is modified for the people who indicate that their recycling rate equals to zero. On the survey, the motivation question becomes 'your motivations for not recycling.' The way the five motives are described in this question is changed accordingly.

The second part contains questions about people's activities at MSU. The questions include how long they have been working or studying at MSU, what they do at MSU, at which building they spend most of their time on campus, if it is convenient to recycle in their building, and people's attitudes towards recycling in their building.

The third part includes questions about demographic characteristics,

including gender, age, ethnicity, education level, field of study, participating organizations, childhood financial situation, income and family structure.

The demographic data will be analyzed as regression predictors on the five social motive percentages that were indicated by survey participants. One research question of this study seeks to find out which of the demographic factors are significant predictors of the five motives. By understanding that, recommendations can be made to encourage people to better participate in recycling activities through enhancing their recycling motivations.

The fourth part asks people to provide comments and suggestions regarding the survey. Another open-ended question in this part asks what the barriers are for recycling in the buildings where they spend most of their time on MSU campus.

Also, 15 Likert Scale questions are included in this part, aiming to understand how some specific activities motivate people to recycle more. People can choose among ‘Increase significantly’, ‘Increase slightly’, ‘Will not affect’, and ‘Will reduce’ to indicate the impact of these activities in terms of increasing the amount of materials that they recycle.

These 15 activities are associated with the five motives. For example, the statement ‘providing more recyclable containers in your building’ is associated with the personal consumption motive. The statement ‘instituting medals/prizes (that can be displayed) for units in buildings with a significant level of recycling’ is associated with the self-respect motive.

This part is helpful to learn about the recycling barriers that people perceive in their buildings on campus. Also, the suggestions people provide for improving MSU recycling activities are either practical or creative. These ideas can be collected and taken into consideration if real changes need to be made to improve recycling in the buildings. Lastly, as mentioned earlier, people's comments about the survey design should be taken into consideration in order to improve future surveys.

3.3 Participant Selection

The survey was distributed through emails among 66 selected buildings on MSU campus. The buildings were selected based on the recycling rate of these buildings. The recycling rate is calculated as follows,

$$\text{Recycling rate} = \frac{\text{recycled material weight}}{\text{recycled material weight} + \text{waste weight}}$$

The weight data of recycled materials and waste are available in the Stewardship Application on the MSU Geographic Information System website. The most current data available on the website are aggregated recycling and waste weight from July 2012 to April 2013. With the data, recycling rates of all the buildings on the MSU campus were calculated.

In order to include buildings with a variety of recycling rates, about one third of buildings with the highest recycling rates, about one third with medium recycling rates and about 20 buildings with the lowest recycling rates were

chosen among all the buildings on campus. These buildings and their recycling rates (during July 2012 to April 2013) are listed in Table 2 in the Appendix.

After the buildings were identified, the people to be contacted to take the survey were randomly chosen from the selected buildings by the MSU Human Resources department. Those invited to participate in the survey either work or study in the buildings.

The targeted participants were contacted by email. They received communication emails that encouraged them to participate in the survey. In total, 2,629 individuals were contacted.

3.4 Survey implementation

The survey was designed and implemented through a survey software called FluidSurvey. A survey link generated by the software was attached in communication emails to the targeted survey participants. The software was also used for collecting and maintaining data for this study. In addition, the software was also used to send out follow-up reminder emails and generate some statistical results of completed responses.

The survey was sent out on Saturday, April 27, 2013. Initially, 492 people responded to the survey, among which 406 had completed the survey. The response rate was 15 percent; and the completion rate was 82 percent.

The first reminder email was sent out on Monday, May 13, 2013. An additional 208 responses were received. The response rate was increased

from 15 percent to 23 percent. The completion rate was 83 percent; it was about the same as earlier.

A second reminder was sent out on Thursday, May 23, 2013. The three email communications generated a total of 928 responses and the response rate increased to 29 percent. The total completed responses were 772; the completion rate was 83 percent.

The survey and reminders were sent out on three different weekdays over a five-week period. In this way, people with disparate schedules and availability during a given weekday could be reached, which potentially results in a relatively high survey responding rate.

3.5 Survey Evaluation

While responding to the open-ended survey questions, or directly emailing us, some survey participants expressed frustration they experienced when they took the survey.

The most common problem raised by survey participants was about the motivation question. According to the comments and email feedback from survey participants, it seems that people did not have a clear understanding of the recycling motivation question. They did not think or did not totally think that their personal recycling motivations were among the motivation choices provided on the survey. Thus they chose to distribute a certain percent number or 100 percent to the ‘Other motives’ category.

Though the language of the motivation question was refined and

simplified, the motivation concepts were deeper than the reasons that people usually think of. As one participant mentioned, the motivations provided for explaining recycling behaviors were identifiable, however, he/she never thought that way.

It can be concluded that participants do not tend to think too hard on the "real drive" for their recycling behaviors. In other words, they did not think 'deeply' enough to reach the motivation level.

Actually, there is a distinction between reasons and motivations. Survey participants did not realize that the reasons they provided, like protecting the earth, are actually associated with the social capital motives. Due to this recurring misconstruction, some extra efforts were made for recoding 'Other motives' for the purpose of data analysis.

People also commented that the survey did not contain any environment-related statement as an option for explaining why people recycle in the motivation question. And they believed that is the most important 'motivation' for them to recycle. For example, the explanations that many participants provided for 'Other motive' were recycling for protecting the earth and recycling for reducing the waste stream that goes to the landfill.

3.6 Discussion for Future Survey

The fact that some participants provided negative comments when they felt frustrated answering the motivation question tells us to think more carefully about the questions for future surveys. Generally speaking, survey questions

do not require a lot of thinking; thus it is natural for survey participants not to stretch too hard while they take surveys.

To increase the efficiency and effectiveness of future surveys on general exchange theory and social capital, the following ideas can be taken into consideration.

First, the survey language should be written more explicitly and reviewed by people who do not have much knowledge in social capital theory in order to ensure that survey questions are clear and concise enough to be understood.

Second, rather than having social motives as options in motivation question, reasons associated with motives can be generated and be included on the survey. Since it is easier for people to think about reasons, survey participants do not need to think as complexly when they consider motivations for recycling behaviors or some other behaviors. Also, these reasons can be sorted into each motivational category after the surveys are completed. The percentage weights for the reasons can also be coded accordingly.

3.7 Pilot Survey

A pilot survey was conducted among Team Member Rick Winder's personal social network connections through an online communication tool (Facebook.com). The survey link was posted on Rick Winder's personal Facebook page; each of his contacts has access to the survey if they are interested. Through that link, 40 people completed the pilot survey.

Instead of focusing on campus-recycling behaviors, general recycling

questions were asked on the Facebook-version survey. The pilot survey was helpful to determine the effectiveness of survey questions.

CHAPTER FOUR

DATA ANALYSIS AND RESULTS

This chapter presents statistical summaries of relevant variables, data management and mathematic models for data analysis. Two sets of data were created for analysis at an individual level and building level. All the estimation results are also included in this chapter.

4.1 Variable Summaries and Coding (individual)

In total, 2,629 people on the MSU campus were contacted to take the recycling survey. Among them, 963 people took the survey and 782 people completed the survey. The responding and completion rates were 37% and 81.2% respectively. The responses who indicated they recycled more than 0% and completed the survey were used for data analysis.

Summaries of Self-reported recycling rates and five motives

The recycling rate question asks people to estimate the percentage of recyclable materials they recycle on average. The question about recycling motivations asks people to distribute 100% to the five preselected social motives or any other motives that they could think of, based on the relative importance of these motives in terms of motivating them to recycle. For convenience, the five motives are defined as goodwill, consumption, self-respect, caring and belonging. The five terms represent the following statements on the survey.

Goodwill – I recycle so other people will like and respect me more.

Personal consumption – I recycle to increase my own income or reduce my expenses.

Self-respect – I recycle to increase my self-respect.

Caring – I recycle to increase the well-beings of persons I care about.

Belonging – I recycle so that I will feel more connected to others.

A statistical summary of people's self-reported recycling rates and their recycling motives are reported in Table 1.

Table 1 Recycling Rates and Motive Summary (Individual)

	Mean	Std. Dev.	Max	Min	Percent of non-zero responses
Recycling rate (Self-reported)	0.75	0.21	1	0.1	N/A
Goodwill	0.02	0.09	1	0	13.9%
Consumption	0.08	0.20	1	0	25.1%
Self-respect	0.28	0.33	1	0	60.7%
Caring	0.56	0.37	1	0	83.2%
Connection	0.03	0.10	1	0	20.1%

(Number of observations: 782)

The column of Percent of non-zero responses refers to the percentages of the survey participants who placed a number higher than 0 out of the total observations in each of the motive categories. The percentages were calculated based on the recoded data.

The mean of the selfishness motive is 8.4%. It ranks as the third highest

motive percentages for explaining people's recycling behaviors. The mean of the caring motive is 56%. About 83% of all the survey participants indicated a percent number on this motive. Both of the two numbers are the highest among the five motives.

Except for the 'Age' question, all the other demographic questions on the survey were coded as categorical variables. Their frequency, percent and observations are summarized in Table 2.

Table 2 Summaries of Demographic Variables

		Frequency	Percent
Gender	Male	293	38.30
	Female	472	61.70
Total		765	100
Ethnicity	White	617	80.44
	Spanish	28	3.65
	Black	39	5.08
	Asian	40	5.22
	Pacific	1	0.13
	Native American	4	0.52
	Multiracial	14	1.83
	Other	5	0.65
	Prefer not to answer	19	2.48
Total		767	100
Education	Below high school	1	0.13
	High school graduate/GED	38	4.93
	Some college	61	7.91
	College/Associate's degree	225	29.18
	Graduate/professional degree	446	57.85
Total		771	100

Table 2 (cont'd)

Field of Study	Humanities	52	5.94
	Natural Sciences	138	15.75
	Social Sciences	119	13.58
	Agricultural & Natural Resources	113	12.90
	Business	110	12.56
	Communications	41	4.68
	Education	67	7.65
	Engineering	53	6.05
	Human or Osteopathic Medicine	38	4.34
	Law	5	0.57
	Music	12	1.37
	Nursing	12	1.37
	Veterinary Medicine	13	1.48
	Other	103	11.76
Total		876	100

Participating Organization	Academic	446	30.26
	Art	56	3.80
	Athletics	86	5.83
	Community Service	188	12.75
	Cultural/Racial	39	2.65
	Gender/Sexuality	15	1.02
	Government/Politics	37	2.51
	Health/Wellness	95	6.45
	Media/Publications	27	1.83
	Religious organization	203	13.77
	Social organization	87	5.90
	Other	83	5.63
	None	112	7.60
Total		1474	100

Childhood Finance	Well-to do	52	6.80
	Comfortable	391	51.11
	Had enough to get by but few "extras"	289	37.78
	Not enough to get by	33	4.31
Total		765	100

Table 2 (cont'd)

Income	Under $20,000	2	0.26
	$20,000 - $30,000	26	3.40
	$30,000 - $40,000	87	11.37
	$40,000 - $50,000	101	13.20
	$50,000 - $75,000	205	26.80
	$75,000 - $100,000	83	10.85
	$100,000 $150,000	98	12.81
	$150,000 or more	67	8.76
	Prefer Not to Answer	96	12.55
Total		765	100

Family Structure	Two biological parents	634	82.34
	Two non-biological parents	12	1.56
	One biological parent and one non-biological parent	23	2.99
	Single non-biological parent	2	0.26
	Single biological parent	19	2.47
	Divorced parents	67	8.70
	Other family situation not described above	13	1.69
Total		770	100

Building Type	Administrative and office	245	31.3
	Classroom	49	6.3
	Lab	172	22.0
	Dormitory	96	12.3
	Mix	125	16.0
	Other	95	12.1
Total		782	100

The demographic factors on the survey were coded as follows to perform regressions and properly interpret results.

Gender: The gender variable is coded as 'female'. Male is coded as 0 and female is coded as 1.

Ethnicity: For the ethnic variable, ‘White/Caucasian’ was a dominant response. Based on the summary, 80.44% of the survey participants are white. Thus the ‘White/Caucasian’ category was coded as 1; all the other ethnic groups, such as ‘Spanish/Hispanic/Latino’, ‘Black/African American’ and ‘Prefer not to answer’ were coded as 0. The variable was named as ‘white’.

Education: The question on the survey about education includes five education levels; they are ‘Did not graduate from high school’, ‘High school graduate or GED’, ‘Some college/ currently attending’, ‘College graduate/ Associate’s degree’ and ‘Graduate school/ professional degree’. These five education categories were coded as numbers from 1 to 5 in the order as they are listed above. This variable was coded as ‘education’.

Field of Study: this survey question contains 13 study fields and ‘Other’. These 13 fields were categorized into six groups. The first group ‘Science and Math’ includes ‘Natural sciences’ and ‘Agriculture & Natural Resources’. The second group ‘Engineering’ has only one field of study ‘engineering’. The third group is ‘Social Science’ and includes ‘Social sciences’, ‘Business’, ‘Communication’, ‘Education’ and ‘Law’. The fourth group ‘Humanity’ contains the fields of ‘Humanities’ and music. The fifth group is ‘Medicine and nursing’ and has ‘Human or Osteopathic Medicine’, and ‘Nursing’ and ‘Veterinary Medicine’ in the group. The sixth group is ‘Other’ fields of study. Except for the ‘Other’ group, the other five groups were coded as five dummy variables to be used in data analysis.

Organization Participation: the variable ‘org_participation’ is coded as 1 if a survey participant indicates that he/she participates in any kind of the organizations listed on the survey; and the variable is coded as 0 if he/she chooses ‘none’ to indicate their organization participation activities.

Childhood Financial Situation: A variable was created and named as ‘Child_finance’. ‘Had enough’ and ‘Not enough to get by’ were coded as 0; and ‘Well-to-do’ and ‘Comfortable’ were coded as 1.

Annual Income: The annual income variable was named as ‘income’. The coding numbers ranged from 1 to 8 for the eight gradually increasing income categories from ‘Under $20,000’ to ‘$150,000 or more’. For the people who responded ‘Prefer not to answer’, those observations were dropped.

Family Structure: The last demographic question asked people about their childhood family structure. 82% of the survey participants chose the option of ‘Two biological parents’ and this type of family structure was coded as 1; all the other options, such as ‘Two non-biological parents’, ‘One biological and one non-biological’ were all coded as 0. This variable was defined as ‘two_biopar’.

Building type: a group of building type dummy variables were created based on the survey question ‘which building do you spend most of your time on the MSU campus’. The 66 selected buildings were categorized into six groups, including administrative and office, classroom, lab, dormitory, mix and others. And then five dummy variables were created and named as ‘ad_office’,

'classroom', 'lab', 'dorm' and 'mix'.

4.2 Variable Summaries and Coding (by building)

A different data set with 66 building observations was created for data analysis at the building level. This data set contains nine variables, all of which were calculated for average values by people reporting in the building; these variables are the five motives, self-reported recycling rate, actual recycling rates for the building, building recycling convenience, and attitude towards recycling in the building.

Self-reported Recycling rate: First, the average self-reported recycling rate of each building was calculated. For example, the self-reported recycling rates[2] of the survey participants from the Administration Building were added up. Then the total percent number was divided by the number of survey participants from the building, resulting in an average recycling rate, which is 68.5% for the Administration Building.

Actual Building Recycling rate: As mentioned in Chapter 3, the building recycling rate is the percent of the recycling weight over the total of the recycling and waste weight. The accumulated weight data from June 2012 to March 2013 were used for calculation. The average self-reported recycling rates of the 66 buildings and their actual building recycling rates are listed in Table 1 in the Appendix.

The last two variables are how convenient it is to recycle in the building

[2] The self-reported rate is the percent of recyclable materials people recycle on average, not specifically referring to their recycling on campus.

and how people in that building value recycling. The recycling convenience variable was coded as 1 for ‘Not available/don’t know’, 2 for ‘not convenient’, 3 for ‘convenient’, and 4 for ‘Very convenient’. Similarly, the ‘Recycling attitude’ variable was coded as 1 for ‘Oppose recycling’, 2 for ‘Don’t care about recycling’, 3 for ‘Support recycling’ and 4 for ‘Strongly support recycling’. For ‘I don’t know’ responses, the observations were not counted for calculating average values. Secondly, an average value of the coding numbers was calculated for each building. The average number represents how convenient it is to recycle (or people’s attitude towards recycling in each building). A statistical summary of the variables in the building level data set is reported in Table 3.

Table 3 Summary of Average Recycling Rates and Motives (building level)

	Mean	Std. Dev.	Max	Min	Obs.
Goodwill	2.60	3.48	16.67	0	66
Consumption	10.58	14.19	95	0	66
Self-respect	28.78	12.55	70	1	66
Caring	52.41	15.55	81.57	1	66
Connection	3.86	2.88	13.06	0	66
Recycling rate (Actual)	38.61	14.31	81.12	10.62	62
Recycling rate (Self-reported)	71.08	13.42	85.5	15	66
Recycling Convenience	3.45	0.28	4	2.9	66
Recycling Attitude	3.26	0.22	3.83	2.9	66

The building function of the selected 66 buildings is summarized and

reported in Table 4. Based on the categories, five dummy variables, including administrative and office, classroom, lab, dormitory, mix and others were created for analysis, which is the same as the coding for building type at individual level.

Table 4 Summary of Building Function Type

Building Type	Administrative and office	16	24.24
	Classroom	5	7.58
	Lab	11	16.67
	Dormitory	15	22.73
	Mix	112	18.18
	Other	7	10.61
Total		66	100

Recoding the “other motives” is an essential step for this study and it had an impact on the data analysis. The survey data shows that the mean of the ‘Other motives’ was the highest among the six motives (five motives and the ‘Other’ motives). However, it can also be concluded that almost all the survey participants’ explanations of their ‘Other motives’ were actually associated with the five motives. Based on this, the percentages of the ‘Other motives’ were reallocated to the appropriate motive category.

The recoding work was conducted as follows. First, the explanations of the survey participants on the ‘Other motives’ were reviewed. Then the decisions of which social capital motives the explanations were associated with were made based on the participants’ explanations. Lastly, the percent

numbers originally allocated for the ‘Other motives’ were reallocated to the social capital motives accordingly based on the decisions that were made earlier.

Rick Winder generated criterion for recoding the ‘Other motives’. He listed various explanations of ‘Other motives’ under each of the five motives. Then the explanations from the survey participants can be compared and decided which category they fall into. In order to ensure accuracy, three research group members including Rick Winder, Prof. Satish Joshi and myself conducted the recoding work separately. Our recoding results were then compared and finalized.

4.3 Mathematic Model

The Ordinary Least Squares (OLS) model and Seemingly Unrelated Regression (SUR) models were used for estimating regressions in this study. OLS was used for analyzing the impact of the five recycling motives on the recycling rates. SUR was used to analyze the determinants of the recycling motives.

OLS was used to address the following three research questions, which were mentioned in Chapter 2. The question numbers below correspond to the original question numbers from Chapter 2.

1. Do the five motives explain people’s self-reported recycling rates?

3. Do average motives of people from each building affect actual building recycling rates?

4. Do average motives of people from each building affect people's average self-reported recycling rates (by building)?

If mathematic models are established for these three questions, all of the dependent variables of relevant models are proportion values. Papke and Wooldridge proposed a method using Generalized Linear Model (GLM) with family (binomial) and link (logit) to estimate regression models with proportional dependent variables (Papke, 1996). One advantage of this method is to have the predicted values fall between 0 and 1, while the OLS model can predict values that are below 0 or above 1. However, for these three models, the predicted values do not go below 0 or above 1 while using OLS. Thus OLS was chosen to estimate the regression models.

The SUR model was used to analyze the relationship between each of the five motives and demographic factors, which is Research Question 2 of this study. Because the percentages of the five motives sum up to 100%, the error terms of the five regressions are correlated across the five equations. Thus, the SUR model is more appropriate and efficient to estimate this model than five OLS models.

4.4 Analysis Results

Individual level analysis

Research Question 1: Do the five motives explain people's self-reported recycling rate.

To address this question, three OLS models, regressing individual

self-reported recycling rates against their recycling motives, are estimated. Robust option is used in all three models. In the first model, it is assumed that the five motives fully explain self-reported recycling rates. In other words, there are no other motives or variables influencing recycling rates. Thus, the model does not include a constant. The empirical results from the estimation are reported in Table 5.

Table 5 Individual Recycling Rate and Motive Regression Results

	Coef. est.	Robust SE	t	sig.
Goodwill	0.53	0.13	4.04	0.00
Consumption	0.59	0.05	12.90	0.00
Respect	0.78	0.02	43.13	0.00
Caring	0.78	0.01	74.52	0.00
Belonging	0.70	0.08	8.22	0.00

Number of Observation=782
F (5, 777)= 2350.47
R-squared=0.92
Root MSE=0.22

In the above table, the motives are listed in the same order as they appeared on the survey. The estimated coefficients of the five motives are all significant at levels of 1%. The coefficients represent how much more recycling one person will do if one of the five motives increases. For example, if a person increases one percent of self-respect motivation for recycling, his or her recycling rate is expected to increase by 0.78 percent. The Caring and Self-respect motives have relatively higher coefficients, meaning these two motives have a higher effect on self-reported recycling rates.

In the second OLS model, the assumption that the five recycling motives fully explain the self-reported recycling rate does not hold, thus a constant is included in this model to capture some other factors affecting people's self-reported recycling rates. The consumption motive was dropped in this model to compare the relative importance of this motive with the other four social capital motives. The empirical results from the estimation are reported in Table 6.

Table 6 Individual Recycling Rate and Motive Regression results

(With constant_1)

	Coef. est.	Robust SE	t	sig.
Goodwill	-0.07	0.14	-0.48	0.634
Respect	0.18	0.04	4.13	0.000
Caring	0.19	0.04	4.44	0.000
Belonging	0.10	0.10	1.06	0.291
Constant	0.59	0.0393	15.11	0.000

Number of Observation= 782
F (4, 777)= 6.66
R-squared= 0.0562
Root MSE= 0.2014

The respect and caring motives are significant in this mode. Because the consumption motive was dropped and considered as a base line in the model, the self-respect and caring motives are relatively significant in comparison with consumption for explaining self-reported recycling rates.

Similarly, another regression was estimated with a constant. In this regression model, the belonging motive was dropped from the model while the

consumption motive was included in order to test the significance of the consumption motive. The result is reported in Table 7.

Table 7 Individual Recycling Rate and Motive Regression Results

(With constant_2)

	Coef. est.	Robust SE	t	sig.
Goodwill	-0.12	0.15	-0.83	0.407
Consumption	-0.08	0.08	-1.02	0.309
Respect	0.12	0.06	1.89	0.06
Caring	0.12	0.06	2.01	0.05
Constant	0.66	0.06	11.30	0.000

Number of Observation= 782
F (4, 777)= 6.80
R-squared= 0.0563
Root MSE= 0.2014

The estimation result shows that the self-respect motive is significant at 10% level and the caring motive is significant at 5% level. However, the consumption motive is insignificant.

The third OLS model added demographic factors in the regression to explore how the demographic variables affect self-reported recycling rates and if the motives affect the self-reported recycling rates differently while adding demographic variable. The empirical results of the OLS estimation are reported in Table 8.

Table 8 Individual Recycling Rate And Motive Regression Results

(With demographics_1)

	Coef. est.	Robust SE	t	sig.
Goodwill	-.0897213	.1659892	-0.54	0.589
Respect	.1896185	.0474419	4.00	0.000
Caring	.2080096	.0451623	4.61	0.000
Belonging	.1482763	.0974902	1.52	0.129
Age	.0007459	.0007403	1.01	0.314
Female	-.0182799	.017024	-1.07	0.283
White	.0247536	.0230136	1.08	0.283
Education	-.0143433	.0107267	-1.34	0.182
Income	-.0046796	.005776	-0.81	0.418
Science	-.0224721	.0184162	-1.22	0.223
Classroom	.0291472	.0315553	0.92	0.356
Cons	0.5937	0.0393	15.11	0.000

Number of Observation= 634
F (4, 777)= 3.25
R-squared= 0.0801
Root MSE= 0.20022

In this model, the self-respect and caring motive are still significant; the demographic variables do not explain much of the total variation. The seven added demographic variable only help increase R-squared by 2.4 percent (subtract the R-squared value of Model 2 from that of Model 3). The coefficients of the self-respect and caring motives slightly differ between Model 2 and 3.

Table 9 Individual Recycling Rate And Motive Regression Results

(With demographics_2)

	Coef. est.	Robust SE	t	sig.

Table 9 (cont'd)

Goodwill	-.176	.175	-1.01	0.314
Consumption	-.113	.077	-1.47	0.142
Respect	.096	.062	1.57	0.118
Caring	.115	.059	1.93	0.054
Age	.0008	.0007	1.08	0.279
Female	-.020	.017	-1.16	0.245
Education	-.016	.011	-1.53	0.127
Income	-.005	.006	-0.79	0.432
Science	-.021	.018	-1.16	0.245
Classroom	.028	.032	0.90	0.369
Cons	0.748	0.084	8.90	0.000

Number of Observation= 636
F (4, 777)= 3.34
R-squared= 0.0785
Root MSE= 0.20015

A similar regression model was conducted, in which the belonging motive was dropped while the consumption motive was included in the model. In this model, the caring motive is significant at 6% level. The other motive variables, including the consumption motive are insignificant.

In sum, the two variables, the self-respect and caring motives, are significant in all three models discussed above, which illustrates strong support for the statement that social capital motives are significant for explaining individual self-reported recycling rates. However, the consumption motive is only significant in the first regression model that does not include a constant.

Research Question 2: How do demographic factors affect people's recycling motives?

The SUR model is used to regress each of the five motives on the

demographic variables. In each equation, the dependent variable is the percentages that survey participants allocated for each of the five motives based on its relative importance, compared with the other four motives.

Originally, the model contained another three variables, which were whether a person participates in organizations (such as professional or wellness organizations), family financial situation while growing up, and family structure. These three variables were dropped in the final regression model due to the fact that they do not explain much of the total variation and that the three variables are not significant. The SUR model consists of five equations and the empirical results of SUR from the estimation are reported is Table 10.

Table 10 Recycling Motives and Demographics_ SUR Results

Equation	Obs	RMSE	R-Squared
Goodwill	634	0.0862	0.0318
Consumption	634	0.2034	0.0646
Respect	634	0.3173	0.0383
Caring	634	0.3578	0.0559
Belonging	634	0.1087	0.0383

	Goodwill	Consumption	Respect	Caring	Belonging
	Coef. est. (se)	Coef. est. (se)	Coef. est. (se)	Coef. est. (se)	Coef. est. (se)
Age	-.0004	-.0012**	.0008	-.0001	.0007*
	(.0003)	(.0008)	(.0012)	(.0013)	(.0004)
Female	-.0028	-.0227	-.0420	.0707**	-.0035
	(.0076)	(.0178)	(.0278)	(.0314)	(.0095)
White	-.0037	-.0175	-.0035	.0757**	-.0477***
	(.0089)	(.0210)	(.0328)	(.0370)	(.0112)

Table 10 (cont'd)

Education	-.0158**	-.0524***	.0259	.0382*	.0016
	(.0051)	(.0120)	(.0188)	(.0212)	(.0064)
Income	.0020	-.0063	-.0063	.0171	-.0057*
	(.0026)	(.0061)	(.0095)	(.0107)	(.0033)
Science	-.0065	.0487**	-.0299	-.0137	.0010
major	(.0096)	(.0227)	(.0354)	(.0399)	(.0121)
Engineering	-.0149	.0628*	.0427	-.1067*	.0043
	(.0149)	(.0352)	(.0549)	(.0619)	(.0188)
Social	-.0021	.0246	-.0212	-.0007	-.0013
Science	(.0085)	(.0201)	(.0314)	(.0354)	(.0107)
Humanity	.0026	.0165	-.0086	.0033	-.0179
	(.0127)	(.0300)	(.0468)	(.0528)	(.0160)
Medical	-.0073	-.0304	-.0478	.1089*	-.0068
	(.0140)	(.0330)	(.0514)	(.0579)	(.0176)
Ad office	.0116	.0164	.0120	-.0220	-.0020
	(.0115)	(.0271)	(.0423)	(.0478)	(.0145)
Classroom	.0215	-.0472	.1565***	-.1188*	.0098
	(.0166)	(.0391)	(.0610)	(.0688)	(.0209)
Lab	.0040	.0155	-.0415	.0242	-.0053
	(.0124)	(.0293)	(.0457)	(.0515)	(.0156)
Dormitory	.0073	.0122	.0340	-.0400	-.0062
	(.0138)	(.0326)	(.0508)	(.0573)	(.0174)
Mix	.0206	-.0059	.0914*	-.0921*	-.0041
	(.0133)	(.0314)	(.0490)	(.0552)	(.0168)
Cons	.0997	.4029	.1931	.2238	.0745
	(.0279)	(.0657)	(.1025)	(.1156)	(.0351)

*** Significant at 1%

** Significant at 5%

* Significant at 10%

The significant variables of the five motives identified in Table 10 are summarized and reported in Table 11.

Table 11 Summary of Significant Variables for Each Motive

Motives	Significant variables

Table 11 (cont'd)

	1%	5%	10%
Goodwill		Education (-)	
Consumption	Education (-)	Age (-) Science major (-)	Engineering (+)
Respect	Classroom (+)		Mix (+)
Caring		Female (+) White (+)	Education (+) Engineering (-) Classroom (-) Mix (-)
Belonging	White (-)		Age (+) Income (-)

In the goodwill motive equation, education is a significant indicator at 5% level. The negative sign of the variable's coefficient means that the higher the level of education, the less people think about the goodwill motive (I recycle so other people will like and respect me more) when they recycle. Other than the education variable, all the other variables in the regression are found to be insignificant.

The consumption motive refers to the statement 'I recycle to increase my own income or reduce my expenses' on the survey. In the consumption equation, age, education and majoring in science are found to be significant indicators. The education variable is significant at 1% level. And the other two variables are significant at 5% level.

The coefficient of the age variable is negative, which means the older the people are, the less they consider personal consumption when they recycle. Education also appeared to be significant. The negative sign of the education coefficient can be interpreted as the higher the level of education, the less

people think of personal consumption while recycling.

Also, majoring in science-related fields is a third significant factor of the consumption motive. The variable's coefficient is positive, thus if one person's field of study is science, which includes Natural Sciences and Agriculture & Natural Resources for the purpose of this study, he or she considers their personal consumption less when they recycle, compared 'other' fields of study (as the base case), that were not listed on the survey. Also, majoring in engineering is significant at 10% level and positively affects the consumption motive.

The classroom and mix variables are significant in the self-respect equation. The classroom variable is found to be a significant variable of the self-respect motive at 1% level. This variable refers to the function type of the building where the survey participants spend the most of their time on campus. With a positive coefficient, it means that if a person spends most of his or her time in a classroom type of building, he or she thinks more about the self-respect motive than the people from 'other' types of buildings. The mix variable, which also refers to the type of building, is significant at 10% level. The variable positively affects the self-respect motive.

The female and white variables are significant for the caring motive at 5% level. The 'female' variable has a positive coefficient, meaning females think more about the caring motive (I recycle to increase the well-being of persons I care about) when they recycle. And they are both significant at 5% level. Also,

‘white’ is significant for explaining the caring motive for recycling. The variable has a positive coefficient sign. Thus compared with the other ethnic groups, white people think more about the caring motive when they recycle.

In addition, four variables are significant at 10% level; they are education, engineering, classroom, and mix. Among these variables, education positively affects the caring motive while majoring in engineering, locating in classroom or mix type of buildings negatively affect the caring motive.

The ‘white’ variable is significant for the belonging motive at 1% level. However, it negatively affects the belonging motive. In other words, if a person is white, he or she thinks less of the belonging motive (I recycle so that I will feel more connected to others) when they recycle, compared with other ethnic groups.

At 10% level, the age and income variables are significant. The age variable has a positive coefficient while the income variable has a negative coefficient.

The third and fourth research questions explore the relationship between building-related recycling rates and people’s average recycling motives by building. Before solving the problems, the correlated relationship between the average self-reported recycling rates (by building) and the actual recycling rates per building was calculated for the purpose of understanding if the two recycling rates are highly correlated (or if they are representative of each other).

The correlation coefficient of the two recycling rates is 0.25. The positive sign of the correlation coefficient means the two recycling rates are positively correlated. However, their correlation relationship is weak; in other words, they are correlated to each other a lit bit but not too much.

Research Question 3: Do the average motives of people from each building affect actual building recycling rates?

The OLS model (with Robust option) is used to regress actual building recycling rates on people's five average recycling motives (by building). The result of the model estimation is reported in Table 12.

Table 12 Actual Recycling Rate and Motive Regression Results (by building)

	Coef. est.	Robust SE	t	Sig.
Goodwill	-.002	.459	-0.01	0.996
Consumption	.428	.171	2.50	0.016
Respect	.410	.149	2.74	0.008
Caring	.352	.132	2.67	0.010
Belonging	-.012	.438	-0.03	0.978
Recycling Convenience	22.75	7.63	2.98	0.004
Recycling Attitude	-.895	7.31	-0.12	0.903
Ad_office	20.04	7.10	2.82	0.007
Classroom	19.41	7.99	2.43	0.019
Lab	-.348	7.05	-0.05	0.961
Dorm	3.56	7.02	0.51	0.614
Mix	5.99	7.43	0.81	0.424
Constant	-80.41	32.66	-2.46	0.017

Number of Observation=62
F (5, 57)= 12.13
R-squared=0.5303
Root MSE=10.944

For the motive variables in this OLS model, the consumption and caring motives are significant at 5% level and the self-respect motive is significant at 1% level. All of the three coefficient signs are positive. For example, the positive coefficient of the caring motive means that the higher the average caring motive is, the higher the actual building recycling rate will be. If the caring motive increases one unit, the building recycling rate will increase by 0.35 units. Whereas, the belonging and goodwill motives are not found to be significant.

Also, the building recycling convenience is significant at 5% level. This variable has a relatively high coefficient. As discussed earlier, the variable was coded as 1 for 'Not available/don't know', 2 for 'not convenient', 3 for 'convenient', and 4 for 'Very convenient'. Thus, the interpretation of the coefficient is that if the average value of the convenience level increases by one percent, such as from 1 to 2 or from 2 to 3, the building recycling rate will increase by 23%.

Administrative-office, and classroom refer to the function of the buildings. In this model, the administrative-office variable is significant at 5% level and the classroom variable is significant at 1% level. They all have relatively high coefficients. If a building is an administrative/office, or a classroom building, its building recycling rate is higher by 20% or 19%, compared with 'other' types of buildings.

Research Question 4: Do the average motives affect people's self-reported recycling rates (at building level)?

This question is responding to the first research question but at a different analysis level. The result of estimating the OLS model (with Robust option) is reported in Table 13.

Table13 Self-reported Recycling Rate and Motive Regression Results (by building)

	Coef. est.	Robust SE	t	Sig.
Goodwill	-.510	.324	-1.57	0.122
Consumption	.147	.274	0.53	0.595
Respect	.698	.241	2.89	0.006
Caring	.678	.262	2.59	0.012
Belonging	.387	.521	0.74	0.460
Recycling Convenience	3.41	5.94	0.58	0.568
Recycling Attitude	5.45	7.35	0.74	0.461
Ad_office	-.608	5.38	-0.11	0.911
Classroom	4.36	5.49	0.79	0.431
Table 13 (cont'd)				
Lab	4.39	5.45	0.81	0.424
Dorm	.929	6.09	0.15	0.879
Mix	2.73	5.04	0.54	0.590
Constant	-17.49	31.25	-0.56	0.578

Number of Observation=66
F (5, 57)= 6.18
R-squared=0.6596
Root MSE=8.6735

Two variables are reported as significant predictors for the dependent variable. The self-respect motive is significant at 1% level and the caring

motive is significant at 5% level. With positive coefficient signs, it means that the greater the values of the self-respect or caring motives are, the higher the average self-reported recycling rates (by building) will be. For example, if the building-average value of the caring motive increases by one percent, the average recycling rate of the building will increase by .68 percent.

At the building level, the relative importance of the selfishness motive and social capital motives were further examined by analyzing average self-reported recycling rates and actual building recycling rates. The consumption, self-respect and caring appeared significant variables for explaining actual building recycling rates, which is the same as the result of individual level. Another three building characteristics are also significant variables in this model; they are recycling convenience, administrative (or office) building and classroom building (in terms of building function).

Substituting the actual building recycling rates with average self-reported recycling rate as dependent variable, the five motives were estimated again. The result is consistent with that of the actual building recycling rate model that the self-respect and caring are significant variables. However, the consumption motive, building function and recycling convenience are not significant any more in this model.

Research Question 5: How are individual motives correlated with 15 actions designed to incentivize recycling?

Each action is related to one of the five motives. This research question is

to calculate the correlation between the five motives and the recycling-related actions. A brief description of these actions and their relationship with the five motives are reported in Table 14.

Table 14 Summaries of Motive-Related Recycling Actions

	Action No.	Action
Goodwill	6	Giving certificates to people in buildings with high recycling rates
	7	Giving medals/prizes to units with high recycling rates
	8	Having a recycling coordinator
	9	A weekly email showing building recycling trend
	10	Electronic display showing building recycling trend
Consumption	1	Providing more recycling containers
	2	Providing suitable waste containers in office
	3	Increasing the types of collected recyclables
	4	Collecting one commingled stream recyclables
	5	Giving some savings from recycling back to your unit
	15	Providing a recycling telephone hotline to report problems
Self-Respect	11	Displaying recycling poster to emphasis Spartan spirit
Caring	12	Displaying poster to show environmental benefit of recycling
	13	Displaying poster to show cost of disposing waste and saving from recycling
Belonging	14	Forming recycling club in building

For calculating correlation, the 15 actions were coded based on people's

responses on the survey. Each action was coded as 1,2,3 or 4, referring to 'Will reduce', 'Will not affect', 'Increase slight', and 'Increase significantly' in terms of how these actions affect the amount of materials people recycle.

As described earlier, the motive variables are still percentages that the survey participants allocated on each of the five motives based on their relative importance. The results of correlation calculation are reported in Table 15. The correlation coefficients between the motives and their related actions are highlighted in the table.

Table 15 Correlations Between Recycling Motives and Incentive Actions

	Goodwill	Consumption	Respect	Caring	Belonging
Action No.					
6	0.0758	-0.0106	-0.0408	0.0247	0.0763**
Table 15 (cont'd)					
7	0.0456	-0.0202	-0.0200	0.0198	0.0675
8	0.0397	-0.0380	-0.0162	0.0142	0.1217**
9	0.0442	-0.0750	0.0125	0.0248	0.0862**
10	0.0372	-0.0261	0.0095	-0.0077	0.1122**
1	-0.0096	-0.0307	-0.0205	0.0430	0.0344
2	0.0001	0.0175	-0.0636	0.0378	0.0675
3	0.0092	-0.0945**	0.0019	0.0607	0.0588
4	0.0745	-0.0320	-0.0309	0.0328	0.0236
5	0.0524	0.0148	-0.0251	0.0086	0.0205
15	0.0436	-0.0664	0.0451	-0.0264	0.0688
11	0.0249	-0.0161	0.0480	-0.0389	0.0833**
12	-0.0053	-0.0579	0.0229	0.0158	0.0719
13	0.0224	-0.0381	-0.0126	0.0328	0.0796
14	0.0059	-0.0438	0.0361	-0.0067	0.0342

** Significant at 5%

Except for four correlation coefficients in the consumption motive

category, all the others have positive signs, meaning the motives and actions have positive correlated relationships. However, because the values of the coefficients are small (all smaller than 0.1), the correlation between the motives and actions are weak. In other words, they correlate to each other a little bit, but not too much.

The respect and caring motives are examined. For the respect motive, the Action11 is the only action that belongs to this category. The correlation coefficient of Action11 is the highest compared with that of all the other actions. However, it is not much higher. Also, the coefficient is not significant. For the caring motive, the correlations of the related actions, Action 12 and 13 are not higher than that of the other actions.

Four negative correlation coefficients were observed from the correlation result table, meaning the consumption motive is negatively associated with the four incentive actions, which is unexpected. Among the negative relationships, the correlation coefficient of Action3 and the consumption is significant at 5% level.

Lastly, the means of the recycling actions were calculated and reported in Table 16. The means are used for comparing the relative importance of the 15 recycling actions. The actions are listed in order based on the value of their means.

Table 16 The result of the Means of The 15 Recycling Actions

Action No.	Mean	Relevant Motive
3	3.20	Consumption
4	3.13	Consumption
1	2.81	Consumption
2	2.77	Consumption
5	2.73	Consumption
13	2.67	Caring
8	2.56	Goodwill
10	2.55	Goodwill
12	2.55	Caring
9	2.48	Goodwill
6	2.45	Goodwill
7	2.43	Goodwill
11	2.38	Self-respect
15	2.36	Consumption
14	2.19	Belonging

The recycling actions associated with the consumption motive appear to be important. However, the recycling actions associated with the caring and self-respect motives did not appear as important as the consumption motive, based on the mean values of the actions.

CHAPTER FIVE

CONCLUSION AND DISCUSSION

This study designed to explore the impact of social capital on regional waste recycling and measure the relative importance of selfness motive and social capital motives by using MSU as a case study. Also, this study analyzed the determinants of the relevant social motives and selfishness motive.

5.1 Recycling rates explained by five motives

When analyzing recycling behaviors at an individual level, the results showed that the consumption, self-respect and caring motives are significant indicators for explaining people's self-reported recycling rates. Further, when the consumption motive is considered as a baseline (dropped in estimation models), the self-respect and caring motives were found to be relatively significant in comparison with the consumption motive. In addition, the self-respect and caring motives still appear significant while adding some demographic variables in the model. Whereas, all the other motive variables and demographic factors are insignificant. Thus, it can be concluded that the respect and caring motives are constantly found to be significant for explaining individual's self-reported recycling rates.

The relative importance of the selfishness motive and social capital motives were further examined by analyzing average recycling behaviors at building level. The consumption, self-respect and caring appeared significant variables for explaining actual building recycling rates, which is the same as

the result of individual level. Another three building characteristics are also significant variables in this model; they are recycling convenience, administrative (or office) building and classroom building (in terms of building function).

While substituting the actual building recycling rates with average self-reported recycling rate as dependent variable, the five motives were estimated again. The result is consistent with that of the actual building recycling rate model that the self-respect and caring are significant variables. However, the consumption motive, building function and recycling convenience are not significant any more in this model. The building type and convenience variables are not significant mainly because in this model, the self-reported recycling rate is a general recycling rate that survey participants indicated; it does not specifically imply their recycling behaviors in their buildings on campus. For the consumption motive, though how easy people have access to the recycling facilities is an important factor when people think of recycling, it is not consistently significant explaining both self-respect recycling rates and building actual recycling rate.

Thus, both at individual and building level, the self-respect and caring motives are significant factors for people's self-reported recycling rates and actual building recycling rates. The caring motive referring to the statement 'I recycle to increase the well-being of persons I care about' is found to be significant motive in all the tests, which is consistent with responses that the

survey participants provided to explain their ‘Other motivation’ on the survey. For example, the most common explanations they gave were that they recycle to protect the earth or environment and that they recycle to reduce materials going to the landfill. These responses reflect their caring motivations.

The model regression results prove that social capital motives have an impact on recycling behaviors. The estimation showed that social capital does contribute to waste recycling. Furthermore, The assumption of the standard neoclassical utility mode that agents’ motives are selfish is rejected in all the regression models.

5.2 Determinants of the five recycling motives

This study also found some demographic factors that explain the five recycling motives respectively. Each of the recycling motives has several significant demographic variables. For example, education and age are significant variables for the consumption motive and have negative coefficients. For the self-respect motive, classroom building was found to be significant factors. For the caring motive, female are white significant indicators that have positive coefficient. These significant factors can be taken into consideration for improving recycling activities by enhancing the two recycling motives. The results can be implied to improve recycling activities at a college community.

5.3 Recycling Motives and Actions

The self-respect motive is positively correlated with the incentive recycling

statement ‘displaying a poster in your building emphasizing recycling is a part of the Spartan spirit’. However, the correlation coefficient is relatively small; the motive and the action are weakly correlated. Similarly, the caring motive is positively correlated with two recycling actions: ‘displaying a poster in your building that shows the environmental benefits of recycling’ and ‘A poster displaying how much disposing of waste in landfills costs the University and savings it can achieve from recycling’. The caring motive and the actions are correlated to each other but they are not correlated too much. Also, the other three motives are not highly correlated with their relevant recycling actions either.

One possible reason why stronger correlation relationships between recycling motives and recycling actions are not observed is that the actions do not match the recycling motives very well. It is also possible that some actions may be related with more than one motive.

Also, higher correlation coefficients can be observed if the survey participants are only provided with the recycling actions that are relevant to the recycling motive category on which they indicated the highest percentage. Because most people are driven by multiple recycling motives, they may not quite differentiate the actions related with different motives when they scale actions (among ‘increase significantly’, ‘increase slightly’, ‘will not affect’, ‘will reduce’). However, if they are only asked to scale the actions related to their ‘most important’ recycling motive that they indicated on the survey, they would

probably have a bigger chance to choose ‘increase significantly’ on those actions. That would result in different correlation coefficient results.

Furthermore, the means of the 15 recycling actions were calculated to compare the relative importance of the actions. The results showed that the actions that are relevant to the consumption motive have higher mean values compared with the actions associated with the other four motives. This result does not further support the previous conclusion that the caring and self-respect motives are significant for explaining people’s self-reported and actual building recycling rates. However, since the recycling actions more implicitly reflect the potential of improving recycling behaviors, the actions with relatively high mean values can be used to promote recycling.

5.4 Summary

Firstly, the self-respect and caring motives are significant in all the regression models that explain people’s self-reported (at the individual level and building level) and building actual recycling rates; while the consumption motive is not. Thus, the assumption of selfishness that only personal consumption bundle matters is rejected in this study.

Secondly, the recycling actions that are related to the self-respect and caring motives are not found to be highly correlated with the two motives. Thus, those recycling actions can not be recommended to put into practice to promote recycling at the MSU campus.

Lastly, some demographic factors are found to be significant for

explaining the five recycling motives. Exploring the ways of how to utilize these facts can be studied in the future study.

APPENDIX

Table 17 Self-reported and Actual Recycling Rates (by building)

Building No.	Building Name	Recycling Rate (Self-Reported)	Recycling Rate (Actual)	Function
1	Administration Bldg.	68.5	60.6%	Ad
2	Administration Bldg. Adm & Schl	70.0	60.6%	Ad
3	Agriculture Hall	65.0	63.5%	Office
4	Agronomy Farm - Crop & Soil	75.0		
5	Akers Hall (East)	78.3	24.0%	Dorm
6	Akers Hall (West)	84.0	24.0%	Dorm
7	Anthony Hall	72.6	24.8%	Mix
8	Baker Hall	81.7	51.8%	Office
9	Biochemistry	78.0	35.1%	Lab
10	Biomed Phys Sci	73.2	30.7%	Lab
11	Brody Hall	68.3	68.3%	Dorm
12	Butterfield Hall	20.0		Dorm
13	Case Hall (North)	77.1	32.8%	Dorm
14	Case Hall (South)	73.1	32.8%	Dorm
15	Central Services	83.3	36.1%	Other
16	Chemistry	72.3	30.4%	Lab
17	Clinical Ctr A	78.6	32.9%	Mix
18	Clinical Ctr B	60.0	32.9%	Mix
19	Clinical Ctr C	62.0	32.9%	Mix
20	Clinical Ctr D-E	85.0	32.9%	Mix
21	Comm Arts And Sci	78.6	54.0%	Classroom
22	Computer Ctr	67.1	55.2%	Office
23	Conrad Hall	53.3	36.6%	Ad
24	Cyclotron	79.3	37.1%	Lab
25	Dairy Cattle Rsch Ctr	15.0	20.1%	Other
26	Diagnostic Ctr For Animal Hlth	69.4		Lab
27	Engineering	68.3	34.2%	Mix
28	Engr Rsch Complex	64.6	36.5%	Lab
29	Eppley Ctr	77.5	41.1%	Mix
30	Erickson Hall	72.0	41.4%	Office
31	Farrall Hall	74.7	27.9%	Mix
32	Fee Hall (East)	66.3	52.0%	Ad
33	Fee Hall (West)	77.0	52.0%	Ad
34	Food Safety	76.5	51.9%	Lab

Table 17 (cont'd)

35	Food Stores	65.0	58.9%	Other
36	Geography Bldg.	78.3	40.3%	Office
37	Giltner Hall	78.6	22.7%	Lab
38	Hubbard Hall (North)	58.0	37.8%	Dorm
39	Human Ecology	81.2	44.5%	Office
40	Integ Plant Sys Ctr	73.3	21.9%	Lab
41	Kresge Art Ctr	80.0	11.4%	Lab
42	Life Science	71.1	35.4%	Office
43	Linton Hall	77.6	45.0%	Office
44	Marshall-Adams Hall	71.8	40.1%	Office
45	McDonel Hall (East)	82.5	46.1%	Dorm
46	McDonel Hall (West)	82.9	46.1%	Dorm
47	Music Bldg	65.0	26.7%	Office
48	Natural Resources	76.0	58.9%	Classroom
49	Natural Science Bldg	80.5	49.1%	Classroom
50	Nisbet Bldg	75.3	54.7%	Office
51	Olds Hall	61.1	81.1%	Office
52	Owen Graduate Hall	66.7	25.1%	Dorm
53	Packaging	81.1	30.0%	Mix
54	Physical Plant	80.9	24.7%	Other
55	Plant And Soil Sci	74.2	33.5%	Mix
56	Plant Biology Lab	85.5	29.8%	Lab
57	Psychology Bldg	78.0	52.4%	Office
58	Radiology	70.9	46.7%	Mix
59	RHS Information Services	62.9		
60	Snyder Hall	71.1	36.1%	Dorm
61	Trout Bldg	77.0	26.1%	Other
62	Wells Hall	81.4	42.5%	Mix
63	Wilson Hall (East)	75.6	29.3%	Dorm
64	Wilson Hall (West)	70.0	29.3%	Dorm
65	Wonders Hall (North)	22.0	10.6%	Dorm
66	Wonders Hall (South)	70.0	10.6%	Dorm

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