Talking Trash:
Valuing Household Preferences for Garbage and Recycling Services Bundles Using a Discrete Choice Experiment

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Abstract:

Facing increasing costs for tipping fees and worker salaries, many smaller municipalities have begun to explore ways to adopt mechanized pay-as-you throw container garbage collection and changes to the basket of currently provided services, such as the addition of curbside recycling. Choice-experiments, while used widely in marketing, have not often been applied to environmental policy issues such as municipal waste. Using a discrete choice experiment offers a new way to examine the basket of services cities provide in waste collection given limited budgets and often vocal opposition to change among residents. A discrete choice model is developed to test household preferences for municipal waste services in Stillwater, Oklahoma. In addition, the study compares the willingness to pay estimates for adding curbside recycling service from the discrete choice model ($1.98/household/month) with results from an embedded contingent valuation question ($1.35/household/month). The survey shows that residents are willing give up one of two weekly garbage days to obtain weekly curbside recyclable collection. Furthermore, women are willing to willing to pay more than men for curbside collection of recyclables.

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INTRODUCTION

Increased tipping fees over the last couple of decades, resulting from stricter EPA standards on landfills, have provided a catalyst for communities to adopt measures to reduce the cost of household waste disposal (Jenkins, et al. 2003). In addition to higher dumping costs, local resistance to the creation of new landfills as well as the increase in the age of existing landfill sites have contributed to the problem of disposal (Callan and Thomas 1997). These issues, compounded by increased waste generation and demand for recycling programs, have caused many communities to reassess their solid waste programs. According to Aadland and Caplan (2003), although the number of community recycling programs has increased dramatically, many in the western United States are not covering costs. Given a dearth of tools for aiding small communities in decision-making, a discrete choice model is developed to analyze willingness to pay for different garbage and recycling service attributes for a mid-size urbanizing college town, Stillwater, Oklahoma. Concurrently, willingness to pay for curbside recycling, currently unavailable in the town, is also tested using an embedded contingent valuation question.

In the past, many communities have used a flat fee charged per month to customers to finance sanitation services (Nestor and Podolsky, 1998). Other cities have used general revenue money to fund their sanitation departments (Kinnaman and Fullerton, 2000). Flat fees grant customers unlimited disposal of waste after paying the fee for service. This failure of the consumer to pay the true cost of his/her waste results in an oversupply of garbage, imposing costs on the public through the general public budget.

Two of the most widely used methods of dealing with the issue of rising costs of disposal have been curbside recycling and volume based pricing. Nestor and Podolsky (1998) assess the value of two popular methods of unit-based pricing for sanitation services, a bag/sticker program

and a container program, and point out that communities often do not establish programs that follow the theoretical ideal because of the transaction costs involved in tracking garbage volumes. In order to establish complete per unit pricing, a municipality must weigh, record, and track trash pick-up for each by volume. Nestor and Podolsky claim that the capital costs to convert to such a system can be very prohibitive. As well as the cost of capital, municipalities must also implement politically feasible policies, but these changes may still not be economically optimal because of transactions costs or fees set below marginal cost. Kinnaman and Fullerton (2000) point out that these 'deviations from optimality' must also be analyzed in making policies that fit the needs of communities.

Besides the decrease in total tipping costs, other benefits accrue from unit-based pricing of waste disposal and curbside recycling because users now pay an amount closer to the true cost of disposal (Kinnaman and Fullerton, 2000). Depending on how a community finances its sanitation costs, volume pricing and recycling can reduce taxes, reduce individual household expenditures, reduce labor costs for the municipality, and create demand for source reduction (i.e. consumers buy less-packaged products). Unit-based pricing and curbside recycling are complementary in that having one will create demand for the other. If citizens attempt to limit the quantity of waste produced to avoid higher garbage fees, they are more likely to demand alternatives for waste reduction such as recycling. Curbside recycling provides a convenient method for households to dispose of some waste otherwise destined for the landfill. Conversely, some nearby communities such as Edmond, Oklahoma established unit-based pricing for their solid waste as a complement to citizen demand for curbside recycling.

Studies have shown that the availability of curbside recycling has a significant positive affect on percentage of waste materials that are recycled (Jenkins, et al. 2003). However, the

effect curbside recycling had on unit-based pricing was ambiguous. Kinnaman and Fullerton (2000) note that curbside recycling measures are expensive to operate, but can reduce the costs incurred for dumping garbage in a landfill. As landfill fees rise, the relative value of recycling increases as a way to avoid higher costs.

Aadland and Caplan conducted a study in Utah to estimate willingness to pay and willingness to participate in curbside recycling programs using contingent-valuation methodology (1999). Although previous studies had shown that unit-based pricing and curbside recycling can reduce costs of disposal, Aadland and Caplan pointed out that many community leaders have been hesitant to implement such programs because they depart from the traditional methods. Their study compared the hypothetical willingness to pay with actual willingness to pay shown by other communities that had already changed. While contingent valuation studies provide great insight to consumer desires for specific services, no studies to our knowledge have been attempted to gather what households prefer as a conditioned on the package of services or multi-attribute options from which to choose. Choice-experiments, while used widely in marketing, have not often been applied to public policy issues such as municipal waste. Discrete choice offers a new way to examine the basket of services cities provide in waste collection, given limited budgets and often vocal opposition to change among residents.

Presently the City of Stillwater operates under a set fee scheduled pick-up system whereby residential customers pay thirteen dollars a month for twice-a-week garbage pick-up, centralized recycling at 4 centers, and weekly yard waste service (McClure, 2004). Currently, Stillwater contracts with a private landfill to dispose of solid waste but the city operates trucks and crews to pick up the trash from citizens and move the garbage to a transfer station for a flat monthly fee to customers. Because the city faces rising employee health and benefits costs and

since the landfill serving the city of Stillwater was recently purchased by another private sanitation disposal operator, examining the feasibility in changes to the fee schedule and services proves timely. This study estimates the marginal values of garbage, yard waste, and recycling schedules and pickup locations for Stillwater. Furthermore, the study compares the willingness to pay estimates for curbside recycling from the discrete choice model with results from an embedded contingent valuation question.

SURVEY DESCRIPTION

A discrete choice model was developed to test household preferences for municipal waste services in Stillwater, Oklahoma. A six-page mail-back survey of 2000 households (10% of total households served) was selected randomly from the approximately 20,000 households currently receiving garbage pickup in Stillwater. Apartment dwellers were not included since they had centralized service or their bills were paid by the landlord. The surveys were distributed randomly in March 2005, providing 348 usable surveys (360/2000 surveys were returned for an 18% response rate). The survey provided a brief description of current city solid waste services and the fee. The head of the household or bill payer was then asked through a series of choice experiments (conjoint analysis), what type of services, schedules, and fees he or she preferred.

Each respondent completed four choice sets, each with three scenarios for a service package of which the third was always to choose no change from the present service level. Currently garbage is picked up curbside two times per week (10 cans maximum per week), Recyclables are collected at 4 central locations, and yard waste is picked up weekly for a total monthly fee of $13. Each choice set varied in the level of the five attributes including the garbage schedule, the recycling schedule and collection location, the yard waste schedule and

collection location, the option for a per bag fee for additional garbage pickup, and the base monthly fee for the service package.

Figure 1 shows an example of a choice set. For the each discrete choice bundle of attributes the combinations were chosen from 129 orthogonal service options which were selected optimally from the total possible combinations (128 different combinations for options 'A' and 'B' and then the current service plan). By varying the service options and fee levels and types, a predicted willingness to pay for individual attributes or bundles of services may be estimated. Participants were asked to choose one of the three scenarios presented, of which the third scenario was always to keep the service attributes the same as currently offered.

Service bundles were described by the following attributes; and, levels of these attributes were different plausible schedule or fee options that could be offered in the future. The base fee ($9, $12, $15, or $18 per month) was included to obtain valuations of the other attributes. The schedule of garbage pickup had two attribute levels, the current two times per week or one time per week. Since garbage is often put out the curb the night before pickup resulting in trashcans on the street four out of five of the weekdays and is often ransacked by animals, we expect that residents will not value a second day of garbage pickup per week. Recycling services were included at four levels, no service, centralized service at 4 stations, curbside recycling weekly, or curbside recycling bi-weekly. Early pilot studies indicate that some members of the university community currently pay a startup group $6/month to pickup recyclables and sort them at the centralized recycling center for the homeowner and that current non-recyclers would be willing to recycle if pickup were curbside. Therefore, we expect that residents will prefer curbside recycling. The attributes for yard waste pickup were varied at none, curbside weekly, curbside monthly or central pickup. We expect that residents will not want to give up waste pickup, but

that they will not value weekly service much more highly than bi-weekly service. Finally, a per can use fee at two levels, none or $0.25 per can above 10 cans was included to test the acceptability of pay as you throw volume pricing since current can limits are rarely enforced. We expect that residents negatively value the volume or use fee per can option.

Figure 1: Sample Choice Set

Below you will find 3 scenarios being considered to improve your municipal solid waste disposal services. Before answering, think hard about the choice you would make if it involved real money on your utility bill. Please choose ONE option from choices A, B, or C.

Waste Service Attribute	Option A	Option B	Option C
Garbage Schedule (Household waste, excluding yard waste and recycling)	Curb pickup (1 time/week)	Curb pickup (2 times/week)	No changes. I prefer to keep the pickup schedule, locations, and fees the same as they are now.
Recycling Schedule (glass, plastic, newspaper, cardboard)	Curb pickup (1 time/week)	Curb pickup (1 time/week)	
Yard waste Schedule	Curb pickup (1 time/week)	Central drop-off at a community compost area.	
Additional Usage Fee per can	None	$0.25 extra cost per trash bag over ten bags (1 bag = 45 gallons)	
Base Garbage Fee on City Utility Bill	**$15.00**	**$12.00**	**$13.00**
I would choose (please check ONLY ONE OPTION)	☐ **I Choose Option A**	☐ **I Choose Option B**	☐ **I Choose C. No change.**

The issue of hypothetical bias in stated preference surveys has stimulated copious amounts of research testing the scope and direction of the bias (List and Gallet). First, a script is included to ask respondents to answer by marking the choice he or she "would make if it involved real money on your utility bill." Second, a contingent valuation question about curbside recycling was included for comparison to the part worth estimates in the discrete choice experiment. Finally, a series of questions on household demographics, beliefs, membership in environmental groups, attitudes toward recycling, and satisfaction with current sanitation services were included.

ESTIMATING HOUSEHOLD PREFERENCES FOR MUNICIPAL WASTE SERVICES

The survey responses described above were used to estimate a conditional logit model for municipal waste services and logit model for the contingent valuation (SAS 9.1 mdc and logistic were used respectively). Utility is assumed to be a function of garbage service attributes and fees. Attributes included the number garbage pickup days per week (GAR) and the type of recycling service including central pickup (RECCENT), weekly curbside pickup (RECCURB4), bimonthly curbside pickup (RECCURB2), and no pickup (RECNONE). Yard waste pickup had four levels, weekly yard pickup (YCURB4), monthly yard waste pickup (YCURB1), centralized drop-off of yard waste (YCENT) and no service (YARDNONE). A per volume use fee(USE) above 10 bags/week was posed as a dummy variable whereby if use equals 1, a per bag fee of $0.25 would be imposed. Finally, principle payment vehicle, the base fee per month (BASE), was included in each scenario.

The following random utility model for individual i was estimated.

(1) $U_i = X_i\beta + \varepsilon_i$

Where x_i=[GAR_i, $RECCENT_i$,$RECCURB4_i$, $RECCURB2_i$, $YCURB4_i$, $YCURB1_i$, $YCENT_i$, USE_i, $BASE_i$]. All variables, but the BASE variable, are dummy variables that equal one if that attribute is present, zero if otherwise. The error term, ε_i is assumed to be distributed according to the extreme value distribution. For the conditional logit, we assume that each respondent i chooses alternative j as a function of levels of the other attributes shown according to the following probability:

$$(2)\ \Pr_i(j) = \frac{e^{X_{ij}\beta}}{\sum_{k=1}^{J} e^{X_{ik}\beta}} = \frac{1}{\sum_{k=1}^{J} e^{(X_{ik}-X_{ij})\beta}} \quad for\ i = 1...I,\ k = 1...J$$

Marginal rates of substitution among any attributes x_i and x_j can be calculated as the ratio of the coefficients. Marginal willingness to pay or the marginal value of an attribute can be estimated by dividing the estimated coefficient for the attribute divided by the payment vehicle, i.e., when β_k is the estimated coefficient for the BASE attribute, as in Equation (3).

(3) MWTP= - β_j/β_k

Different versions of the conditional logit are estimated to examine differences among demographic groups and are reported in Tables 2 and 3. Table 1 reports the sample statistics for attributes chosen across surveys. The marginal values of each attribute are given in Table 4 for each of the models. The marginal willingness to pay values in Table 4 are found by dividing the coefficient on each attribute by the BASE fee estimated coefficient. The estimation of the basic model (Model 1) with all respondents shows that all of the attributes are significant and in the directions hypothesized. In fact, across all the twelve estimated models, all of the service attributes were positively related to willingness to pay except for the second day of garbage,

which was negative. The imposition of a use fee was universally negative. Only for those with no college in 3b was central yard waste collection (YCENT) a negative value.

As Shown in Table 4 and the basic model on the entire sample, the second garbage pickup per week imposes a negative externality on residents who are willing to forgo that pickup for a savings of $3.94. Residents were willing to pay $7.50 for weekly curbside recycling (RECCURB4) or $7.09 for curbside recycling twice per month, both of which were preferred to the current scenario of $5.52/month for centralized drop off of recycling in comparison to the base scenario (omitted) of no recycling. The difference between the RECCENT and RECCURB, $1.98 is the additional amount residents are willing to pay for curbside recycling compared to the current service. Similarly, households clearly ranked weekly curbside yard waste collection ($7.87) first as compared to monthly curb pickup (YCURB1), centralized drop off ($1.51), as compared to no yard waste service (the omitted base scenario). The value on the imposition of fee per bag over the 10 bag limit (USE) was negative $0.84.

Additional models were specified to examine whether attributes were valued differently by gender, education, age, current recyclers, and by income. Models 2a and 2b separate out men and women, to find that although the rankings of services are the same as the basic model, women are willing to pay more for curbside recycling ($8.64) compared to men ($6.11) and also greatly valued weekly yard waste service compared to men ($8.80 vs. $6.59, respectively). Men also negatively valued the additional garbage day more than women (-$4.21) as opposed to (-$3.76). Gender interactions with recycling were also run with the basic model, but none proved significant, so these results were not reported. We hypothesized that education might make respondents more likely to pay for recycling, which we found in models 3a and 3b. Those respondents with a college or higher education were willing to pay more than those without a

college degree for all of the recycling categories. Interestingly, the largest negative response to the use fee was among those without a college degree at $3.90/month if a per can use fee were imposed. As expected, age influences willingness to pay for services. The results for Models 4a and 4b, which separate out households that earn $40,000/year and less from those that earn more than $40,000, show that the lower income group would pay more for curbside recycling than the higher income group. It also, shows that the lower income group is more opposed to the use fee, trading $1.47 in monthly fee for that use fee if it were imposed. A separate model with interaction terms between recycling and individual income fields showed they were insignificant and was consequently left unreported. Those younger than 26 were less willing to pay for recycling services ($1.89 for centralized pickup) than the 26-45 year old group or the older than 45 group. The young group was also most willing to give up a weekly day of garbage service to save $5.76, more than any other group. The 45+ year olds were the most willing to pay for weekly curbside service at $9.16/month.

As Aadland and Caplan(2003) found, we found that environmental attitudes positively affect willingness to pay for recycling. Models 6a and 6b compare current recyclers with non recyclers, to find that those who currently recycle would pay as much as $10.01 for weekly curbside service compared to non-recyclers who would pay $5.65. Model 7 shows the interaction between a respondent's belief that recycling is an ethical responsibility and significantly higher values for both weekly and biweekly curbside pickup. For each point on a scale of one to five whereby 5 means that the person highly agrees with the statement that "It is an ethical duty to recycle," there is a $2.15 per month marginal willingness to pay for weekly curbside recycling service. The willingness of current recyclers to value curbside recycling comes as no surprise

given the level of commitment needed to deal with the hassle of carting recyclables to the central recycling area and stuffing them into six or seven overflowing bins.

To test the robustness of the marginal value on curbside recycling, a contingent valuation question asking if residents were willing to pay an extra fee for curbside pickup was posed on the same survey as the discrete choice scenarios. Two logit models are reported for the contingent valuation method (CVM) in Table 5 using the same sample as the discrete choice model 1. Table 6 reports the sample statistics. The probability that the respondent says yes to the randomly posed bid (CVP) for the logistic function is:

$$\Pr(yes) = \frac{e^{\beta x}}{1 + e^{\beta x}} \tag{4}$$

To calculate the median willingness to pay (WTP) for a permit let the Pr(Yes)=0.5 and α be the estimated y-intercept and β equal the coefficient on the random bid given to the respondent. By taking the natural log of both sides, equation (4) becomes:

$$\ln\left(\frac{P}{1-P}\right) = \alpha + \beta x. \quad At \quad P = .0.5, \tag{5}$$

$$0 = \alpha + \beta x. \quad Then \quad x = \frac{-\alpha}{\beta} \quad or \quad median \quad WTP.$$

In the first contingent valuation model (left hand column, Table 5), the coefficients on Gender (GEN=1 if female, 0 otherwise), membership in environmental organization (ENVR), status as a current recycler (CREC) all prove to have a significant and positive effect on the probability of saying yes to the payment posed in the contingent valuation question (CVP).. The coefficients on age (AGE in years)and the 4 income groups between $25,000 and $200,000 annually per household were not significant. When the choice to pay or not was regressed against the bid

alone (Column 2, Table 5), the bid proved significant and the median willingness to pay was $2.23.

To date, most studies have focused on the marginal willingness to pay for curbside recycling service through contingent valuation surveys rather than considering waste service as a bundle such as in done in the discrete choice survey above. . Using the basic forms of these two survey methodology, the willingness to pay estimates for adding curbside recycling service from the discrete choice model was $1.98/household/month compared to the results from an embedded contingent valuation question were $1.35/household/month using the same 348 individuals who answered both questions on the survey. Ninety-five percent confidence intervals for these surveys were ($1.76, $2.02) and ($1.22 ,$1.45) for the discrete choice (model 1) and second contingent valuation model respectively. Since these confidence intervals do not overlap, we can conclude that the contingent valuation method gives a significantly lower value for this marginal attribute which seems intuitive the question format does not allow the individual to shuffle the attributes to meet their own highest utility from the bundle of services. While both of these valuation methods involve hypothetical payments, Lusk and Schroeder (2004) found that in discrete choice experiments marginal willingness to pay for attribute quality changes in attributes is generally not statistically different when respondents respond to surveys in which they make hypothetical versus actual bids.

CONCLUSIONS

This study applied a discrete choice experiment and contingent valuation to the issue of how to maximize household utility for municipal solid waste services. As hypothesized, both techniques showed that women, current recyclers, and households with higher income are more

willing to pay for recycling services. Ordinally, the rankings from centralized service to curbside pickup for both yard waste and recycling show that residents value weekly curbside pickup most for these attributes over less frequent service, centralized pickup or no service at all. Perhaps more interesting for public policy is the idea that residents do not value more service for garbage pickup as shown by the negative value for having a second day of garbage per week. Eliminating one day of garbage pickup could potentially cover the costs of adding curbside pickup for recyclable materials, given the city already pays for recyclable disposal from central locations. From the discrete choice scenarios, while most have a negative value for the addition of a per volume use fee above the current level of 10 bags of garbage per week, the greatest negative values were for households under with no college degree and households under $40,000 income per year, indicating that use fees were not seen as inconsequential, even at $0.25 per bag. Furthermore, the finding that for the addition of curbside recycling, the one attribute for which the two methods were comparable, was significantly different between methods adds more fuel to the debate over whether hypothetical methods are even internally consistent.

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Table 1: Average Values of Attributes Chosen Across Surveys (N=1392)

	Mean	Times chosen	Minimum	Maximum
Garbage (2 days/week)	0.117	163	0	1
Recycle Central	0.736	1024	0	1
Recycle Curbside (4x/mo)	0.121	168	0	1
Recycle Curbside (2x/mo)	0.115	160	0	1
Yard Waste Curbside (4x/mo)	0.810	1128	0	1
Yard Waste Curbside (1x/mo)	0.090	125	0	1
Yard Waste (Central Drop-off)	0.057	79	0	1
Use Fee (=1 if imposed)	0.160	223	0	1
Base Fee (monthly)	$12.575	na	$9	$18

Table 2: Conditional Logit of Scenario Choice on Attribute Levels for Solid Waste Services (2005)

	Model 1: Basic		Model 2a: Males		Model 2b: Females		Model 3a: No College		Model 3b: College		Model 4a: Income <40k/year		Model 4b: Income >40k/year	
	Parameter Estimate (t-statistic)													
GAR	-0.9426	***	-1.1074	***	-0.8461	***	-0.9197	*	-0.9386	***	-0.9658	***	-0.923	***
	(-8.26)		(-5.99)		(-5.79)		-1.96		-7.95		-5.99		-5.69	
RECCENT	1.3186	***	1.5422	***	1.1795	***	1.6027	**	1.3001	***	1.3675	***	1.2731	***
	(7.07)		(5.19)		(4.89)		2.4		6.67		5.1		4.89	
RECCURB4	1.7924	***	1.6076	***	1.9425	***	1.9834	***	1.7989	***	1.9897	***	1.6007	***
	(9.02)		(5.11)		(7.52)		2.65		8.69		6.97		5.75	
RECCURB2	1.694	***	1.5834	***	1.7868	***	1.6404	**	1.6937	***	1.6684	***	1.7389	***
	(8.48)		(4.99)		(6.9)		2.09		8.17		5.77		6.27	
YCURB4	1.8819	***	1.7313	***	1.979	***	1.9359	***	1.8922	***	1.7849	***	2.0208	***
	(11.73)		(7.04)		(9.31)		3.3		11.26		7.97		8.7	
YCURB1	1.0081	***	1.0794	***	0.9685	***	1.4167	**	0.9931	***	0.8263	***	1.2028	***
	(5.66)		(3.91)		(4.12)		2.11		5.34		3.27		4.76	
YCENT	0.3597	*	0.2007		0.4695	*	-0.8983		0.4279	**	0.3585		0.3565	
	(1.89)		(0.67)		(1.9)		-0.97		2.17		1.34		1.31	
USE	-0.2016	*	-0.0582		-0.298	**	-1.1729	***	-0.1284		-0.3547	**	-0.0221	
	(-1.9)		(-0.34)		(-2.16)		-2.71		-1.16		-2.36		-0.14	
BASE	-0.239	***	-0.2629	***	-0.2248		-0.3007	***	-0.2387	***	-0.2418	***	-0.2388	***
			(-8.78)		(-9.29)		-3.79		-12.27		-8.97		-9.11	
Log-Likelihood Function Value	-960		-388		-564		-67		-883		-479		-575	
Observations	1392		604		778		132		1260		696		696	

***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Table 3: Conditional Logit of Scenario Choice (c=1) on Attribute Levels for Solid Waste Services (2005) (Models 5-7)

	Model 5a: < 26 year olds		Model 5b: 26-45 year olds		Model 5c: > 45 year olds		Model 6a: Currently Recycle		Model 6b: Non-Recyclers		Model 7 Ethics	
	Parameter Estimate (t-statistic)											
GAR	-1.4284	***	-0.8839	***	-0.7867	***	-0.8397	***	-1.0639	***	-0.8943	***
	-8.31		-4.67		-4.55		-5.21		-6.45		-7.19	
RECCENT	-0.5086		1.3167	***	1.8835	***	1.2495	***	1.3831	***	1.3784	***
	-1.07		4.28		5.59		4.61		5.36		5.05	
RECCURB4	1.1052	**	1.7213	***	2.3735	***	2.0907	***	1.5761	***	1.3417	***
	2.04		5.33		6.67		7.23		5.72		4.43	
RECCURB2	0.8105		1.8061	***	2.2258	***	2.0273	***	1.3228	***	1.0966	***
	1.5		5.56		6.23		7.13		4.66		3.52	
YCURB4	1.926	***	1.5781	***	2.4297	***	1.9294	***	1.8684	***	1.9485	***
	11.84		6.04		9.05		8.67		7.97		11.2	
YCURB1	1.0351	***	0.9668	***	1.2545	***	0.9717	***	1.0689	***	1.0221	***
	5.74		3.36		4.22		3.89		4.15		5.26	
YCENT	0.4095	**	0.3406		0.4514		0.4632	**	0.2499		0.4084	**
	2.13		1.12		1.43		1.76		0.89		1.98	
USE	-0.1891	*	-0.00533		-0.5146	***	-0.2123		-0.2057		-0.1135	
	-1.76		-0.03		-3.11		-1.39		-1.36		-.98	
BASE	-0.2433	***	-0.2416	***	-0.2591	***	-0.2089	***	-0.279	***	-0.2449	***
	-12.88		-7.89		-8.64		-7.98		-10.04		-11.98	
ETH*RECCENT											-0.00293	
											-0.07	
ETH*RECCURB4											0.1073	**
											2.16	
ETH*RECCURB2											.1315	***
											2.62	
Log-Likelihood Function Value	-418		-939		-341		-465		-479		-800	
Observations	720		1392		456		640		752		1196	

***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Table 4: Marginal Willingness to Pay for Service Attributes by Model

	Model 1: Basic	Model 2a: Males	Model 2b: Females	Model 3a: No College	Model 3b: College	Model 4a: Income <$40k/year	Model 4b: Income >$40k/year	Model 5a: < 26 year olds	Model 5b: 26-45 year olds	Model 5c: > 45 year olds	Model 6a: Recyclers	Model 6b: Non-Recyclers
GAR	**-3.94**	**-4.21**	**-3.76**	**-3.06**	**-3.93**	**-3.99**	**-3.87**	**-5.76**	**-3.66**	**-3.04**	**-4.02**	**-3.81**
RECCENT	**5.52**	**5.87**	**5.25**	**5.33**	**5.45**	**5.66**	**5.33**	**1.89**	**5.45**	**7.27**	**5.98**	**4.96**
RECCURB4	**7.50**	**6.11**	**8.64**	**6.60**	**7.54**	**8.23**	**6.70**	**4.71**	**7.12**	**9.16**	**10.01**	**5.65**
RECCURB2	**7.09**	**6.02**	**7.95**	**5.46**	**7.10**	**6.90**	**7.28**	**3.46**	**7.48**	**8.59**	**9.70**	**4.74**
YCURB4	**7.87**	**6.59**	**8.80**	**6.44**	**7.93**	**7.38**	**8.46**	**5.87**	**6.53**	**9.38**	**9.24**	**6.70**
YCURB1	**4.22**	**4.11**	**4.31**	**4.71**	**4.16**	3.42	5.04	**3.16**	**4.00**	**4.84**	**4.65**	**3.83**
YCENT	**1.51**	**0.76**	**2.09**	***-2.99***	**1.79**	**1.48**	1.49	*1.66*	*1.41*	**1.74**	**2.22**	0.90
USE	**-0.84**	**-0.22**	**-1.33**	**-3.90**	*-0.54*	**-1.47**	**-0.09**	*0.80*	*-0.02*	-1.99	-1.02	**-0.74**

*MWTP numbers in bold were significant

Table 5: Contingent Valuation of WTP Extra for Recycling (n=348).

	Parameter Estimates (Standard Errors)			
Intercept	.9754		0.6084	***
	(1.05)		(0.27)	
CVP	-0.4994	***	-0.449	***
	(0.12)		(0.1039)	
AGE	-0.0462			
	(0.047)			
AGE2	0.0002			
	(0.00005)			
ENVR	1.08	***		
	(0.27)			
highed	0.127			
	(0.28)			
CREC	0.809	***		
	(0.26)			
GEND	0.63	**		
	(0.26)			
inc25k50k	-0.068			
	(0.38)			
INC50k75k	0.64			
	(0.43)			
INC75k125k	0.49			
	(0.42)			
INC125k150k	0.999			
	(0..81)			
INC150k200k	0.83			
	(0.84)			
INCGT200k	-0.50			
	(0.94			
Likelihood Ratio	70.57	***	19.62	***

***, **, and * denote significance at the 1%, 5%, and 10% level, respectively

Table 6: Descriptive Statistics for Contingent Valuation Data (n=348)

Variable	Mean	Std Dev	Minimum	Maximum
CV Payment ($1-$4)	$2.57	$1.12	$1	$4
AGE (years)	46.91	17.57	19	85
ENVR (=1 if in environmental group)	0.22	0.48	0	1
Highed (=1 if has degree after High school)	0.42	0.49	0	1
CREC (=1 if current recycler)	0.46	0.50	0	1
GEND (=1 if female)	0.57	0.50	0	1
inc25k50k (income per household per year)	0.22	0.42	0	1
INC50k75k	0.19	0.39	0	1
INC75k125k	0.24	0.43	0	1
INC125k150k	0.03	0.16	0	1
INC150k200k	0.03	0.16	0	1
INCGT200k	0.03	0.16	0	1