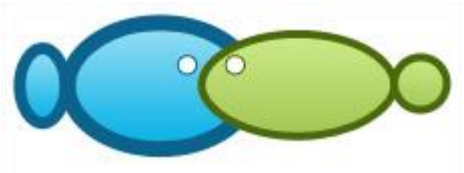

An economic valuation analysis of mangrove conservation using contingent valuation method: A case study at Ciletuh Bay

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Abstract. Mangrove forest is one of the Ciletuh Bay landscapes tourist attractions as a part of Ciletuh-Palabuhanratu Geopark, Sukabumi Regency, West Java Province. Previous studies have reported severe damage to mangrove forests due to overexploitation by residents. This study aims to determine the economic value of mangrove forest conservation to serve as a recommendation for the government in making budget policies for mangrove forest conservation activities in Ciletuh Bay. This study used a contingent valuation method supported by Tobit and multiple linear regression. The data was collected through a survey using an open-ended questionnaire in order to obtain the value of the respondent's willingness to pay. Some respondents were not willing to pay for mangrove ecosystem conservation. This study compares the mean absolute error (MAE) value between the Tobit model and multiple linear regression. The results showed that the MAE values of the Tobit model and the multiple linear regression model were 2.64 and 0.00091, respectively. A multiple linear regression model is the best model to predict the individual WTP value since it has the smallest MAE value. The value of the individual WTP is 44.94 USD year^{-1}. Thus, the economic value of mangrove forest conservation in Ciletuh Bay is 298,943.64 USD year^{-1}. The economic value of mangrove conservation indicates that the government must set conservation policies, including spatial regulation, payments for ecosystem services for the use of mangrove resources, and surveillance of the users of mangrove resources.

Key Words: conservation, mangrove economic valuation, Tobit model, multiple linear regression, mean absolute error (MAE)

Introduction. The mangrove forest in Ciletuh Bay are used for ecotourism, crab catching, wildlife observation, and research. Those are the main driving forces affecting the mangrove ecosystem as providers of services (van Oudenhoven et al 2015). The mangrove forest ecosystem in Ciletuh Bay has experienced heavy pressure due to large-scale exploitation by residents (Bonita 2017; Qodarriah 2017; Rinaldi 2019; Winantris et al 2018). The population growth rate in the Ciemas District of 1.45% from 2009 to 2020 (Central Bureau of Statistics of Sukabumi Regency 2021) may accelerate the damage to the coastal ecosystems, including mangrove forest (Long et al 2015). According to Barbier (2016) and Sofian et al (2019), mangrove forests have many ecological roles in coastal ecosystems, including service providers for humans, both directly and indirectly. Its existence provides a flow of benefits of goods and services for humankind. Damage to mangrove forests can undoubtedly disrupt the flow of these benefits to humans and impact decreasing human welfare in the future. Therefore, mangrove forests can be considered an economic asset.

Some local communities formed Conservation Community Group in 2010 and initiated the rehabilitation and conservation of mangrove forests by replanting mangrove trees until now (Bonita 2017). Therefore, an economic evaluation of the Ciletuh Bay mangrove forest conservation needs to be carried out. It is expected to assist the

Government in implementing strategies and managing the mangrove forests. In addition, proper assessment aims to prevent undervalued mangrove forest resources so that market failures do not occur (Fauzi 2015; Freeman III et al 2014).

The Contingent Valuation Method (CVM) was used in this study to analyze the economic valuation of mangrove forests conservation in Ciletuh Bay. This method was used to determine the economic value of ecosystem conservation that is not marketed through the estimation of willingness to pay (WTP) or respondent's willingness to pay (Ardiansyah et al 2019; Tonin 2019). An open-ended questionnaire was used by asking the respondents about the maximum value of payments for conserving the Ciletuh Bay mangrove forest. The development of open-ended questions is rarely used but has several advantages. It requires fewer datasets than dichotomous choice. The survey procedures are time-saving and less costly than the dichotomous choice survey (Armbrecht 2014; Fauzi 2015).

The Tobit model is a fit regression for processing open-ended questionnaire data to estimate individual WTP value (Fauzi 2015). Open-ended questions will classify respondents who are willing to pay and those who are not. According to Gujarati (2015), the Tobit model divides respondents into two groups: groups that have information about the independent variable, regressor, and information about the dependent variable, regressand. The second group is respondents who have information about the regressor but do not have information about the regressand. A sample with only partial information about the regressand variable is also called a censored sample. Consequently, respondents who answered that they were unwillingness to pay for mangrove conservation did not have WTP data but only data on the respondent's socioeconomic variables.

Foster & Kalenkoski (2013) stated that several studies that compared the Tobit and OLS models in estimating the dependent variable were still contradictory. Some researchers have argued that the Tobit framework can process censored data on regressand. Others argued that the OLS model is used because it is more robust to measurement error. Also, using the Tobit regression model to calculate CVM and conservation is rare. Therefore, this study aims to determine the economic value of mangrove forest conservation by comparing the results of two models: Tobit and multiple linear regression models.

Research methods. This research was conducted from January to March 2020. The respondents are the residents from Ciletuh Bay who are likely to be interested in mangrove forests protection in front of coastal land abrasion and distruction of habitat of aquatic biotas. They were farmers, fishers, crab fishers, shrimp farmers, and conservationists. These local communities live in coastal villages located in Ciletuh Bay, namely Ciemas, Girimukti, Ciwaru, and Mandrajaya. Secondary data were obtained from the Sukabumi Regency Government and the West Java Provincial Government.

Characteristics of Ciletuh Bay mangrove forest. Ciletuh Bay mangrove forest has about 8.62 ha and is located at coordinates 7011'13''–7011'37" South Latitude and 106026'50''-106026'38" East Longitude. The administrative location is in Mandrajaya Village, Ciemas District, Sukabumi Regency, West Java Province. In the 1990s, the mangrove forest of Ciletuh Bay was exploited massively by residents, including the wood used for fuel and household needs. Coastal communities utilizing coastal resources tend to use chemicals, which accelerates the destruction of mangrove forests (Bonita 2017).

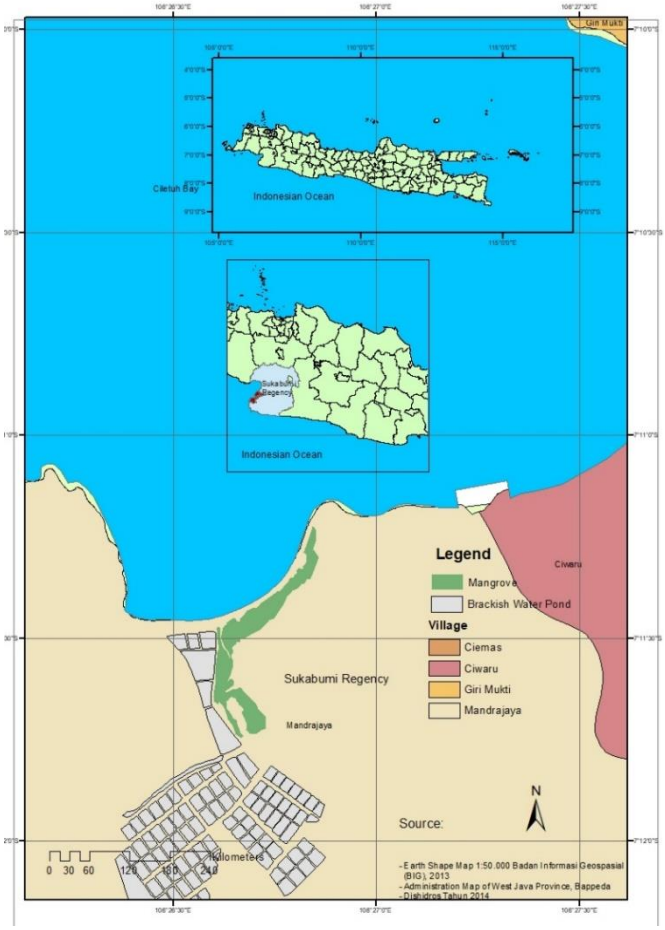

Figure 1. The location of mangrove forests at Ciletuh Bay.
Source: Geospatial Information Agency 2013 (www.tanahair.indonesia.go.id)

The Conservation Community Group, Pokmasi Mandrajaya Nusantara, has introduced the Ciletuh Bay mangrove forest as an ecotourism spot to preserve it from 2010 until now. This conservation activity has received assistance from various institutions, including the Department of Marine Affairs and Fisheries of Sukabumi Regency Government, the Department of Marine Affairs and Fisheries of the West Java Province, universities, and private companies.

Sampling method. Determination of farmer and fisher respondents was made using probability sampling method by following the formula (Parel et al 1973):

$$n = \frac{Nz^2p(1-p)}{Nd^2 + z^2p(1-p)}$$

where n is the number of respondents specified, z is the value of Z (1.64) based on the confidence interval (90%), p is the proportion of the sample to the population, d is the error rate accepted by the statistical model, and N is the total number of sampling units in the population. Farmer population data were obtained from the Ciemas Forestry and Fisheries Agricultural Extension Center (2018), and fisher population data were obtained from the Department of Marine Affairs and Fisheries of the West Java Province (2018). The detailed data about the farmer and fisher respondents are presented in Tables 1 and 2.

Table 1

Number of farmers

Farmer population in Ciemas District (N)	*Villages in Ciletuh Bay*	*Farmer population in each village (p)*	*Respondents per village (n)*
12,812	Ciemas	1,634	15
	Girimukti	1,012	9
	Ciwaru	2,445	23
	Mandrajaya	2,078	19
Total		7,169	66

Source: Study data (2022)

Table 2

Number of fishers

Fisher population in Sukabumi Regency (N)	*Fishers in Ciletuh Bay (p)*	*Respondents (n)*
9,214	663	18

Source: Study data (2020)

There are no crab fishers data available in local government statistics, and the snowball sampling found four people. The Labuan Monodon company is the only shrimp farming in this area. The mangrove conservation respondent is the head of the conservation community group. Thus, the number of respondents was 90 people. All monetary values presented in the study were converted from Indonesian currency into USD using the exchange rate of 1 USD= Rp13,895 (this was the exchange rate data used on January 2, 2020, according to Indonesian Central Bank (www.bi.go.id).

Characteristics of respondents in Ciletuh Bay coastal community. Table 3 below shows the characteristics of respondents from the coastal community of Ciletuh Bay.

Table 3

Characteristics of respondents from the coastal community of Ciletuh Bay

Characteristics	*Description*	*Number of respondents*	*Percentage (%)*
Gender	Male	70	77.78
	Female	20	22.22
Profession	Farmer	66	73.33
	Fisher	18	20.00
	Crab fisher	4	4.44
	Shrimp farmer	1	1.11
	Conservationist	1	1.11
Age	Productive age 15 – 64 years	88	97.78
	Non-productive age > 64 years	2	2.22
Marital status	Married	90	100
	Single	0	0
Education	Uneducated	0	0
	Elementary school	55	61.11
	Junior high school	26	28.89
	Senior high school	7	7.78

	Bachelor	2	2.22
Family members	≤ 3 people	57	63.33
	> 3 people	33	36.67
Income	< Regional minimum wage	69	76.67
	≥ Regional minimum wage	21	23.33

Information: Sukabumi Regency minimum wage was 200.86 USD month^{-1} in 2019
Source: Study data (2020)

Based on the data in Table 3 above, the characteristics of the respondents who dominate are: 77.78% male, 73.33% farmers, 97.78% are within the productive age, 100% are married, 61.11% graduated elementary school, 63.33% have total family members below or equal to three people, and 76.67% have the average monthly income below the Sukabumi District Minimum Wage.

Data analysis. Estimating the conservation value of the Ciletuh mangrove forest used the Contingent Valuation Method. The WTP offer starts from a minimum value of 7.20 USD year^{-1}, and the increase is in multiples of 7.20 USD. The offer's value used the value of social contributions within the neighborhood association, around 0.72 USD month^{-1} or 8.64 USD year^{-1}. Parameters related to the willingness to pay function are the respondent's socioeconomic variables adopted from the CVM research conducted by Tonin (2019), namely age (Ag), education level (Ed), family members (Fa), duration of business operation (Bu) (in years), and income (Ic). The willingness to pay function is in the form of the following linear equation:

$$WTP = \beta_0 + \beta_1 Ag + \beta_2 Ed + \beta_3 Fa + \beta_4 Bu + \beta_5 Ic$$

Tobit model is statistically as follows (Norris & Batie 1987) :

(1) $y_t = X_t\beta + e$ if $X_t\beta + e > 0$
$= 0$ if $X_t\beta + e \leq 0$
$t = 1, 2, \ldots, N$

(2) $Ey = X\beta F(z) + \sigma f(z)$
(3) $Ey^* = X\beta + \sigma f(z)/F(z)$
(4) $\partial Ey/\partial X_i = F(z)(\partial Ey^*/\partial X_t) + Ey^*(\partial F(z)/\partial X_i)$
(5) $\partial Ey^*/\partial X_i = \beta_i[1 - zf(z)/F(z) - f(z)^2/F(z)^2]$
(6) $\partial F(z)/\partial X_i = f(z)\beta_i/\sigma$

where:
X = a vector of regressor variables
β = a vector of unknown coefficients (Tobit coefficients)
e = a vector of independent and identically distributed normal random variables assumed to have mean zero, and constant variance, σ^2
$E(Y^*)$ = $E(Y \mid Y > 0)$
z = $X\beta/\sigma$, normalized index
f(z) = the standard normal density function
F(z) = the cumulative standard normal distribution function

The MAE value is obtained by the formula (Chai & Draxler 2014):

$$MAE = \frac{1}{n}\sum_{i=1}^{n}|e_i|$$

where:
MAE = Mean Absolute Error value

i = residual value of respondent's observation i
n = number of data
e = the errors or residual (the absolute value of the reduction between the i observed WTP value and the i estimated WTP value)

Chai & Draxler (2014) stated that the evaluation of the best linear regression model could compare the value of the slightest deviation between the Mean Absolute Error (MAE) or Root Mean Square Error (RMSE) tests. Error distribution data usually use the RMSE test, and the data is above 100. Since this study had 90 respondents, the error assessment used the MAE value to select the best regression model to obtain the individual WTP value.

Result and Discussion

Evaluation of the best estimation model. Tobit and multiple linear regression models were used to estimate the willingness to pay function coefficients. Based on the regression results of the willingness to pay function on the conservation of mangrove forest resources in Ciletuh Bay using the Tobit model, it is denoted as follows:

$$WTP = -39.81932 + 1.176255Ag + 5.18767Ed - 5.249341Fa + 0.0821318Bu + 0.0055727Ic$$

Table 4

Willingness to pay function using the Tobit model

Variable	*Coefficient*	*P > |t|*	*Prob. > chi²*	*Pseudo R²*
Intercept	-39.81932	0.131	0.0001	0.0296
Ag**	1.176255	0.028		
Ed***	5.18767	0.001		
Fa	-5.249341	0.115		
Bu	0.0821318	0.886		
Ic***	0.0055727	0.003		

Legend: Ag = Age, Ed = education level, Fa = family members, Bu ~~Lt~~ = duration of business operation, Ic = income
*** Significant at 1%.
** Significant at 5%.

The willingness to pay function for the multiple linear regression model is:

$$WTP = -32.56894 + 1.088811Ag + 4.922106Ed - 4.800979Fa + 0.1637499Bu + 0.0046925Ic$$

Table 5

Willingness to pay function using the multiple linear regression model

Variable	Coefficient	P > |t|	Prob > F	Adj. R²
Intercept	-32.56894	0.178	0.0002	0.2038
Ag*	1.088811	0.026		
Ed***	4.922106	0.001		
Fa	-4.800979	0.117		
Bu	0.1637499	0.758		
Ic***	0.0046925	0.007		

Legend: Ag = Age, Ed = education level, Fa = family members, Bu = duration of business operation, Ic = income
*** Significant at 1%.
** Significant at 5%.

Tables 4 and 5 show that the Tobit and multiple linear regression models have a Prob value. > chi2 respectively 0.0001 and 0.0002 and significant at the 1% significance level. Thus, the variables of age, education, family members, duration of business operation, and income affect the willingness to pay simultaneously in both models.

In both models, family member variables have a negative effect on willingness to pay. The partial test shows that the independent variables age, education, duration of business operation, and income have a positive relationship to willingness to pay. Education and income variables have a significant relationship with the willingness to pay at the 1% level. The age variable is significantly related to the willingness to pay at a significance level of 5%. The family members variable has a negative relationship with willingness to pay.

The Pseudo R^2 value in the Tobit model is 0.0296 and Adj. R^2 in the multiple linear regression model is 0.2038. The last value indicates that 20% of the variance in the dependent varable is explained by the selected independent variables. Because both values are far from 1, the model is not fit (Gujarati 2015). However, since we are predicting a human behaviour (WTP) it is worth mentioning the results with the condition of interpreting them in the context of the low value of Adj. R^2. The MAE test results on the Tobit and the multiple linear regression model are 2.64 and 0.00091, respectively (after the conversion from the Indonesian currency into USD) (Annex, Table A.1 and Table A.2). Consequently, the multiple linear regression model best determines individual WTP values because it had the slightest deviation. The goodness of fit model of multiple linear regression has a greater value than the Tobit regression. Thus, multiple linear regression can also be used as a recommendation for the best model to estimate individual WTP values than Tobit model (Gujarati 2015).

The economic value of mangrove conservation in Ciletuh Bay. The economic value of conservation was obtained by multiplying the individual WTP value by the population's willingness to pay. The number of people willing to pay for mangrove forest in Ciletuh Bay is presented in Table 6 below:

Table 6

Number of willing to pay respondents

Category (Profession)	*Population*	*Number of respondents*	*Respondents willing to pay (no of respondents)*	*Proportion of respondents willing to pay (proportion of their category; %)*	*Approximation of population willing to pay in each category*
Farmer	7,169	66	55	83.33	5,974
Fisher	663	18	18	100	663
Crab fisher	4	4	4	100	4
Shrimp farmer	1	1	1	100	1
Conservationist	10	1	1	100	10
Total	7,847	90	79		6,652

Source: Study data (2020)

Table 6 shows that 7,847 people use coastal land in Ciletuh Bay, consisting of 7,169 farmers, 663 fishers, 4 crab fishers, 1 shrimp farmer (company), and 10 mangrove conservationists. The farmer respondents are 66 people, but only 55 respondents are willing to pay, or 83.33%. Since the sample is representative for Ciletuh Bay population (Parel et al 1973), it can be inferred that the population of farmers who are willing to pay is 83.33% or as many as 5,974 people. All respondents from fishers, crab catchers, farmers, and conservationists stated that they were willing to pay. Thus, the total population who are willing to pay is 6,652 people.

Using the average value of the variables Ag, Ed, Fa, Bu, and Ic, into the multiple linear regression model as the best model, the individual WTP value estimates 44.94 USD

year^{-1}. The individual WTP value is multiplied by the number of the population who are willing to pay. The economic value of mangrove forest conservation in Ciletuh Bay is 298,943.64 USD year^{-1} (for the whole forest)

Based on the characteristics of the respondents in Table 3, it can be concluded that jobs in rural areas as farmers, fishers, crab fisher, shrimp farmers, and conservationists are dominated by men because of their role as family breadwinners. This relates to all respondents who are married and most of them are of productive age. The education level of most of the respondents is elementary education, meaning that this work can be done by all workers without any educational background requirements. Most of the respondents have income below the regional minimum wage indicating they are informal and self-employed workers.

Policy implications. The destruction of mangrove forests in almost all tropical coastal areas has been evident, and the condition is getting worse (Barbier 2016). The leading cause is deforestation for land conversion, mainly for shrimp farming, agriculture, and settlement activities. This failure occurs because the Government in every country allows the conversion of mangrove forest for cultivation activities based on conventional GDP as its economic growth. The Government should implement a natural resource balance in its economic development planning, which involves analyzing the valuation of natural resources. Undervalue will not occur if the natural resource commodity clearly describes its actual value well. In addition, natural resource valuation is helpful as a decision-making tool on what strategies the Government should take in its utilization and conservation efforts.

The conservation value of mangrove forest in Ciletuh Bay is USD 298,943.64 year^{-1}. It has an important message for the government in paying attention to the preservation of mangrove forests. Thus, conservation policies need to be established by the government to maintain the preservation of mangroves and the welfare of local communities. These policies are in the form of:

1. spatial regulations.
2. regulation for economic activities that support the preservation of mangrove forests.
3. surveillance of business actors or communities that utilize mangrove ecosystem resources.

Spatial planning regulation is must take into account the need to maintain mangrove forest's existence and to prevent land use conversion. This regulation needs to pay attention to the integration of land and sea zoning to create a synergistic relationship between the two zoning. Economic activities in mangrove forests must be directed by the government to make mangrove forests sustainable. Payment for ecosystem services such as entrance tickets for mangrove ecotourism activities, crab catching, education and research. These costs can be managed by a conservation community group which are used for mangrove conservation activities and as income for the village government.

Conclusion. The study result shows that the multiple linear regression model is the best in determining the estimated value of WTP. The MAE value of the multiple linear regression model is 0.00091, lower than the MAE value of the Tobit model, which is 2.64. Therefore, the results should be interpreting acknowledging the low level of the goodness of fit of the model in this study. The Pseudo R^2 and Adj. R^2 values that are smaller than 1 mean that further research is needed to obtain other explanatory variables to estimate the WTP value and obtain a good model. The individual WTP value is 44.94 USD year^{-1}, and the conservation value of mangrove forests is 298,943.64 USD year^{-1}. The Government must spend that cost to maintain the sustainability of the mangrove forest of Ciletuh Bay, especially efforts to restore the damage that has occurred several decades ago. The government must manage mangrove forests to prevent anthropogenic damage and naturally avoid wasting the state budget. The role of the Government is critical in preserving the mangrove forests, such as granting mangrove land permits for cultivation or industrial activities or *vice versa* for conservation policy. The effectiveness of mangrove conservation programs can consider the variables of age, education level,

duration of business, and income that have a positive relationship to willingness to pay for mangrove conservation, both in the Tobit and OLS models. The variable number of family members has a negative relationship with willingness to pay.

Conflict of Interests. The authors declare no conflict of interest.

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The Annex

Table A.1.
MAE of Tobit model

Respondent	WTP observation (USD)	WTP estimation (USD)	Residual (USD)
1	71.97	23.43	48.54
2	14.39	38.42	-24.03
3	35.98	-2.69	38.68
4	0.00	30.52	-30.52
5	35.98	20.67	15.31
6	71.97	43.05	28.92
7	35.98	13.47	22.52
8	35.98	30.13	5.85
9	50.38	44.22	6.16
10	35.98	57.98	-21.99
11	0.00	8.93	-8.93
12	0.00	20.28	-20.28
13	21.59	28.17	-6.58
14	50.38	17.91	32.47
15	107.95	70.70	37.25
16	35.98	22.11	13.87
17	143.94	39.77	104.17
18	7.20	25.75	-18.56
19	21.59	62.39	-40.80
20	35.98	24.31	11.67
21	21.59	44.02	-22.43
22	0.00	22.41	-22.41
23	14.39	21.91	-7.51
24	0.00	28.00	-28.00
25	7.20	49.26	-42.06
26	0.00	45.26	-45.26
27	7.20	34.73	-27.54
28	7.20	54.83	-47.63
29	143.94	99.16	44.77
30	50.38	38.81	11.57
31	0.00	36.40	-36.40
32	57.57	52.67	4.90
33	122.35	67.08	55.27
34	86.36	68.34	18.02
35	57.57	24.32	33.25
36	14.39	31.24	-16.84
37	21.59	26.93	-5.34
38	57.57	44.12	13.46
39	71.97	39.42	32.55
40	0.00	9.66	-9.66
41	21.59	33.76	-12.17

42	86.36	55.87	30.49
43	50.38	36.44	13.93
44	21.59	50.48	-28.89
45	7.20	22.95	-15.75
46	35.98	16.66	19.32
47	7.20	27.91	-20.72
48	35.98	14.55	21.43
49	0.00	52.60	-52.60
50	43.18	43.48	-0.30
51	71.97	99.95	-27.98
52	50.38	26.58	23.80
53	35.98	39.84	-3.86
54	57.57	77.91	-20.33
55	0.00	29.85	-29.85
56	107.95	38.34	69.61
57	57.57	38.60	18.98
58	0.00	35.73	-35.73
59	86.36	42.11	44.25
60	28.79	31.02	-2.23
61	35.98	23.19	12.80
62	71.97	25.10	46.87
63	14.39	21.53	-7.14
64	71.97	35.88	36.09
65	35.98	33.32	2.67
66	79.17	32.99	46.17
67	71.97	48.85	23.12
68	35.98	44.44	-8.46
69	35.98	50.47	-14.48
70	107.95	75.59	32.36
71	71.97	63.39	8.58
72	35.98	46.48	-10.50
73	35.98	53.22	-17.24
74	57.57	91.43	-33.86
75	43.18	84.99	-41.81
76	71.97	60.47	11.50
77	14.39	72.99	-58.60
78	7.20	29.32	-22.12
79	35.98	40.11	-4.13
80	71.97	86.30	-14.33
81	35.98	50.92	-14.93
82	43.18	47.98	-4.80
83	14.39	65.67	-51.28
84	21.59	60.52	-38.93
85	35.98	28.39	7.60
86	35.98	22.04	13.95
87	57.57	49.77	7.80

88	71.97	40.77	31.20
89	215.90	103.78	112.12
90	143.94	44.49	99.45
		Total residual =	237.52
		MAE =	|237.52|/90
		=	2.64

Table A.2.
MAE of multiple linear regression model

Respondent	WTP observation (USD)	WTP estimation (USD)	Residual (USD)
1	71.97	27.56	44.40
2	14.39	41.91	-27.52
3	35.98	2.96	33.02
4	0	34.30	-34.30
5	35.98	24.46	11.52
6	71.97	47.53	24.43
7	35.98	17.60	18.38
8	35.98	33.40	2.59
9	50.38	49.08	1.30
10	35.98	60.62	-24.63
11	0	13.59	-13.59
12	0	25.57	-25.57
13	21.59	32.79	-11.20
14	50.38	21.65	28.73
15	107.95	71.77	36.19
16	35.98	28.18	7.81
17	143.94	43.30	100.64
18	7.20	29.02	-21.82
19	21.59	63.01	-41.42
20	35.98	28.30	7.69
21	21.59	47.40	-25.81
22	0	28.28	-28.28
23	14.39	26.28	-11.88
24	0.00	34.04	-34.04
25	7.20	51.75	-44.55
26	0	48.02	-48.02
27	7.20	38.71	-31.51
28	7.20	57.58	-50.39
29	143.94	97.52	46.41
30	50.38	41.10	9.28
31	0	39.87	-39.87
32	57.57	54.72	2.86
33	122.35	66.55	55.80
34	86.36	69.35	17.01
35	57.57	29.07	28.51
36	14.39	34.82	-20.42
37	21.59	31.28	-9.69

38	57.57	47.30	10.27
39	71.97	42.83	29.13
40	0	15.96	-15.96
41	21.59	36.76	-15.17
42	86.36	57.41	28.95
43	50.38	40.26	10.12
44	21.59	53.24	-31.65
45	7.20	26.59	-19.40
46	35.98	20.61	15.38
47	7.20	33.36	-26.16
48	35.98	19.14	16.84
49	0	55.17	-55.17
50	43.18	46.70	-3.52
51	71.97	100.93	-28.96
52	50.38	31.55	18.83
53	35.98	43.50	-7.52
54	57.57	77.76	-20.18
55	0	33.17	-33.17
56	107.95	41.00	66.95
57	57.57	41.30	16.27
58	0	39.29	-39.29
59	86.36	45.69	40.67
60	28.79	34.23	-5.44
61	35.98	27.14	8.84
62	71.97	29.25	42.72
63	14.39	25.76	-11.37
64	71.97	39.97	32.00
65	35.98	37.42	-1.44
66	79.17	36.11	43.05
67	71.97	48.74	23.23
68	35.98	46.87	-10.89
69	35.98	50.32	-14.34
70	107.95	73.91	34.04
71	71.97	62.35	9.62
72	35.98	49.19	-13.21
73	35.98	55.13	-19.15
74	57.57	86.26	-28.69
75	43.18	82.82	-39.64
76	71.97	59.03	12.94
77	14.39	70.24	-55.85
78	7.20	33.38	-26.19
79	35.98	42.18	-6.20
80	71.97	82.93	-10.96
81	35.98	52.63	-16.64
82	43.18	49.88	-6.70
83	14.39	65.62	-51.23

84	21.59	60.75	-39.16
85	35.98	30.75	5.24
86	35.98	25.13	10.85
87	57.57	51.68	5.89
88	71.97	42.77	29.20
89	215.90	103.75	112.16
90	143.94	45.89	98.04
		Total residual =	0.08149
		MAE =	$\lvert 0.08149 \rvert /90$
		=	0.00091