Estimation of Citizens’ Willingness to Pay for the Implementation of Payment for Local Forest Ecosystem Services: The Case of Taxes and Donations

Jang-Hwan Jo 1,2, Chang-Bae Lee 3, Hye-Jung Cho 4 and Jukwan Lee 5,*

1 Department of Forest Sciences and Landscape Architecture, Institute of Life Science and Natural Resources, Wonkwang University, 460 Iksan-daero, Iksan 54538, Korea; osmanthusfvam007@wku.ac.kr
2 Institute of Environmental Science, Wonkwang University, 460 Iksan-daero, Iksan 54538, Korea
3 Department of Forestry, Environment, and Systems, College of Science and Technology, Kookmin University, Seoul 02707, Korea; kecolee@kookmin.ac.kr
4 Department of Child Development and Family Studies, Seoul National University, Seoul 08826, Korea; hjcho2@snu.ac.kr
5 International Trade Department, Korea Institute for International Economic Policy, Sejong 30147, Korea

* Correspondence: jklee@kiep.go.kr

Abstract: The purpose of this study is to determine a valid strategy for implementing payment for the local forest ecosystem services (local forest PES) by considering citizens’ willingness to pay (WTP) and the resource types utilized (taxes and donations). A total of 1000 citizens responded to an online survey, which consisted of questions related to respondents’ socio-demographics, predicting factors (i.e., political orientation, personal tie to the region) of their willingness to pay (WTP), and their willingness to pay for a bundle of 10 different forest ecosystem services (ESs) in the region of the Yeoninsan provincial park in Gapyeong-gun, Gyeonggi-do, South Korea. The estimation of the respondents’ WTP for the promotion of the forest management activities, which enhances the ES bundle of the local forest, was 14,315–20,216 KRW (12.75–18.00 USD) per year in taxes and 12,258–26,518 KRW (10.92–23.61 USD) per year in donations. This study also revealed that the predicting factors influencing the respondents’ WTP for the promotion of the local forest ESs differed according to the financial resource type (taxes and donations). The results of this study are meaningful in that they can be used as empirical basic data in estimating payments and preparing measures to secure financial resources when designing payments for the ecosystem services for the local forest.

Keywords: payment for ecosystem service (PES); local forest; tax; donation; willingness to pay (WTP)

1. Introduction

Ecosystem services (ESs) are the direct and indirect services that the ecosystem provides to humanity that sustain and enhance the quality of life [1–3]. ESs are valued as the connection between the life of humans and the biological and physical functions of the ecosystem [4], and there are ongoing efforts to devise and manage the policies that reflect the social demand for ESs concerning the evaluation of ecosystem management [5]. The concept of ESs has received global attention. In the countries that are pioneering the ES concept in their planning and policy, such as the UK, the USA, China, and Australia, the stakeholders have been applying the concept in various ways to justify their goals and lend support to activities regarding the ecosystem [6].

The payments for ecosystem services (PESs) approach is one that promotes free trade between the beneficiary and the supplier of ESs based on market principles. PES has been noted as one efficient way of managing ESs in contrast to the conventional, regulation-centered policies for environmental conservation developed under governmental control. One major reason for the efficiency of the PES approach is that it does not have to engage with the government’s failure to consider the information necessary for designing the
According to Salzman et al. [7], 550 PES programs are currently active worldwide, and the PES market size is 36–42 billion USD per year. A few examples are the various PES projects implemented by the Department for Environment, Food and Rural Affairs (DEFRA) in the UK [8,9], the Biodiversity Offsets Banking (BioBanking) in Australia [10,11], and the Grain to Green project in China [12].

In South Korea, the ES concept was introduced through the revision of the act on the conservation and use of biological diversity on 11 June 2020. Simultaneously, specific outlines to support designing and implementing PESs have been included in the legal documents of the revised act on the conservation and use of biological diversity (Article 2, Clause 10). The revised law defines ES as the benefit(s) of one of the following service categories; a provisioning service category that provides humans with tangible products from the ecosystem, such as food, water resources, and timber; a regulating service category, including services such as air purification, carbon absorption, climate control, and disaster prevention; a cultural service category, including things such as ecotourism, clear and pleasant scenery, and resorts; and/or a supporting service category, including services such as soil formation, the supply of natural habitats, and material circulation [13].

With the revised law, the interest in designing the PESs has been rising in South Korea. Considering the characteristics of Korea, where 63.4% of the land area is forested [14], it is necessary to consider the PESs in using forest resources in order to use the national land resources sustainably. The purpose of this study is to provide primary evidential data for the creation of plans for PES estimation and finance that should be taken into consideration in the introduction of PESs for local forests. For this purpose, the general WTP of the citizens regarding the ES-promoting activities for local forests is estimated. The differences in the estimated cost of citizens’ WTP through donations and taxes are also examined to compare the effect of the financial resource types. Further, the influence of citizens’ socio-demographic characteristics and other plausible predictors on their WTP are investigated.

2. Literature Review and Hypothesis Development

2.1. Payment for ES of Local Forest

Previous studies on PESs have mainly focused on quantitatively estimating people’s WTP [9,12,15–19] and the methods of obtaining the financial resources in implementing PESs [7,8,20–22]. Kaiser et al. [23] asserted that the presence of diversity in defining PESs should be acknowledged when comparing the PES programs between studies. Thus, while more seriously holding the local collective governance systems accountable in the sustainable use of resources, considering the connections between global, regional, and local scales for the development of PES programs is also important. These studies have shown that the first step in designing the PES based on a local forest is to define the target service. Accordingly, focusing on a single specific service [7] or bundles of multiple services [24] are both appropriate. Many previous studies have focused on one specific ES, such as the following: provisioning clean non-timber forest products [25], the conservation of biodiversity [26], carbon absorption [27], regulating local climates [28], and fostering water resources [29]. Investigating the effect of one specific ES on human life is essential for understanding the relationship between the resource and its use from a human’s perspective. However, forestry, in reality, does not provide only one specific ES at a time. Instead, combinations of and interactions between various ES are present at the same time. Thus, trade-offs between ESs can occur [30–33] as well as trade-offs between the issues associated with the ESs. For instance, an enhancement of the quantity and quality of one specific ES may decrease the quantity and quality of another ES [34].

Studies have shown that the simultaneous trade of several ESs as a bundle avoids the trade-off problem, while a genuine and complete value assessment can be performed regarding ecosystem conservation [35]. Further, by managing several related ESs together, a synergistic effect can be achieved [36]. In the case of the Yangtze River in China, a significant correlation was found among 40 out of 45 ES pairs [37]. A study in Germany
also found eight different ES bundles. In the hills surrounding the Alps and the low mountain areas of Bavaria, two ESs coexist: thriving conditions for pollination and active cattle production [38]. Likewise, there is a chance of trade-off occurrence in the local forests of South Korea; although, to our knowledge, no studies have been conducted to empirically define the trade-off phenomenon of local forests in South Korea. Therefore, it is still not yet clear whether there will be trade-offs between the detailed ESs in the area we investigate. To avoid such uncertainty, we chose to investigate the local forest PES in bundles of ESs rather than focusing on one or two specific services. By doing so, we believe we can avoid any issues related to trade-off which could be raised by the stakeholders. We consider this methodology acceptable because the main purpose of this study is to estimate the citizens’ WTP for ESs of local forests based on their characteristics and different resource types (taxes or donations). Our study is developed as an initial step to conceive of a foundation for designing PESs for local forests in South Korea.

In addition, previous studies which examined the financial resources for PESs have focused on one financial resource type (i.e., taxes [39], admission fees [40], or donations [41]) to identify the estimated WTP for a specific area. However, to our knowledge, no studies have attempted to apply two different types of financial resources (methods) to one target area. WTP for the same target area may depend on how the PES is designed (i.e., based on which financial resource type is utilized). Based on this assumption, this study analyzed PESs of one specific area based on two financial resource types: taxes and donations.

Therefore, we set Hypothesis 1 as the following:

**Hypothesis 1.** When the PES is designed for the same local forest, the general citizens’ WTP will differ depending on the financial types (taxes or donations).

### 2.2. Predicting Factors of Participants’ WTP for Local Forest PES

Analyzing the willingness of market participants for the trade of resources is an essential step in designing a PES of local forest resources [42]. This is because the successful establishment of a PES system depends on clearly defined market participants and the adequate motivation of each participant within the ES market [43–45]. Most importantly, the type of participants with a high WTP for the ESs should be predicted so that an active promotion is designed to meet their needs. Consumers would participate in the market only when they have an adequate awareness of the need for the particular ES. In previous studies, the WTP was shown to be high when the participants had a high level of income in general [46], had a liberal political orientation [47], and had a personal tie to the region supplying the ES [48,49]. On the other hand, Nagothu et al. [50] have noted the importance of considering the geographical distance between the consumers and suppliers. This is because when the geographical distance between the respondents and the region is far, their perception of the benefits or their needs regarding the service can decrease while the level of uncertainty increases, which will eventually cause a decrease in the rate of participation in PESs for local forests. It was also reported that the ES suppliers likewise require a definite motivation for participation. Thus, this study investigates the influence of basic demographic characteristics of the citizens on their WTP as well as the influence of the factors mentioned in previous studies—the level of income, political orientations, personal relationships with the site, and geographical distance from the site—by setting them as predicting variables.

The following additional hypotheses will be investigated.

**Hypothesis 2.** Citizens’ WTP for PES which enhances the local forests’ ESs will differ according to their socio-demographic characteristics, political orientations, personal relationships with the site, and geographical distance from the site.

**Hypothesis 3.** The predicting factors of citizens’ WTP for PESs which enhance the local forests’ ESs will differ according to the financial resource types (taxes or donations).
3. Methods
3.1. Research Participants

The participants of this study were general citizens in South Korea. A representative sample group for the demographic characteristics in South Korea, with respect to age, gender, and residential area, was obtained from the Resident Registration Population Statistics provided by the Ministry of the Interior and Safety. Most investigation agencies in South Korea adjust the age and gender ratio of subjects based on the sample size for quota sampling. The online survey investigation agency commissioned by this study likewise conducted the investigation via quota sampling to consider the age and gender ratio. Considering that the survey was conducted online, the individuals in their 50s or above were placed in a single group and extracted in the same proportion as those in their 20s, 30s, and 40s.

The online survey was conducted from 20 July to 31 July in 2020. The survey was e-mailed to 9274 citizens between the ages of 19 and 65. Out of 9274 citizens, 2879 citizens accessed the survey website, and 1328 of them completed the form. Finally, 1000 valid responses were obtained after eliminating unreliable and untrustworthy data (Table 1). The question response rate of this survey was 34.7%, a satisfactory rate based on the standard criteria for non-response rates of 65% [51] or 70% [52].

Table 1. Response status.

| Status                          | Case Number (People) | Proportion (%) |
|---------------------------------|----------------------|----------------|
| Mails received mail left unchecked | 5443                 | 58.7           |
| Logged-out (Recipient)          | 606                  | 6.5            |
| Not targeted subject            | 965                  | 10.4           |
| Logged-in (Recipient)           | 586                  | 6.3            |
| Incomplete response             | 328                  | 3.5            |
| Untrustworthy data              |                      |                |
| Completed response              | 1000                 | 10.8           |
| Total                           | 9274                 | 100.0          |

Table 2 shows the socio-demographics characteristics of the participants. Of the total sample, 35.9% of participants were in their 50s or older. This was followed by those in their 40s (24.1%), 30s (20.3%), and 20s (19.7%). The participants’ sex ratio was similar, and there were more married (62.7%) than unmarried (37.4%) individuals. Additionally, 39.1% of the participants reported not having children, and this was followed by having 2 (31.3%), 1 (25.2%), and 3 or more (4.3%) children. More than 60% of the participants were university degree holders, 20.8% were high school degree holders, and 10.5% were graduate school degree holders. Regarding income level, the highest percentage of participants (18.9%) earned between 3,000,000 KRW and 3,990,000 KRW per household. This was followed by earnings of 4,000,000 KRW to 499,000,000 KRW (18.7%). Only 16.1% of participants reported being involved in social activities. This is five times lower than the rate of those who reported not being involved (83.9%). The prevalence of participants’ political orientation was in the order of moderate (45.3%), progressive (34.2%), and conservative (20.5%). A high percentage (73%) of participants responded positively (agree and very much agree) to the question which asked if they were receiving benefits from the forests in their daily lives. Meanwhile, most participants (87.5%) reported having no personal relationship with the study site (Yeoninsan in Gapyeong). Additionally, 29.1% of the respondents were residing in two areas near Gapyeong: Gyeonggi-do and Gangwon-do. The proportions of respondent ages, sex, and residential locations represent the proportion of Korea’s total population as reported in the registration demographic data by the Ministry of the Interior and Safety [53].
Table 2. Characteristics of respondents.

| Category                  | Sample Size |
|---------------------------|-------------|
| Variables                 | Variable Code | (%) |
| Age                       |             |     |
| 20s                       | 2           | 19.7|
| 30s                       | 3           | 20.3|
| 40s                       | 4           | 24.1|
| 50s and above             | 5           | 35.9|
| Sex                       |             |     |
| Male                      | 1           | 49.3|
| Female                    | 0           | 50.7|
| Marriage                  |             |     |
| Married                   | 1           | 62.6|
| Single                    | 0           | 37.4|
| Number of children        |             |     |
| None                      | 0           | 39.1|
| One                       | 1           | 25.2|
| Two                       | 2           | 31.3|
| Three or more             | 3           | 4.3 |
| Education                 |             |     |
| No degree/Elementary school graduate | 1 | 0 |
| Middle school graduate    | 2           | 0.3 |
| High school graduate      | 3           | 20.8|
| University graduate       | 4           | 60.4|
| Graduate school graduate  | 5           | 10.5|
| Monthly household income  |             |     |
| Below 99 (10 thousand KRW) | 1       | 3.4 |
| 100–199 (10 thousand KRW)  | 2       | 7.7 |
| 200–299 (10 thousand KRW)  | 3       | 17.0|
| 300–399 (10 thousand KRW)  | 4       | 18.9|
| 400–499 (10 thousand KRW)  | 5       | 18.7|
| 500–599 (10 thousand KRW)  | 6       | 11.4|
| 600–699 (10 thousand KRW)  | 7       | 9.9 |
| Over 700 (10 thousand KRW) | 8       | 13.0|
| Social activity participation (i.e., Environmental citizen’s organization, religious organization, political party/organization, volunteer organization) | Yes | 1 | 16.1 |
|                           | No | 0 | 83.9 |
| Political orientation     |             |     |
| Progressive               | <9          | 34.2|
| Moderate                  | 9           | 45.3|
| Conservative              | >9          | 20.5|
| Personal relationship with the site | Yes | 1 | 12.5 |
|                           | No | 0 | 87.5 |
| Geological distance from the site | Near | 1 | 70.9 |
|                           | Far | 0 | 29.1 |

3.2. Research Site

Yeoninsan (1068 m) is a well-known provincial park in Gyeoggi-do, located on the backside of Seoul. The main administrative body is the Gyeonggi-do Provincial Office, as a local government, and the area of the region is 3732 ha (Figure 1). The forest is located across the boundaries of Seungan-ri of Gapyeong-eup, Mahil-ri of Jojong-myeon, and Baekdun-ri of Buk-myeon, as it embraces the Yongchu Valley, a popular tourist site. The forest is the natural habitat of a variety of alpine plants and wildflowers, as well as oak and nut pine communities, as a result of the rich soil and high annual precipitation [54]. The local residents are engaged in managing ecological programs and hands-on programs, while various joint projects to invite tourists are ongoing. The rationale for selecting this region as the study area is the presumption that—rather than a top-down approach whereby the central government controls the management—a bottom-up approach, where the resources under the administration of the local government are used, would allow for the more efficient design of the initial model of the local forest PESs.
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Figure 1. Study areas: Yeoninsan with shaded relief as the background.

3.3. Experimental Design
Participants were presented with a bundle of 10 detailed ESs (non-timber forest product, timber, water resources, erosion prevention, water quality control, carbon absorption, air quality, recreation and sightseeing, education about nature, and biodiversity improvement) that were extracted from Jo et al.’s [55] study. Participants were asked to respond to the questions needed for WTP estimation. The same questions were presented for both financial resource designs: the tax-designed situation and the donation-designed situation. The order of presenting tax-designed and donation-designed situations was counterbalanced: for one group, a tax-designed situation was presented before the donation-designed situation, and for another group, the donation-designed situation was presented first.

This study employed a contingent value measurement (CVM), which allowed for the estimation of the utility of the single change through the use of binary (Yes: Y/No: N) discrete choices. A double-bounded dichotomous choice model may be a more efficient model of analysis than a general voting model for the following reasons. First, for the same number of respondents, the soft-voting model acquires twice the number of responses, thus increasing the number of measured values necessary for quantitative analysis. Second, the responses of Y–Y or N–N allow the upper and lower limits of WTP to be more accurately determined compared to the case where the subjects are asked to vote once, although this data lack the range of WTP. The soft-voting model is a commonly used method for the questionnaire in a CVM study. It shows a high probability of producing a consumer surplus.
(CS) that approximates reality [56]. The double-bounded dichotomous choice model is divided, based on the selected method of estimation, into the bivariate dichotomous choice model developed by Cameron and Quiggin [57], the interval data model developed by Hanemann et al. [58], and the Turnbull model of non-parametric distribution developed by Haab and McConnell [59]. In this study, we follow the parametric model and the reason for this will be addressed in the next section.

Ten initial payment proposals were set in this study—2300, 3400, 4500, 5700, 6800, 8000, 10,300, 14,900, 22,500, and 34,500 KRW—based on a preliminary study conducted with 100 general citizens regarding their WTP in the experimental design, to minimize the starting point bias that may arise in a voting model. Based on the preliminary results, we built the three-stage bidding scheme. First, 10 initial amounts (2300, 3400, 4500, 5700, 6800, 8000, 10,300, 14,900, 22,500, and 34,500 KRW) were randomly presented to the participants to minimize the bias of the onset payment amount. Second, based on the respondent’s answer, we presented a follow-up bid. If respondents accepted the first bid, then we suggested twice the amount of the first one. Otherwise, we presented half of the amount of the first bid. Third, if the respondent did not accept both bids, then we asked whether the respondent was willing to pay at least more than 0 KRW. Participants’ responses could be categorized into four types: YY, YN, NY, and NN. Additionally, the NN response was sub-categorized as NNN or NNY.

3.4. Econometric Process

The Spike model with the double-bounded dichotomous choice was used in this study. The Spike model incorporates the WTP responses for the first and second payment proposals and the “0” with no WTP. The case of a zero WTP response frequently occurs due to various factors included during the process of the CVM to induce the consumer’s WTP. Excluding such intolerant responses from the analysis has been shown to produce an overestimated profit or reduced statistical efficiency, so the exclusion is based on the investigator’s subjective judgment and is disputable [60]. Therefore, to avoid such problems, the Spike model was used in this study, where the respondents with zero WTP for the last payment proposal were asked if they had zero WTP for any others to differentiate the “0” WTP from the WTP that was greater than 0 but less than the proposed payment. In this study, the Spike model with double-bound dichotomous choice was used as the estimation model of citizens’ WTP for the implementation of payment for local forest ESs based on empirical analyses carried out in previous studies [61]. The possible four answer sets could be expressed as indicator functions such that:

\[
I_{i}^{YY} = 1 \left( \text{ith respondent’s answer is “Yes-Yes”} \right)
\]
\[
I_{i}^{YN} = 1 \left( \text{ith respondent’s answer is “Yes-No”} \right)
\]
\[
I_{i}^{NY} = 1 \left( \text{ith respondent’s answer is “No-Yes”} \right)
\]
\[
I_{i}^{NN} = 1 \left( \text{ith respondent’s answer is “No-No”} \right)
\]

In this spike model with the double-bounded dichotomous choice case, we included a third follow-up question for the “No–No” group that asked: “Is your maximum WTP larger than zero”. If the respondent’s answer was “Yes” then it meant that even though they did not accept the previous bid, the respondent still had a positive WTP. This allowed us to distinguish between true zero WTP and false zero WTP within the “No–No” group. These cases are represented as follows:

\[
I_{i}^{NNY} = 1 \left( \text{ith respondent’s answer is “No-No-Yes”} \right)
\]
\[
I_{i}^{NNN} = 1 \left( \text{ith respondent’s answer is “No-No-No”} \right)
\]
Assuming that the WTP is distributed as a logistic function \( G(A_i; \theta) \) with parameter \( \theta = (a, b) \), where \( a \) stands for the constant of model and \( b \) represent the coefficient on the bid \( A_i \), and

\[
G(A_i; \theta) = \begin{cases} 
1 + \exp(a - bA_i) & \text{if } A_i > 0 \\
1 + \exp(a) & \text{if } A_i = 0 \\
0 & \text{if } A_i < 0 
\end{cases}
\]

Based on this distribution, we could construct the extended log-likelihood function of the spike model as follows:

\[
\ln L(\theta) = \sum_{i=1}^{N} \left( I_{YY} \ln \left[ 1 - G(A^H_i) \right] + I_{YN} \ln \left[ G(A^H_i) - G(A_i) \right] + I_{NY} \ln \left[ G(A_i - G(A^L_i)) \right] + I_{NNY} \ln \left[ G(A^L_i) - G(0) \right] + I_{NN} \ln \left[ G(0) \right] \right)
\]

The mean WTP in the spike model can be calculated as follows:

\[
\text{Mean}(WTP) = \left( \frac{1}{b} \right) \ln \left[ 1 + \exp(\hat{a}) \right]
\]

When covariates are added to the model, \( b \) (the vector of coefficients associated with covariates) is replaced by \( \bar{X} \hat{b} \) in the likelihood function and the mean WTP calculation, where \( \bar{X} \) is the vector containing the sample means of covariates.

4. Results and Discussion

4.1. Estimation of Mean Willingness to Pay (MWTP)

Table 3 summarizes the participants’ response ratios for the WTP estimation model of Yeoninsan based on two financial resource types: taxes and donations. In addition, the summary of the MWTP is presented in Table 4.

Table 3. Participants’ response ratios for the WTP estimation model of Yeoninsan, based on two financial resource types: taxes and donations.

| Category | Response Type | N  | Category | Response Type | N  |
|----------|--------------|----|----------|--------------|----|
| Tax      | YY           | 274| YY       | 200          |
|          | YN           | 180| YN       | 134          |
|          | NY           | 99 | NY       | 43           |
|          | NN           | 100| NNY      | 11           |
|          | NNN          | 347| SUM      | 1000         |

Table 4. Summary of the estimation of mean willingness to pay (MWTP) for Yeoninsan ESs in the form of taxes and donations.

| Category | Spike MWTP (Unit: KRW) |
|----------|------------------------|
|          | Mean  | SE    | Wald | N   |
| Tax      |        |       |      |     |
| Respondent with zero included | 14,315.30 *** | 704.77 | 36.34 *** | 1000 |
| Respondent with zero not included | 20,126.13 *** | 827.32 | 21.36 ** | 653  |
| Donation |        |       |      |     |
| Respondent with zero included | 12,257.80 *** | 927.22 | 37.82 *** | 1000 |
| Respondent with zero not included | 26,518.07 *** | 1357.62 | 11.36 | 388  |

* \( p < 0.05 \), ** \( p < 0.01 \), *** \( p < 0.001 \).

The Spike model was employed in this study. When participants’ WTP intentions, including the respondents with zero WTP, for Yeoninsan in the form of taxes were analyzed, they were willing to pay 14,315 KRW (12.75 USD) per year. When respondents with zero WTP were excluded, the estimated MWTP was 20,126 KRW (18.00 USD) per year. Participants, including the respondents with zero WTP, were willing to pay 12,258 KRW (10.92 USD) per year in donations. When respondents with zero WTP were excluded,
the WTP amount was found to be 26,518 KRW (23.61 USD) per year. In other words, participants’ WTP for Yeoninsan PES was higher when the financial resource type was set as a donation rather than a tax. Citizens wanted to pay a lower amount for Yeoninsan PES if the financial source was in the form of a tax. This result is in line with Menges and Traub’s [62] study, which revealed that people generally prefer to set the payment amount lower for taxes than donations because taxes are mandatory while donations are voluntary.

A t-test was conducted to test whether or not the difference (2057.5 KRW) in MWTP among all participants for taxes and donations was significant. The test was indeed confirmed to be significant (Table 5). Based on the Spike model, the MWTP of all citizens in the form of a tax was significantly higher than for a donation. Similar to Menges and Traub’s [62] finding, our finding implies that it would be more effective to implement PES in the form of a tax, which requires all citizens to pay, rather than a voluntary donation.

**Table 5. t-test for comparing Yeoninsan PES in the form of taxes and donations.**

| Resource Type | WTP_1       | WTP_2       | Differentiation | SE   | T Value |
|---------------|-------------|-------------|-----------------|------|---------|
| Tax vs. Denotation | Tax: 6.82 x 10^{-5} *** | Donation: 7.19 x 10^{-6} ** | 2057.5 *** | 36.83 | 55.86 |

* p < 0.05, ** p < 0.01, *** p < 0.001.

**4.2. Predicting Factors Influencing Citizens’ WTP for Yeoninsan ESs**

The influence of predicting factors on citizens’ WTP for improving the Yeoninsan’s ESs is presented in Table 6.

**Table 6. Summary of predictors’ influence on participants’ WTP for improving Yeoninsan ES.**

| Variables                      | Tax |               | Donation |               |
|-------------------------------|-----|---------------|----------|---------------|
|                               | Coef | SE            | Coef     | SE            |
| BID OFFER                     | 0.5532 | 0.299        | -0.5029 | 0.3267        |
| Constant                      | 6.82 x 10^{-5} *** | 3.19 x 10^{-6} ** | 4.05 x 10^{-5} *** | 2.73 x 10^{-6} |
| Socio-demographics            |     |               |          |               |
| Sex                           | 0.023 | 0.0591        | -0.0922 | 0.0861        |
| Age                           | -0.1297 | 0.1628    | -0.3905 * | 0.1816        |
| Married                       | 0.0038 | 0.0034        | 0.0091 * | 0.0038        |
| Distance from the site        | 0.0384 | 0.1272        | 0.0174  | 0.1409        |
| Predictors                    |     |               |          |               |
| Social activity participation | 0.3723 | 0.1604        | 0.6435 *** | 0.1666        |
| Political orientation         | -0.56147 *** | 0.133949     | -0.3133 * | 0.1456        |
| Personal relationship with the site | 0.41656 * | 0.162017   | -0.2739 | 0.178         |
| Income                        | 0.16303 | 0.177105       | 0.3341  | 0.1878        |

* p < 0.05, ** p < 0.01, *** p < 0.001.

This model estimates WTP from the differences in utility based on the choices of respondents, as previously presented. The level of individual utility is a factor that influences these choices. The amount of money they intend to spend and the socio-demographic status of individuals affect their decision-making. Thus, this section attempts to estimate the effect of various socio-demographic factors for the individual respondent.

Accordingly, for taxes, participants’ income, social activity involvement, and political orientation were all significant predictors of their WTP for local forest ESs. Participants were willing to pay higher amounts for local forest ESs as their income level and their involvement in social activity increased. Moreover, The participants with progressive political orientations were willing to pay more than those with moderate or conservative orientations. For donations, participants’ income, social activity involvement, political orientation, and marriage status were significant predictors. However, sex, age, a personal relationship with the site, and the distance from the site were not significant predictors. The amount of participants’ WTP for local forest ESs increased as they participated in more social activities. The participants with progressive political orientations were willing to pay more than those with moderate orientations. Marriage status negatively affected participants’ WTP; married people were less willing to pay for local forest ESs in the form of donations. Our findings on the influence of an individual’s income and political orientation
on PES are somewhat in line with previous studies [46,47]. People with a higher income and a progressive political orientation were more willing to pay for ESs. In particular, with regards to political orientation, our study result goes along with Neumayer’s [47] study, which reported that people with a progressive political orientation tend to be more willing to pay PES based on the survey analysis of 40,585 individuals in 45 countries in Europe. Likewise, our study also showed that citizens with a progressive political orientation were more willing to pay a higher amount of money, whether in the form of a tax or a donation. However, that no significant effect of having a personal relationship with the site or the distance from the site on PES was revealed in our study contradicts the results found in other previous studies [48–50]. Such differences may have been derived because forests are generally profoundly embedded in all Korean history and culture [63]. It may be possible that Korean citizens generally believe that forests should be highly valued for their existence. Thus, their experience with it or distance from it may not have been treated as important variables.

In addition, Morrison and Wendelin [64] claimed that creating an effective PES depends on the community’s active involvement in suggesting ideas for PES design, the designer’s respect for the community, and their willingness to create a system in harmony with the community’s traditional ways of life. Thus, it is important for future studies to investigate local residents’ priorities regarding the local forest ESs. In the future, studies should investigate local residents’ priorities regarding the ESs in lieu of investigating the citizens in general as the consumers. Moreover, it is essential to note other types of individuals or groups, aside from the local or general citizens, (e.g., business enterprises) who are actively participating in ecosystem conservation [65,66], as it would be vital to consider their opinions as well. Especially for companies that receive direct benefits from the ESs, a market approach such as the PES could be a desirable method for protecting their economic profits [67]. For similar reasons, PESs can also provide opportunities to preserve ecosystems for small private businesses, such as tourism, skiing, and lodging, in areas where ESs are produced. This is because local businesses that are closer to the area where ESs are produced and will be more directly affected in their livelihoods are more likely to show interest in PESs than general citizens or large companies residing in cities. Currently, limited studies have been conducted regarding the participation of small local businesses in PESs [42]. Therefore, it is considered that there is a possibility of developing a new method of securing financial resources if it is actively promoted to the general public and to various businesses that directly benefit from the ESs in the region.

5. Conclusions

This study aimed to determine a reasonable method of payment estimation and types of financial resources that should be considered in implementing the local forest PES. The participants’ responses to survey items were analyzed through the Spike model to estimate their WTP so that a local forest PES could be implemented. More specifically, 1000 citizens’ WTP for promotion activities to enhance 10 different forest ES bundles for Yeoninsan in Gapyeong-gun, Gyeonggi-do, South Korea, was estimated.

The findings in this study are as follows. First, the estimation of the WTP for the promotion of the local forest ESs showed that the WTP was 14,315–20,216 KRW per year when the financial resource was a tax and 12,258–26,518 KRW per year in the case of a donation. Second, the predicting factors of citizens’ WTP for the local forest ESs differed according to the financial resource types: taxes and donations. For taxes, income, social participation, and political orientation were the significant factors. For donations, marital status, income, social participation, and political orientation were the significant factors.

Previous studies have pointed out that many PES systems were created without much reflection on the effectiveness of the design and management [68]. In the present study, it was challenging to evaluate the effects of the system after its implementation [69]. Thus, after the presently designed research, further studies should investigate methods of evaluating the effectiveness of these systems as well as methods for periodic monitoring.
The significance of this study is as follows. First, this study is among the initial studies which attempt to estimate citizens’ WTP for the promotion activities of 10 ES bundles, rather than a specific, individual ES. Our attempt provides quantified data of citizens’ preferences which can serve as basic data for the design of a payment system for bundles of ecosystem services for local forests. Second, while previous studies focused on one specific financial resource type (taxes, donations, or administration fees), we investigated the effect of two financial resource types (taxes and donations) on citizens’ WTP by comparing the mean difference of citizens’ WTP for the same site for both of the financial resource types. These results can be used as basic data when designing PESs targeting local forests by quantifying and presenting citizens’ preferences for payment.

This study also has managerial implications for designing PES systems for promoting the ESs of other local forests in different regions. For instance, based on our study results, one may begin considering an individual’s income level, social activity participation, and political orientation when the financial resource is set to be a tax. For donations, an individual’s marital status, income level, social activity participation, and political orientation may be considered carefully. Moreover, one may become aware that the prediction of the direction of change in the amount of payment should be estimated differently for taxes and donations. Our study focuses on peoples’ subjective valuation for overall ESs which does not have a market value. This study aims to estimate the maximum price of ESs that could be paid by general consumers. For a more robust and comprehensive valuation for subcategorized ES, we recommend that our study results be accompanied by biophysical assessment and socio-economic mapping, as Reed et al. [33] suggest.

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