forests

MDPI

Article

Estimating Regional Aggregate Economic Value of Forest Recreation Services with Linked Travel Cost Model

Güven Kaya

Marmara Forestry Research Institute, Sarıyer, 34085 İstanbul, Turkey; guvenkaya@ogm.gov.tr

Abstract: Multi-site linked travel cost models answer the need for aggregate demand and economic value estimations that consider the attributes of all forest recreation sites in a region and the preferences of visitors at the regional level. This study aimed to predict the aggregate value of forest recreation services in Ankara Province, Turkey, with a discrete choice-count data-linked model in the context of current and changing levels of forest attributes. In the first stage, the site choice model was predicted with the random parameter logit model; in the second stage, the trip demand model was estimated with the negative binomial model. The expected consumer surplus per trip derived from the first model was used as the link variable in the second model. The expected consumer surplus per trip of 14 forest recreation sites was estimated at 137.34 TL, and the annual aggregate consumer surplus per capita was estimated at 156.59 TL—a total of 13.49 million TL in the study area. This study predicts the total benefit will increase by 65% if the development stage of stands at recreation sites increases by two stages, degraded stands are improved, stands have a normal canopy, and the camping facilities are improved.

Keywords: travel cost; aggregate value; linked model; site choice; trip demand; forest recreation

check for updates

Citation: Kaya, G. Estimating Regional Aggregate Economic Value of Forest Recreation Services with Linked Travel Cost Model. *Forests* **2022**, *13*, 1561. https://doi.org/10.3390/f13101561

Academic Editor: Nikoleta Jones

Received: 12 August 2022
Accepted: 21 September 2022
Published: 24 September 2022

1. Introduction

Since Hotelling's inspiring letter to the U.S. National Parks Service in 1947 [1,2] and Clawson's seminal work in 1959 [3], the travel cost method (TCM) has been one of the most widely used valuation methods for estimating the economic value and demand for outdoor recreational services such as those forests provide [4–6]. Classical TCM assumes that there is an inverse relationship between the number of visits to a recreation site and travel costs; the variation between these variables can be used to predict the demand for recreation and then estimate the economic value of recreational services by calculating consumer surplus [6,7].

TCM, with more than 60 years of evolution, is methodologically well-founded [4,8], and when correctly applied, it produces values close to individuals' real willingness to pay [9,10]. In fact, it is the most accurate method that can be used in the benefit transfer for recreation services [11]. There are two main classes of TCM models: single- and multi-site [12]. TCM studies around the world have generally focused on determining the economic value of recreation services at a single site [13]. However, there is usually more than one recreation site in a region that an individual can visit, which can influence visitor preferences.

Single-site TCM studies, which often neglect the attributes of forest recreation sites and substitution and complementary interactions among the sites [14,15], provide limited information for developing regional or national recreational policies in larger areas covering many recreational sites [13,14,16–18]. On the other hand, estimating separate economic values for each recreational site in a region and using average values of the sites to arrive at the regional value possibly leads to inaccurate value estimates and can be both time and money-consuming [19,20]. Therefore, multi-site TCM models were developed, as effective recreation management requires aggregate demand and value estimates that take into account the attributes of all forest recreation sites at the regional level and substitution and complementary interactions among the sites in the region [21,22]. The random utility model (RUM) is the most popular of the multi-site models [12,23] and has played a dominant role in the evolution of TCM [2]. The RUM, introduced by McFadden [24], models individuals' choices among discrete sets of alternatives and was first used by Hanemann [25] to describe recreation demand. As a TCM model, the RUM estimates the value of changes in the quality of recreation services by focusing on the decision of individuals to visit a particular site over alternative sites, considering travel costs and site attributes [2].

However, the RUM's focus on site choice, which is only one dimension of recreation demand, has been criticized [26]. It does not consider the number of visits to be made by an individual to each site in a recreational season (i.e., the total number of trips per season); thus, the estimated economic value of the sites may not be completely accurate [27]. As a corner solution [26] to overcome this gap, linked models in which the trip-demand model was added to the RUM were derived [2,27,28]. The discrete choice-count data-linked model was originally constructed by Bockstael et al. [29] and Bockstael et al. [28]. Later, variants of the linked model [23,30–32] were developed. The number and order of patterns and the presence and extent of the linkage components generally shape the differences among these variants [26]. The linked models have made it possible to produce aggregate recreation demand and value estimates at the regional or national level, considering the heterogeneity and substitution effects of forest recreation sites and the interactions between the supply and demand side of forest recreation services [33,34]. Since the linked models can determine the value of changes in forest attributes [22], changes in aggregate recreation value can also be examined through scenarios [27].

In the context of non-market valuation, attempts to estimate the economic values of recreation and other forest ecosystem services have primarily arisen from the need to provide resource managers with comparable value information for market-price goods and services versus non-market-price ones. However, apart from some problems related to the estimation of damage costs to natural resources and resource allocation, especially in the USA, valuation studies were mostly seen as academic exercises by resource managers around the world and could not be integrated into resource management [35]. Perhaps one of the most important reasons for this problem in terms of forest resources management is that economic valuation studies do not focus on the effects of forestry investments involving changes in forest attributes with forestry techniques on economic values as much as on questioning the values of beneficiaries. More research is needed to predict the economic values and demand of ecosystem services such as recreation for alternative forestry investment scenarios involving changes in forest attributes to expand the effective use of non-market economic value estimations in forest resources management.

However, most of the studies estimating the aggregate regional value of recreation sites with linked models are related to water resources. The economic values of improving water quality for recreational use [28], losses of recreational use caused by the Exxon Valdez oil spill [30], sportive angling [27,31,36], loss of recreational benefits due to the closure of beaches [37], and recreational fishing in Sweden [38] were estimated by the linked models. Regional demand and aggregate value studies conducted with the linked models in forest recreation sites, such as in Denmark [39], Mallorca, Spain [14], and Lorraine in northern France [40], are very rare.

Regional recreation demand analyses and economic value estimations are particularly important in the management of public forest recreation sites. While 532 forest recreation sites were established between 2014 and 2020 in Turkey, where 99% of the forest resources are under state ownership, 457 of the sites were closed due to insufficient demand in the same years [41], indicating a lack of demand analyses and economic value estimations, as well as the necessity of making these analyses at the regional level. While single-site individual and zonal models were generally used in previous TCM studies [42–48] to estimate the recreation demand or value for forest recreation sites in Turkey, regional recreation-demand research based on a zonal model [49] exists, but it did not provide an aggregate recreation value and demand. It is necessary to yield aggregate recreation value estimations at the regional level with multi-site models, which consider the determinants of recreation demand and public preferences for the attributes of the sites, to measure the effectiveness of the policies that foresee the establishment of new forest recreation sites in a region and the changes in the attributes of the existing ones. This study aimed to predict the aggregate value of forest recreation services in Ankara, Turkey, with a linked model in the current and changing levels of forest attributes under four different scenarios.

2. Materials and Methods

2.1. Study Area

The research area in this study was actively used forest recreation sites in Ankara, the capital city of Turkey. Ankara province, located in a region of the country that suffers from a lack of forest and green spaces, is the second most populous province in Turkey, with a population of 5.75 million [50]. The forest area is 441,000 ha and the primary tree species are Austrian pine, Scotch pine, and fir; they constitute 17% of the surface area of the province [51]. In 2015, when the research data were collected in the province, there were 14 actively used forest recreation sites (Figure 1), including one national park, five nature parks, two urban forests, and six forest picnic sites, with a total area of 1794 hectares, and 301,000 people visited the sites [52,53]. The forest recreation sites provide visitors with the opportunity to participate in many activities, such as picnicking, landscape viewing, hiking, nature observation, and nature photography.

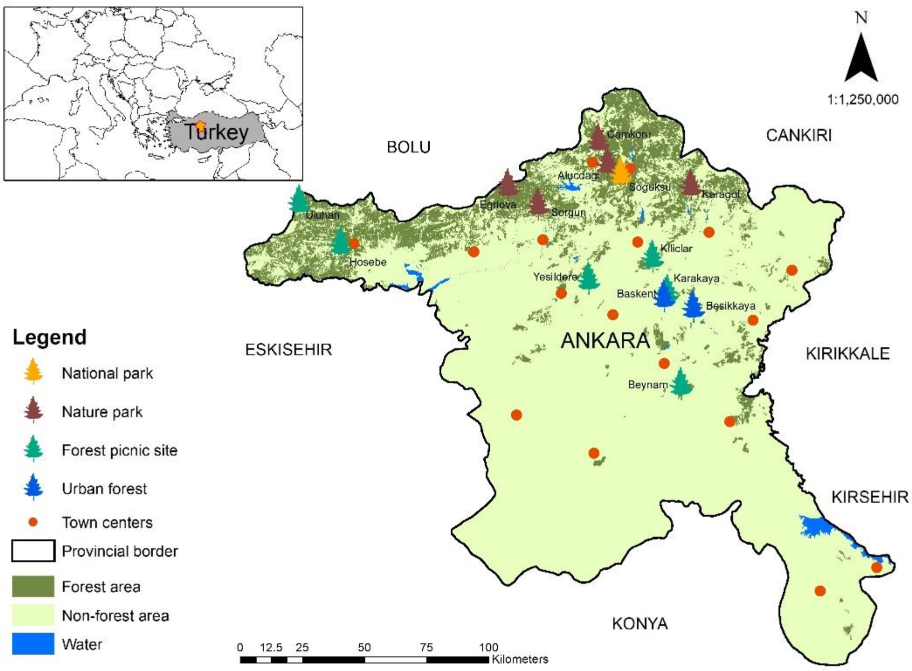

Figure 1. Study area.

2.2. Model

This study followed the original linked model [28] with Hausmann et al.'s variant [30], which has previously been successfully applied in determining the economic value of forest recreation sites [14]. The linked model used in this study consisted of two stages. In the first stage, known as site choice, potential visitors allocated their trips to forest recreation sites, considering the travel costs and attributes of the sites. In the second stage, called trip demand, individuals decided whether to visit a site and, if yes, how many visits they would make to the site in a year or season. This decision regarding trip frequency was shaped by a price index of recreational visits among the sites obtained from the first stage and the socioeconomic characteristics and recreation preferences of the visitors.

The RUM, used in the site choice stage of the linked model, models discrete choice decisions taken from a choice set of available sites with different attributes. The utility U_{ni} that an individual n derives from choosing the site i from a site choice set (i = 1, . . . ,I) consisting of forest recreation sites is defined by the conditional indirect utility function [14,54]:

$$U_{ni} = \beta'_n x_{ni} + \varepsilon_{ni} \quad (1)$$

where x_{ni} is a vector of observed site attribute variables, β'_n is a vector of coefficients for each visitor n, $\beta'_n x_{ni}$ is the non-stochastic portion of the indirect utility of the visitor, and ε_{ni} is the error term.

The RUM assumes that all other variables being equal, individuals choose the site with the lowest travel cost; so, if the sites are of equal cost, individuals will choose the sites with the higher quality [23]. Thus, according to the RUM, the probability π_{ni} of individual n choosing site i can be expressed as follows [14]:

$$\pi_{ni} = Pr\left(\beta'_n x_{ni} + \varepsilon_{ni} > \beta'_n x_{nj} + \varepsilon_{nj}\right),\ \forall j \neq i \quad (2)$$

The econometric analysis of the RUM for the site choice decisions made from a choice set consisting of forest recreation sites with different attribute levels requires the solution of a multinomial logit model. In the analysis, the random parameter logit (RPL) specification of the multinomial model, also known as mixed logit, was applied. It was a generalization of the standard logit model [55,56] and avoided the problems of independent irrelevant alternative constraint and correlation in unobserved factors [57], in addition to better reflecting the preference heterogeneity of visitors compared to other discrete choice models [54].

In the RPL model, the unconditional choice probability of individual n to visit the i field was obtained by integrating the standard logit probability function for all possible β values, with $f(\beta)$ being the density function as the mixing distribution [57]:

$$\pi_{ni} = \int \left(e^{\beta'_n x_{ni}} / \sum_{j=1}^{I} e^{\beta'_n x_{nj}} \right) f(\beta) d\beta \quad (3)$$

The log-likelihood function, which was the logarithmic expression of the probability function in Equation (3) for a given value of the parameter vector β, is as follows [14]:

$$LL(\beta) = \sum_{n=1}^{N} \sum_{i=1}^{I} y_{ni} ln(\pi_{ni}(\beta)) \quad (4)$$

N represents the number of individuals in the sample; y, the indicator variable, is equal to 1 if individual n chooses alternative i; otherwise, it is equal to 0 [14]. Then, the simulated log-likelihood function was maximized for estimating the utility function and preference heterogeneity parameters [58,59], as mixed logit probabilities do not have closed-form expressions for common distributions and are approximated by simulation [60].

In the original linked model [28], at the end of the site choice stage, once the coefficients β'_n of the simulated maximum log-likelihood function were estimated, the inclusive value (IV) as the linkage component to the second stage is calculated to connect to the trip demand model. The inclusive value, which was the maximum utility expected from the attributes of the site chosen by individual n in any site choice task, is expressed as follows [61]:

$$IV_n = ln\left(\sum_{i=1}^{I} e^{\beta'_n x_{ni}} \right) \quad (5)$$

Hausman et al. [30] contributed to the linked model by using a modified measure called expected consumer surplus per trip (s_n) [62,63]. This was the normalized form of the inclusive value with the estimated coefficient (β_{tc}) of the travel cost variable in the site choice model, assuming that the utility is linear in income [14,57]:

$$s_n = \frac{1}{\beta_{tc}} IV_n \quad (6)$$

This approach, which applied the expected consumer surplus per trip as a linkage component instead of the inclusive value in the second stage, was adopted in the empirical model of this study.

In the second stage, the number of seasonal trips was estimated by using the expected consumer surplus per trip for each site calculated in the previous stage and the socioeconomic characteristics of individuals, including recreational behaviors. At this stage of the linked model, a count data model was used because the number of trips was a non-negative integer value [30].

Although Poisson distribution is generally used in recreational demand research with the count data model [64], the negative binomial model (NBM) was used in this study, as suggested [14,65], since the recreational data are often over-dispersed [66].

The conditional mean (μ_n) in the NBM, consisting of the conditional mean (λ_n) in the original Poisson model and the effect (u_n) of the unobservable random heterogeneity term (ϕ), is defined as follows [14,67]:

$$\mu_n = \lambda_n u_n = e^{\gamma s_n + z_n \delta + \varphi_n} \quad (7)$$

where γ is the coefficient of expected consumer surplus per trip (s_n), and δ is the vector of the coefficients estimates of the socioeconomic variables (z_n). Thus, the probability of individual n making the numbers of visits t_n in a season with the NBM is defined as [14,40] follows:

$$Pr(t_n | s_n, z_n, u_n) = \frac{e^{-\lambda_n u_n} (\lambda_n u_n)^{t_n}}{t_n!} \quad (8)$$

The NBM probability distribution was obtained by the partial integration of Equation (8), assuming that u_n was gamma-distributed [67]. The parameters of the NBM are estimated using maximum likelihood estimation [14,68]:

$$LL(\gamma, \delta | t_n, s_n, z_n) = \sum_{n=1}^{N} Pr(t_n | s_n, z_n) \quad (9)$$

Once the parameters of the trip-demand function with the NBM were estimated, the aggregate consumer surplus (S_n) gained by individual n from all forest recreation sites in the region in a year or a season is calculated by integrating the function [14,30]:

$$S_n = \int_0^{s_n} e^{\gamma s_n + z_n \delta} ds = \frac{1}{\gamma} e^{z_n \delta} (e^{\gamma s_n} - 1) \quad (10)$$

By using S, the aggregate recreation value in one year or a season for all forest recreation sites in the region for the whole visitors can be calculated [14].

2.3. Data and Survey Implementation

The site choice and trip demand models required the collection of two types of data. The first type of data were attributes of the forest recreation sites, such as vegetation cover, stand types and facilities, etc., and obtained from site development plans and forest management plans. The other group of data covered the visitors' recreational experiences and socioeconomic characteristics that were collected through an on-site survey conducted at the forest recreation sites.

The questionnaire included items to determine the number of visits to each forest recreation site in Ankara throughout the last year in terms of the dependent variables of the two models. The origins of the visitors, the purpose of the visit, the duration of the trip, the size of the visitor group, the means of transportation, the number of people per vehicle, and other travel and recreation expenses were inquired about to derive the travel cost variable. The questionnaire also included items to elicit the recreational experiences of visitors to each site and the demographic and socioeconomic characteristics of the visitors.

The survey was conducted between May and September 2015, with representatives of 350 visitor groups selected by a simple random sampling method, stratified according to the number of annual visitors to the 14 forest recreation sites. Incorrect and incomplete surveys were removed, leaving 312 surveys to be evaluated.

The annual average number of trips per capita was 3.49, implying that the total 301,000 trips were made by 86,246 visitors. Men comprised 87% of the respondents, the mean age was 39, and the average education level was a high school diploma. Of the respondents, 39.4% had visited the forest recreation site for the first time. Most visitors (88.5%) reached the recreation site by car, traveled an average of 1.62 hours, and spent quite a long time at the site (8.08 hours). The average visitor group size was 5.41. Most visitors at the sites engaged in picnic (83%) and barbecue (79%) activities, then viewing scenery (58%), hiking (49%), and nature watching (41%).

In the calculation of the travel cost variable at the core of the method, it was accepted that the cost of travel per person for each visit consisted of travel expenditures and the opportunity cost of travel time. Multi-purpose visits were not excluded, but only the recreation site-specific travel expenditures were considered within the total travel cost of the visit. The travel expenditures of visitors traveling with their own vehicle were calculated per capita and for the round-trip distance, considering the number of people per vehicle. The distances between the visitor origins and the forest recreation sites were measured with Google Maps. The unit travel expenditures were 0.96 TL per kilometer. For visitors using public transportation and tours as a means of transportation, the expenses reported in the survey were regarded as travel expenditures. For visitors traveling on foot and by bicycle, travel expenses were zero.

The opportunity cost of travel time was calculated by multiplying the travel time (hours) for the round-trip distance by the opportunity cost per unit time (TL per hour). The alternative cost per unit of time was accepted as at least one-third of the visitor's hourly wage, following the well-known suggestion of Cesario and Knetsch [69]. The hourly wage was also calculated as the ratio of the visitor's monthly personal income to the monthly working time (240 h). All nominal costs and income values were converted into real values using the Consumer Price Index (April 2022) [70].

2.4. Econometric Analyses

NLOGIT 5.0 software [71] was used for maximizing log-likelihood functions and estimating the parameters of the site choice and the trip demand models. While determining the final models, the lower value of Akaike information criteria (AIC) was preferred among the alternative models. Although many different independent variables are designed for the site choice and trip demand models, the variables that are set in the statistically significant models are defined in Table 1.

Once the site choice function was estimated, the expected consumer surplus per trip (s_n) for each visitor was calculated with Equation (6), and then the annual aggregate consumer surplus per visitor (S_n) was calculated with Equation (10) using the parameters of the estimated trip-demand function. The aggregate benefit gained by a visitor from 14 forest recreation sites in the study area, that is, the aggregate economic value of recreation services for a visitor, was expanded to all visitors by multiplying the total annual number of visitors (86,158).

Table 1. Definitions, descriptive statistics, and expected signs of variables in the models.

Variables	Descriptions	$\bar{x}$	σ	+/−
Travel cost	Travel cost per trip (TL)	34.43	30.34	−
Stand development stage	A stand area-weighted average score of stand development stages from regenerated (1) to overmature (7) in the recreation site	3.46	1.44	+/−
Coniferous stands	Equals 1 if coniferous stands exist at the recreation site, 0 if not	0.93	0.26	+/−
Mixed stands	Equals 1 if mixed stands exist at the recreation site, 0 if not	0.07	0.26	+/−
Normal canopy	Area (ha) of stands with 71%–100% canopy closure in the recreation site	11.30	14.89	+/−
Destructed coppice	Area (ha) of destructed coppice stands at the recreation size	1.13	2.19	+/−
Picnicking	Equals 1 if a picnic area exists at the recreation site and the visitor is a picnicker, 0 otherwise	0.79	0.41	+
Hiking	Equals 1 if a hiking trail exists at the recreation site and the visitor is a hiker, 0 otherwise	0.42	0.49	+
Camping	Equals 1 if a camping area exists at the recreation site and the visitor is a camper, 0 otherwise	0.03	0.17	+
Guided activities	Equals 1 if the site presents guided activities, and the visitor preferred the site for these activities, 0 otherwise	0.01	0.11	+
Electricity	Equals 1 if electricity is available at the recreation site, 0 if not	0.93	0.26	+
Expected consumer surplus	Expected consumer surplus per trip (TL)	43.71	42.84	+
Individual income	Monthly individual income (1 for less than 5000 TL; 2 for 5000–9999 TL; 3 for higher than 10,000 TL	1.14	0.38	+/−
Sex	Equals 1 if a respondent is a man, 2 if a woman	1.13	0.33	
Education	Education time (year)	11.65	3.18	+/−
Under 18	Equals 1 if the number of minors in the visitor group is more than 1, 0 otherwise	0.32	0.47	+/−
Activity number	Equals 1 if the number of recreational activities performed by visitors is more than 1, 0 otherwise	0.89	0.32	+/−
Weekday visitor	Equals 1 if visiting the site on weekdays, 0 otherwise	0.26	0.44	+/−

Four scenarios were designed based on variables in the site choice function to find out the value of the change in the attributes of the forest recreation sites. In the first scenario, the development stages of all the stands in the forest recreation sites in the study area increased by two stages, i.e., the stands' ages. The second was the rehabilitation of degraded coppice stands in the forest recreation sites, while the third scenario was that all stands reached the normal canopy. In the last scenario, it was foreseen that camping facilities in some forest recreation sites (the national park, all nature parks, and one forest picnic site) in the study area would be improved, and 20% of the visitors would camp. To calculate the expected consumer surplus and the aggregate value of the scenarios, the s_n and S_n values, respectively, were calculated as explained above with changes in the attribute levels, and the annual aggregate consumer surplus was reached for all visitors.

Effects of hypothetical changes in the demographic and socioeconomic characteristics and recreational behavior of visitors on the trip demand were also investigated. The marginal effects (*ME*) of the variables in the trip-demand function, i.e., the percentage change in demand versus one unit change in the value of the variable, were calculated with Equation (11) for the expected consumer surplus and Equation (12) for other variables.

$$ME_{Sn} = (e^{\gamma} - 1) \times 100 \tag{11}$$

$$ME_{zn} = \left(e^{\delta} - 1\right) \times 100 \tag{12}$$

Possible demand changes were estimated by multiplying the hypothetical changes in the variables with their marginal effects.

3. Results

3.1. Determinants of Site Choice and Trip Demand

The site choice model estimated by the RPL model is presented in Table 2. The site choice model was obtained by maximizing the simulated log-likelihood function with 1000 replications per observation of 312 visitors. The χ^2 value of the model was statistically significant ($p < 0.01$), and the model was an excellent fitting model as the McFadden pseudo R^2 value as between 0.20 and 0.40 [72]. All variables in the model were statistically significant ($p < 0.05$), except coniferous stands ($p < 0.1$), and their signs were consistent with the expectations.

Table 2. Site choice model.

Variables	Coefficients	St. Error
Travel cost	−0.0490 ***	0.006
Stand development stage	0.2241 **	0.088
Coniferous stands	0.9292 *	0.477
Mixed stands	−1.4467 ***	0.277
Normal canopy	0.0462 ***	0.004
Destructed coppice area	−0.1112 ***	0.036
Picnicking	2.5737 ***	0.622
Hiking	1.2782 ***	0.304
Camping	1.5396 ***	0.359
Guided activities	1.1795 **	0.504
Electricity	2.3267 ***	0.729
Distances of random parameters standard deviations		
Travel cost	0.0239 ***	0.007
Stand development stage	0.3874 **	0.159
Log-L	−701.034	
Restricted Log-L	−1016.037	
χ^2	630.006 ***	
Mc Fadden Pseudo R^2	0.310	
Adj. Mc Fadden R^2	0.308	
AIC	1443.5	
n	312	

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. AIC: Akaike information criteria; Log-L: log-likelihood.

Consistent with the nature of TCM, the sign of the travel cost variable is negative, indicating that sites close to the visitor's origin are more likely to be chosen. The signs of the variables show that forest areas with a higher stand development stage, consisting of coniferous species, and having a normal canopy were more preferred for recreation by visitors. However, it was determined that the presence of mixed and degraded coppice stands in the forest recreation sites has a negative effect on the choice probability of the sites. The variables of picnicking, hiking, camping, and guided activities based on the interaction of the recreation activity opportunities in the site with the activity preferences of the visitors show that the sites that provided these activities were more popular among visitors. Forest recreation sites without electricity were less preferred. The travel cost and stand development stage variables were included in the model as random parameters. Considering preference heterogeneity, the fact that only these two variables have significant standard deviations implies the existence of random variation in tastes for the travel costs and the stand development stages of the forest recreation sites.

Table 3 shows the trip demand model estimated with the negative binomial regression, which is the second stage of the linked model. The McFadden pseudo R^2 value indicated the model has a very good fit, while the χ^2 value of the model is statistically significant ($p < 0.01$). In the trip demand model, all the variables were statistically significant ($p < 0.10$), and their signs are in line with the expectations.

According to the trip demand model, as expected, the visitors take more trips to the sites where they expect higher benefits per trip, i.e., higher consumer surplus per trip, considering the site attributes. Visitors with higher income and education levels, those with more people under the age of 18 in the visitor group, those who prefer weekday trips, and those who only engage in one activity at the site visit the forest recreation sites more. Visitors who engage in more than one activity at the forest recreation sites are likely to make fewer visits. Finally, the fact that the alpha parameter, which measures the dispersion of the gamma distribution of the NBM, is statistically significant, showing that it is correct to prefer the NBM over the Poisson regression.

Table 3. Trip demand model.

Variables	Coefficients	St. Error
Constant	−1.0056 **	0.396
Expected consumer surplus	0.0142 ***	0.001
Individual income	0.2533 **	0.119
Sex	−0.3279 *	0.179
Education	0.0379 **	0.016
Under 18	0.3406 ***	0.104
Weekday visitor	0.1902 *	0.103
Activity number	−0.5198 ***	0.198
Alpha	0.4243 ***	0.065
Log-L	−670.609	
Restricted Log-L	−849.292	
χ^2	357.365 ***	
Mc Fadden Pseudo R^2	0.210	
AIC	1359.2	
n	312	

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. AIC: Akaike information criteria; Log-L: Log-likelihood.

3.2. Welfare Estimates and Demand Changes

Table 4 shows the descriptive statistics of s_n estimated with the site choice function and S_n calculated with the help of the trip-demand function for each visitor. While the mean and median values of the expected consumer surplus per trip are quite close, the median value (156.59 TL) of the aggregate consumer surplus per capita is much more moderate than its mean value. For this reason, the 95% confidence interval of the two welfare measures was calculated for the median values of the sample. The consumer surplus per trip is calculated as 66.50 TL for the mean value and 44.87 TL for the median value by dividing the aggregate consumer surplus per capita by the number of trips per capita (3.49).

Table 4. Economic value estimates.

Estimate	Per-Trip Expected Consumer Surplus (TL)	Annual Aggregate Consumer Surplus per Capita (TL)
Mean	140.14	232.07
Median	137.34	156.59
Median's 95% con. interval	128.54–147.47	138.15–171.79
Standard deviation	51.90	217.60
Minimum	12.88	9.51
Maximum	277.18	1612.49

The annual aggregate values of all visitors for the status quo and the scenarios were calculated using the sample's median values to produce more conservative value estimates. Considering the status quo and four scenarios designed based on the baseline and the change in the attributes of the forest recreation sites in the study area, the expected consumer surplus per trip and the annual combined consumer surplus for each visitor and all visitors are given in Table 5.

Table 5. The aggregate value estimates by the scenarios.

Scenarios	Per-Trip Expected Consumer Surplus (TL)	Annual Aggregate Consumer Surplus per Capita (TL)	Annual Aggregate Value for Target Population (million TL)
Status quo	137.34	156.59	13.51
I	146.49	181.80	15.68
II	142.81	164.36	14.18
III	149.46	189.25	16.32
I + II + III	159.14	224.81	19.39
IV	143.64	167.01	14.40
I + II + III + IV	166.06	257.67	22.22

In the status quo, it was determined that 14 forest recreation sites in the province of Ankara produced benefits of 156.59 TL per capita and 13.51 million TL for all visitors in real prices. If the stand development stage increased by two stages at the sites (Scenario I), the expected consumer surplus could increase by 6.7% per trip, and the annual aggregate value for the visitors would increase by approximately 2.17 million TL per year. The rehabilitation of degraded stands at the sites (Scenario II) could provide a lower benefit increase compared to other improvement scenarios. In addition, it was estimated that the normal canopy of the stands at the forest recreation sites (Scenario III) could increase the expected consumer surplus per trip by 8.82%, while it could increase the aggregate value by approximately 2.82 million TL. If the first three scenarios, which foresee changes in the stand structures at the sites, were realized, all visitors could derive an additional benefit of 5.88 million TL per year. Improving the camping facilities in the specific sites and encouraging the visitors to engage in camping activities (Scenario IV) could increase the aggregate consumer surplus by 0.89 million TL. If all four scenarios occurred at the same time, the expected consumer surplus per trip would increase by 20.9%, while the annual aggregate consumer surplus could be 8.71 million TL more.

The marginal effects of the variables in the trip-demand function, calculated by Equations (11) and (12), are given in Table 6. The trip-demand function implies that an increase of 1 TL in the expected consumer surplus per trip could lead to a 1.43% increase in the number of trips per capita. If the visitors to the forest recreation sites perform one additional activity on average, the total number of trips could decrease by 40%.

Table 6. Marginal effects of variables in the trip-demand function.

Variables	ME (%)
Expected consumer surplus	1.43
Individual income	28.83
Sex	−27.96
Education	3.87
Children	40.57
Weekday visitor	20.95
Activity number	−40.54

4. Discussion

In the previous single-site TCM studies conducted in Ankara, the mean consumer surplus per trip was estimated as 53.42 TL in real values with the zonal approach at Soguksu National Park [43] and 80.82 TL at the Beynam Forest Recreation Site [47] with an individual approach. In the single-site individual TCM valuation studies conducted in other regions of Turkey, some mean per trip consumer surplus estimates in real values were also available, such as 2.15 TL at Kursunlu Waterfall Nature Park [45], 101.70–342.39 TL at seven forest picnic sites in two provinces [44], and 573.60 TL at Dilek Peninsula National Park [46]. Based on the aggregate value, the mean consumer surplus per trip, estimated in this study as 61.89 TL, was generally lower than the estimates in the existing studies on the country. It was unclear whether the difference is due to the models used in the studies, the site attributes, or the changes in the tastes and preferences of the society.

Visitors earn the consumer surplus in terms of both mean and median values (61.89 and 41.75 TL, respectively) from visits to the forest recreation sites less than twice the mean travel cost per trip (34.43 TL), despite the expectation of four times (140,14 TL and 137,34 TL, respectively). This decrease was due to the differentiation of the consumer surplus gained in deciding on the number of trips with the expectation of maximum benefit in choosing the site considering the site attributes. It was also a strength of the linked model, which progressively analyzes visitors' decision-making processes on recreational trips since the decision motives in the two stages are different.

Scenarios related to the stand structures of the forest recreational sites provided an annual aggregate benefit increase of 4.96–20.86% compared with the current situation. The greatest benefit increase among all scenarios occurred when stands had a normal canopy. If all scenarios, including improvements in stand structures and improvements in the camping facilities, were actualized, the annual aggregate consumer surplus could be 64.6% higher. The scenarios related to forest stand structure can be realized with silvicultural interventions or can be used in making the selection among the existing forest areas when determining the location of new recreation sites.

The marginal effects of the variables on the number of trips through the trip-demand function showed that more than one visitor under the age of 18 in the visitor group had the highest positive effect, while the number of activities had the most negative effect. However, the total effect was limited, especially for dummy variables, and varied for continuous and categorical variables. In this context, if the four scenarios designed for the variables in the site choice model were realized, it meant that an increase of 28.72 TL in the expected consumer surplus per trip could create an increase of approximately 124,000 trips (41%) in the total number of visits, i.e., demand, while other variables remained constant. It was expected that an increase of 5.47 TL in the expected consumer surplus, when only degraded stands were rehabilitated, would create an increase of 7.85% in the number of trips per person and an increase of 23,600 in the total trip demand. The coefficient of the income variable showed that the number of trips could increase by 28.8% if the visitors rose to a higher income level, while the total number of trips could increase by 11,640 people if the average education time increased by one year.

Although it was reported in some studies that broad-leaved and mixed forests are preferred more than coniferous forests for recreational activities, these preferences may vary [73]. In Lorraine [74,75] and Denmark [76,77], visitors prefer the mixed forests to the broad-leaved forests and the broad-leaved forests to the coniferous forests, respectively, for recreational activities. In other studies, on Danish forests [33,73,78], broad-leaved trees were similarly preferred to conifers, but the opposite was also determined in some cases [79,80]. On the other hand, in the exemplary Mallorca study [14], it was explained that while visitors prefer broad-leaved forests, mixed forests have a negative effect on site choice. In this study, as seen in some studies in Denmark [79,80], it was determined that the recreation sites with coniferous stands were more preferred by visitors. The dominance of the coniferous stands in the forests of the Ankara province and the excessive destruction of the broad-leaved forests may have shaped the tastes and preferences of the visitors. The fact that visitors in Ankara prefer the mixed and damaged stands less is consistent with the preferences of visitors to Mallorca forests [14].

Studies show that forests consisting of old stands are generally more preferred for recreation than younger ones [77]. In this study, it was similarly revealed that recreation sites with a higher stand development stage were preferred by visitors. On the other hand, in line with some studies [81,82], visitors to forest recreation sites in Ankara prefer forests with a normal canopy.

Activity-related attributes such as picnicking, camping, guided activities, and having electricity increased the probability of visitors choosing a recreation site, as noted in other studies [14,40,83,84]. The positive effect of the expected consumer surplus variable on trip demand showed that the visitors rationally acted and made their preferences by considering the site's attributes. It was seen that the effects of demographic and socioeconomic characteristics, such as income, gender, education, and the number of children, on the trip demand of visitors in Ankara are like those who visit the recreational areas in Mallorca [14], Lorraine [40], and Denmark [33].

The findings of the trip demand model indicated that as the number of activities in forest recreation sites in Ankara increases, the frequency of visits is negatively affected. In other words, a significant part of visitors making frequent trips to the forest recreation sites in Ankara is that they may not want to be close to those who want to do different recreational activities at the same site. On the other hand, it was found that the aggregate economic value could increase in the scenario that includes improving camping facilities in specific sites. When these two pieces of information are considered together, the advantage of the multi-stage aspect of the linked model, which serves to evaluate the site choice and the trip demand separately but in conjunction, for resource managers emerges.

In the linked model, an aggregate demand curve was estimated for many forest recreation sites in a wide geographic area. Thus, the minimum number of recreation sites required to derive the demand curve with a multi-stage model is a matter of controversy [85]. The aggregate demand and value of a high number of sites were estimated in linked model studies for 59 forest recreation sites in Mallorca [14] and 120 forest sites in Denmark [33]. Lutz et al. [85] stated that the optimal number of areas is uncertain, and six well-distributed areas performed very well in their analysis. In this study, the statistically significant site choice and trip demand models were produced with 14 sites. It is more suitable to use the number of sites that can statistically provide the number of visits–travel cost variation, rather than the absolute number of sites.

In travel cost studies with multi-site models [14,33,40], off-site surveys are generally preferred to collect the preferences of non-visitors to the sites. While it may be seen as a weakness in this study that the data were based on on-site surveys, it may be an important issue that a high number of people who never visit are faced with off-site surveys [86]. Reaching enough visitors to elicit their preferences with off-site surveys may not be possible. Therefore, the information derived from a study based only on on-site surveys may be accepted as sufficient considering the research costs and time.

Changes in the public's economic, social, cultural, and health conditions can change their recreation behaviors and preferences towards forest recreation areas. During the COVID-19 pandemic, which is one of the most important drivers that can cause such changes, in Bonn, Germany [87], Vermont in the United States [88], across the United States [89], and Oslo, Norway [90], it was determined that the number of visitors participating in recreational activities in forests and other green areas generally increased. In Turkey, however, access to forest recreation areas was sometimes restricted during the COVID-19 breakout period. Studies have determined that most of the people in Turkey were against this restriction on urban green spaces [91], and the use of these areas was adversely affected during the pandemic [92]. However, there is no research questioning the relationship between the COVID-19 pandemic and the value of forest recreation services. Since 7 years have passed since the data collection year of this research, aside from all other factors, it is expected that the public's recreation preferences and behaviors, and therefore the derived value and demand estimates, will change during and after the COVID-19 pandemic in Turkey and the study area. In this context, new studies on aggregate recreation value and demand with linked models should be conducted in the same area and other regions, both to test the results of this study, to contribute to the methodological development, and to learn about the effects of the COVID-19 pandemic.

5. Conclusions

This study showed that the discrete choice-count data linked model as a multi-site travel cost model generates reliable value estimates by deriving statistically significant site choice and trip-demand functions and that functions, economic values, and demand estimations can be used effectively in various decision-making processes in the management of forest recreation sites. More explicitly, the fact that the model is two-stage, its connection with the expected consumer surplus calculated from the inclusive value of the sites between the stages, and the fact that in-forest recreation services consider both the supply and demand aspects indicate that it can serve resource managers as an efficient information generating tool.

The scenarios designed in this study foresee the improvement of stand attributes in the forest recreation sites. These improvements could occur with silvicultural practices, as well as with natural processes, over time. In addition, it was determined that the improvement of recreational activity opportunities acts in the opposite direction of the diversity of activities in terms of demand and value. Forest resource managers can benefit from the future demand and value estimations derived by using the linked model in evaluating forestry intervention opportunities and investment alternatives to increase demand satisfaction and user utility. The increase in the consumer surplus attributed to the rehabilitation of degraded stands allocated for the purpose of creating recreation services can be compared with rehabilitation costs. Some, or even all, of the rehabilitation costs can be financed by the increases in the number of visits and entry fee revenues. Similar cost–benefit analyses can be made for the third scenario for increasing stand canopy in this study. On the other hand, if the forest stands with high development stages are allocated for recreational purposes instead of those with lower development stages, the increase in aggregate consumer surplus can be compared with the raw wood material revenues that are given up. While this study can give specific information to resource managers about these variables, the variable designs in line with the changes in resource management policies and the requirements of resource managers show the limits of the efficiency of the linked model. The contribution of the linked model is also valid for the changes in the attributes of the recreation facilities and infrastructures in the forest recreation sites, besides the stand characteristics. On the other hand, the site choice and the trip-demand functions estimated with the linked model can be used to evaluate the probability of deterioration in the attribute levels and even site loss through scenarios.

Using the linked model, the seasonal and annual aggregate values can be estimated with a single attempt, taking into account the substitution relations among many forest recreation sites as well as the recreational behavior of the visitors, instead of conducting separate studies of each site with the single-site models. Although economic valuation studies for recreation services using the travel cost method in Turkey and many developing countries started in the late 1990s, a leap like that in developed countries could not be achieved. It did not find the place it deserved in resource management. It was observed that multi-site travel cost studies using the linked model produce more comprehensive and application-oriented information in a more cost and time-effective way than single-site models. Estimation of the economic value of recreation sites in forests and establishment of demand determinants in large geographical areas and even throughout the country in developing countries can be done with the linked model. Furthermore, working in larger areas requires support from spatial analysis due to the heterogeneity of forest recreation sites and preferences.

In the site choice model, it was observed that visitor preferences for some of the attributes of the forest recreation sites are consistent with the research results in the literature, while some are different. In addition, there is a heterogeneity of preferences among the visitors for the same recreation sites, as in the preferences for the stand development stage. These two issues prevent the spread of economic valuation studies with the benefit transfer method and require focusing on region-specific studies.

Lack of information about the economic value of forest recreation services as semi-public goods may cause forestry investments to produce recreational services to be seen as activities with no return and insufficient budget allocations, especially by the responsible public institutions. However, with valuation studies conducted at the regional level, it is possible to both provide data for regional investment plans and choose forestry investment alternatives and forestry techniques that will produce the highest recreational value.

Funding: This article was created from the database of a research project numbered 23.5302/2013-2015-2016 funded by the Central Anatolia Forestry Research Institute, which is an R&D unit of Turkish General Directorate of Forestry.

Data Availability Statement: Not applicable.

Acknowledgments: Thanks to Kenan Ok for his useful comments on the manuscript.

Conflicts of Interest: The author declares no conflict of interest.

References

1. Pearce, D. An intellectual history of environmental economics. *Annu. Rev. Energy Environ.* **2002**, *27*, 57–81. [CrossRef]
2. Phaneuf, D.; Smith, V.K. Recreation Demand Models. In *The Handbook of Environmental Economics Volume 2 Valuing Environmental Changes*; Mäler, K.G., Vincent, J.R., Eds.; Elsevier: Amsterdam, The Netherlands, 2005.

3. Clawson, M. *Methods of Measuring the Demand for and Value of Outdoor Recreation*; Reprint No. 10; Resources for the Future Press: Washington, DC, USA, 1959.
4. Freeman, A.M. *The Measurement of Environmental and Resource Values: Theory and Methods*, 1st ed.; Resources for the Future Press: Washington, DC, USA, 1993.
5. Bateman, I.J.; Lovett, A.A.; Brainard, J.S. Developing a methodology for benefit transfers using geographical information systems: Modelling demand for woodland recreation. *Reg. Stud.* **1999**, *33*, 191–205. [CrossRef]
6. Loomis, J. A Comparison of the Effect of Multiple Destination Trips on Recreation Benefits as Estimated by Travel Cost and Contingent Valuation Methods. *J. Leis. Res.* **2006**, *38*, 46–60. [CrossRef]
7. Rosenthal, D.H.; Loomis, J.B.; Peterson, G.L. *The Travel Cost Model: Concepts and Applications*; Gen. Tech. Rpt. RM-109; U.S. Department of Agriculture Rocky Mountain Forest and Range Experiment Station: Fort Collins, CO, USA, 1984.
8. Randall, A. A Difficulty with the Travel Cost Method. *Land Econ.* **1994**, *70*, 88–96. [CrossRef]
9. Willig, R.D. Consumer surplus without apology. *Am. Econ. Rev.* **1976**, *66*, 589–597. Available online: http://www.jstor.org/stable/1806699 (accessed on 10 March 2022).
10. Ward, F.A.; Beal, D. *Valuing Nature with Travel Cost: A Manual*; Edward Elgar: Cheltenham, UK, 2000.
11. Zandersen, M.; Tol, R.S. A meta-analysis of forest recreation values in Europe. *J. For. Econ.* **2009**, *15*, 109–130. [CrossRef]
12. Parsons, G.R. The Travel Cost Model. In *A Primer on Nonmarket Valuation: The Economics of Non-Market Goods and Resources, vol 3.*; Champ, P.A., Boyle, K.J., Brown, T.C., Eds.; Springer: Dordrecht, The Netherlands, 2003.
13. Heagney, E.C.; Rose, J.M.; Ardeshiri, A.; Kovac, M. The economic value of tourism and recreation across a large protected area network. *Land Use Pol.* **2019**, *88*, 104084. [CrossRef]
14. Bestard, A.B.; Font, A.F. Estimating the aggregate value of forest recreation in a regional context. *J. For. Econ.* **2010**, *16*, 205–216. [CrossRef]
15. Riccioli, F.; Marone, E.; Boncinelli, F.; Tattoni, C.; Rocchini, D.; Fratini, R. The recreational value of forests under different management systems. *New For.* **2018**, *50*, 345–360. [CrossRef]
16. Hill, G.W.; Courtney, P.R. Demand analysis projections for recreational visits to countryside woodlands in Great Britain. *Forestry* **2006**, *79*, 185–200. [CrossRef]
17. Lovett, A.A.; Brainard, J.S.; Bateman, I.J. Improving benefit transfer demand functions: A GIS approach. *J. Environ. Manage* **1997**, *51*, 373–389. [CrossRef]
18. Juutinen, A.; Kosenius, A.; Ovaskainen, V. Estimating the benefits of recreation-oriented management in state-owned commercial forests in Finland: A choice experiment. *J. Forest Econ.* **2014**, *20*, 396–412. [CrossRef]
19. Knoche, S.; Lupi, F. Valuing deer hunting ecosystem services from farm landscapes. *Ecol. Econ.* **2007**, *64*, 313–320. [CrossRef]
20. Okuyama, T. A model for estimating values of recreational activity time in multi-sites. *J. Environ. Info. Sci.* **2015**, *44*, 11–22. [CrossRef]
21. Garber-Yonts, B.E. *Conceptualizing and Measuring Demand for Recreation on National Forests: A Review and Synthesis*; Gen. Tech. Rep. PNW-GTR-645; U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station: Portland, OR, USA, 2005.
22. Riera, P.; Signorello, G.; Thiene, M.; Mahieu, P.-A.; Navrud, S.; Kaval, P.; Rulleau, B.; Mavsar, R.; Madureira, L.; Meyerhoff, J.; et al. Good practice guidelines for the non-market forest goods and services. *J. For. Econ.* **2012**, *18*, 259–270. [CrossRef]
23. Heal, G.M.; Barbier, E.B.; Boyle, K.J.; Covich, A.; Gloss, S.P.; Hershner, C.H.; Hoehn, J.P.; Pringle, C.M.; Polasky, S.; Segerson, K.; et al. *Valuing Ecosystem Services: Towards Better Environmental Decision-Making*; National Academies Press: Washington, DC, USA, 2005.
24. McFadden, D. Conditional Logit Analysis of Qualitative Choice Behavior. In *Frontiers in Econometrics*; Zarembka, P., Ed.; Academic Press: New York, NY, USA, 1974.
25. Hanemann, W.M. A Methodological and Empirical Study of the Recreation Benefits from Water Quality Improvement. Ph.D. Dissertation, Harvard University, Cambridge, MA, USA, 1978.
26. Herriges, J.A.; Kling, C.L.; Phaneuf, D.J. Corner Solution Models of Recreation Demand: A Comparison of Competing Frameworks. In *Valuing Recreation and the Environment: Revealed Preference Methods in Theory and Practice*; Herriges, J.A., Kling, C.L., Eds.; Edward Elgar: Cheltenham, UK, 1999.
27. Parsons, G.R.; Jakus, P.M.; Tomasi, T. A comparison of welfare estimates from four models for linking seasonal recreational trips to multinomial logit models of site choice. *J. Environ. Econ. Manage* **1999**, *38*, 143–157. [CrossRef]
28. Bockstael, N.E.; Hanemann, W.M.; Kling, C.L. Estimating the Value of Water Quality Improvements in a Recreation Demand Framework. *Water Resour. Res.* **1987**, *23*, 951–960. [CrossRef]
29. Bockstael, N.E.; Hanemann, W.M.; Strand, I.E. *Measuring the Benefits of Water Quality Improvements Using Recreation Demand Models*; U.S. Environmental Protection Agency: Washington, D.C., USA, 1986; Volume 2.
30. Hausman, J.A.; Leonard, G.K.; McFadden, D. A utility-consistent, combined discrete choice and count data model: Assessing recreational use losses due to natural resource damage. *J. Public Econ.* **1995**, *56*, 1–30. [CrossRef]
31. Feather, P.; Hellerstein, D.; Tomasi, T. A discrete-count model of recreation demand. *J. Environ. Econ. Manage* **1995**, *29*, 316–322. [CrossRef]
32. Parsons, G.R.; Kealy, M.J. A demand theory for number of trips in a random utility model of recreation. *J. Environ. Econ. Manage* **1995**, *29*, 357–367. [CrossRef]

33. Termansen, M.; McClean, C.J.; Jensen, F.S. Modelling and mapping spatial heterogeneity in forest recreation services. *Ecol. Econ.* **2013**, *92*, 48–57. [CrossRef]
34. Abildtrup, J.; Horokoski, T.T.; Piedallu, C.; Perez, V.; Stenger, A.; Thirion, E. Mapping of the Forest Recreation Service in Lorraine: Applying High-Resolution Spatial Data and Travel Mode Information. In Proceedings of the 2nd FAERE (French Association of Environmental and Resource Economists) Annual Conference, Toulouse, France, 1–10 September 2015.
35. McCollum, D.W. Nonmarket valuation in Action. In *A Primer on Nonmarket Valuation: The Economics of Non-Market Goods and Resources, vol 3.*; Champ, P.A., Boyle, K.J., Brown, T.C., Eds.; Springer: Dordrecht, The Netherlands, 2003.
36. Morey, E.R.; Rowe, R.D.; Watson, M. A Repeated nested-logit Model of Atlantic salmon fishing. *Am. J. Agric. Econ.* **1993**, *75*, 578–592. [CrossRef]
37. Parsons, G.R.; Kang, A.K.; Leggett, C.G.; Boyle, K.J. Valuing beach closures on the Padre Island National Seashore. *Mar. Resour. Econ.* **2009**, *24*, 213–235. [CrossRef]
38. Gustafsson, J. Modelling Recreational Angling Demand in Sweden Based on Region-Specific Inclusive Values. Ph.D. Dissertation, Umea University, Umea, Sweden, 2017.
39. Zandersen, M. Valuing Forest Recreation in Europe: Time and Spatial Considerations. Ph.D. Dissertation, Hamburg University and International Max Planck Research School on Earth System Modelling, Hamburg, Germany, 2005.
40. Abildtrup, J.; Garcia, S.; Olsen, S.B.; Stenger, A. Recreation Value of Forests in Lorraine: Local Determinants of Preferences. In Proceedings of the 58. Annual North American Meetings of the Regional Science Association International, Miami, FL, USA, 10 November 2011.
41. Turkish General Directorate of Forestry. Annual Activity Reports. Available online: https://www.ogm.gov.tr/tr/faaliyet-raporu (accessed on 15 April 2022).
42. Akesen, A. *Fethiye Yöresinde Rekreasyon Amacı ile Kullanılan Bazı Orman Alanlarında Rekreasyon Talep Değerinin Belirlenmesi Üzerine Araştırmalar [Research on the Determination of Recreation Demand Value in Some Forest Areas Used for Recreation Purposes in the Fethiye Region]*; Istanbul University Faculty of Forestry Publications: İstanbul, Turkey, 1983.
43. Kaya, G.; Daşdemir, İ.; Akça, Y. Soğuksu Milli Parkının ekonomik değerinin belirlenmesi [Determining the Economic Values of Recreation Services of Soğuksu National Park]. *BAROFD* **2000**, *1*, 59–87.
44. Pak, M. Orman Kaynağından Rekreasyon Amaçlı Yararlanmanın Ekonomik Değerinin Tahmin Edilmesi ve Bu Değer Üzerinde Etkili Olan Değişkenler Üzerine Bir Araştırma (Doğu Akdeniz ve Doğu Karadeniz Bölgesi Orman İçi Dinlenme Yerleri Örneği) [A Study on The Estimation of Economic Value of Recreational Benefit from Forest Resources and Effective Variables on The Estimated Value (East Mediterranean and East Black Sea Region Forest Recreation Sites Sample)]. Ph.D. Dissertation, Karadeniz Teknik University, Trabzon, Turkey, 2003.
45. Ortaçeşme, V.; Özkan, B.; Karagüzel, O. An estimation the recreation use value of Kursunlu Waterfall Nature Park by the individual travel cost method. *Turk. J. Agric. For.* **2002**, *26*, 57–62.
46. Başar, H. Dilek Yarımadası-Büyük Menderes Deltası Milli Parkının Rekreasyon Amacıyla Kullanımının Ekonomik Değerinin Saptanması: Bir Seyahat Maliyeti Uygulaması [The recreational use and the economic value of Dilek Peninsula-great Meander Delta national park by travel cost method]. Ph.D. Dissertation, Ege University, İzmir, Turkey, 2007.
47. Özdemir, E. Çevre Sorunlarının Ekonomik Niteliği Bağlamında Dışsallıkların Ortadan Kaldırılması [Elimination of Externalities in the Context of the Economic Nature of Environmental Problems]. Master's Thesis, Ankara Üniversitesi, Ankara, Turkey, 2006.
48. Kaya, G.; Aytekin, A.; Yıldız, Y.; Şaltu, Z. *Bartın İlinde Yaban Hayatı Kaynaklarını Korumanın ve Avlanma Hizmetinin Ekonomik Değerinin Belirlenmesi [The Economic Valuation of Conservation of Wildlife Resources and Hunting in Bartın]*; TÜBİTAK 107O072 Research Project Report; Bartın Faculty of Forestry: Bartın, Turkey, 2009.
49. Kaya, G.; Ok, K.; Porsuk, T.; Deniz, T.; Çetiner, M. Seyahat maliyeti yöntemiyle Ankara ilinde orman içi rekreasyon alanlarına yönelik bölgesel talebin tahmini [Estimating regional recreational demand for forest recreation sites with travel cost method in Ankara province]. *OGMOAD* **2018**, *5*, 15–30. [CrossRef]
50. Turkish Statistical Institute. Geographic Statistics Portal. Available online: https://cip.tuik.gov.tr/ (accessed on 10 April 2022).
51. Ankara Regional Directorate of Forestry. General information and organization status. Available online: https://ankaraobm.ogm.gov.tr/Sayfalar/Kurulusumuz/GenelBilgiler.aspx (accessed on 10 April 2022).
52. Ankara Regional Directorate of Forestry. *Official Documentaries and Statistics on Forest Recreation Sites*; Ankara RDF Non-Wood Forest Products Division: Ankara, Turkey, 2016.
53. Turkish General Directorate of Nature Conservation and National Parks. Official Documentaries and Annual Statistics on National Parks and Nature Parks in Turkey. Turkish General Directorate of Nature Conservation and National Parks: Ankara, Turkey, 2016.
54. Train, K. Mixed Logit Models for Recreation Demand. In *Valuing Recreation and the Environment: Revealed Preference Methods in Theory and Practice*; Kling, C., Herriges, J., Eds.; Edward Elgar Press: Cheltenham, UK, 1999.
55. McFadden, D.; Train, K.E. Mixed MNL models for discrete response. *J. Appl. Econom.* **2000**, *15*, 447–470. [CrossRef]
56. Hensher, D.A.; Greene, W.H. The mixed logit model: The state of practice. *Transportation* **2003**, *30*, 133–176. [CrossRef]
57. Train, K. *Discrete Choice Methods with Simulation*; Cambridge University Press: Cambridge, UK, 2003.
58. Train, K.E. Recreation demand models with taste differences over people. *Land Econ.* **1998**, *74*, 230–239. [CrossRef]
59. Haab, T.; Hicks, R.; Schnier, K.; Whitehead, J.C. angler heterogeneity and the species-specific demand for marine recreational fishing. *Mar. Resour. Econ.* **2012**, *27*, 229–251. [CrossRef]

60. Brownstone, D.; Train, K. Forecasting new product penetration with flexible substitution patterns. *J. Econom.* **1999**, *89*, 109–129. [CrossRef]
61. Hanemann, W.M. *Applied Welfare Analysis with Qualitative Response Models*; CUDARE Working Papers; University of California: Berkeley, CA, USA, 1982.
62. McFadden, D. Econometric Models of Probabilistic Choice. In *Structural Analysis of Discrete Data with Econometric Applications*; Manski, C.F., McFadden, D., Eds.; The MIT Press: Cambridge, MA, USA, 1981.
63. Small, K.A.; Rosen, H.S. Applied welfare economics with discrete choice models. *Econometrica* **1981**, *49*, 105–130. [CrossRef]
64. Roussel, S.; Salles, J.-M.; Tardieu, L. *Recreation Demand Analysis of the Sensitive Natural Areas (Hérault District, France): A Travel Cost Appraisal using Count Data Models*; Working Papers 12-30; LAMETA, Universtiy of Montpellier: Montpellier, France, 2012.
65. Haab, T.C.; McConnell, K.E. *Valuing Environmental and Natural Resources: The Econometrics of Non-Market Valuation*; Edward Elgar Publishing: Northampton, UK, 2002.
66. Cameron, A.C.; Trivedi, P.K. Econometric models based on count data: Comparisons and applications of some estimators and tests. *J. Appl. Econ.* **1986**, *1*, 29–53. [CrossRef]
67. Long, J.S. *Regression Models for Categorical and Limited Dependent Variables*; Sage Publications: London, UK, 1997.
68. Hilbe, J.M. *Negative Binomial Regression*; Cambridge University Press: Cambridge, UK, 2011.
69. Cesario, F.J.; Knetsch, J.L. The time bias in recreation benefit estimates. *Water Resour. Res.* **1970**, *6*, 700–704. [CrossRef]
70. Turkish Statistical Institute. Inflation & Price. Available online: https://data.tuik.gov.tr/Kategori/GetKategori?p=enflasyon-ve-fiyat-106 (accessed on 15 April 2022).
71. Greene, W.H. *NLOGIT Version4.0*; Econometric Software, Inc.: Plainview, NY, USA, 2012.
72. McFadden, D. Quantitative Methods for Analyzing Travel Behaviour of Individuals: Some Recent Developments. Cowles Foundation Discussion Papers 707. 1977. Available online: https://elischolar.library.yale.edu/cowles-discussion-paper-series/707 (accessed on 10 April 2022).
73. Agimass, F.; Lundhede, t.; Panduro, T.E.; Jacobsen, J.B. The choice of forest site for recreation: A revealed preference analysis using spatial data. *Ecosyst* **2018**, *31*, 445–454. [CrossRef]
74. Abildtrup, J.; Garcia, S.; Olsen, S.B.; Stenger, A. Spatial preference heterogeneity in forest recreation. *Ecol. Econ.* **2013**, *92*, 67–77. [CrossRef]
75. Abildtrup, J.; Olsen, S.B.; Stenger, A. Combining RP and SP data while accounting for large choice sets and travel mode–an application to forest recreation. *J. Environ. Econ. Pol.* **2014**, *4*, 177–201. [CrossRef]
76. Nielsen, A.B.; Olsen, S.B.; Lundhede, T. An economic valuation of the recreational benefits associated with nature-based forest management practices. *Landsc. Urban Plan* **2007**, *80*, 63–71. [CrossRef]
77. Filyushkina, A.; Agimass, F.; Lundhede, T.; Strange, N.; Jacobsen, J.B. Preferences for variation in forest characteristics: Does diversity between stands matter? *Ecol. Econ.* **2017**, *140*, 22–29. [CrossRef]
78. Termansen, M.; McClean, C.J.; Skov-Petersen, H. Recreational site choice modelling using high-resolution spatial data. *Environ. Plan.* **2004**, *36*, 1085–1099. [CrossRef]
79. Zandersen, M.; Termansen, M.; Jensen, F.S. Evaluating approaches to predict recreation values of new forest sites. *J. For. Econ.* **2007**, *13*, 03–128. [CrossRef]
80. Termansen, M.; Zandersen, M.; McClean, C.J. Spatial substitution patterns in forest recreation. *Reg. Sci. Urban Econ.* **2008**, *38*, 81–97. [CrossRef]
81. Edwards, D.; Jay, M.; Jensen, F.S.; Lucas, B.; Marzano, M.; Montagne, C.; Peace, A.; Weiss, G. *Assessment of the Recreational Value of European Forest Management Alternatives*; EFI Technical Report 62; European Forest Institute: Joensuu, Finland, 2011.
82. Ebenberger, M.; Arnberger, A. Exploring visual preferences for structural attributes of urban forest stands for restoration and heat relief. *Urban For. Urban Green.* **2019**, *41*, 272–282. [CrossRef]
83. Christie, M.; Hanley, N.; Hynes, S. Valuing enhancements to forest recreation using choice experiment and contingent behaviour methods. *J. For. Econ.* **2007**, *13*, 75–102. [CrossRef]
84. Giergiczny, M.; Czajkowski, M.; Żylicz, M.; Angelstam, P. Choice experiment assessment of public preferences for forest structural attributes. *Ecol. Econ.* **2015**, *119*, 8–23. [CrossRef]
85. Lutz, J.; Englin, J.; Shonkwiler, J.S. On the Aggregate Value of Recreational Activities: A Nested Price Index Approach Using Poisson Demand Systems. *Environ. Resour. Econ.* **2000**, *15*, 217–226. [CrossRef]
86. Borzykowski, N.; Baranzini, A.; Maradan, D. A travel cost assessment of the demand for recreation in Swiss forests. *Rev. Agric. Food Environ. Stud.* **2017**, *98*, 149–171. [CrossRef]
87. Derks, J.; Giessen, L.; Winkel, G. Nature recreation in times of social distancing–booming visits during the COVID-19 pandemic reveal forests as critical infrastructure. *For. Policy Econ.* **2020**, *118*, 102253. [CrossRef]
88. Morse, J.W.; Gladkikh, T.M.; Hackenburg, D.M.; Gould, R.K. COVID-19 and human-nature relationships: Vermonters' activities in nature and associated nonmaterial values during the pandemic. *PLoS ONE* **2020**, *12*, e0243697. [CrossRef]
89. Taff, B.D.; Rice, W.L.; Lawhon, B.; Newman, P. Who started, stopped, and continued participating in outdoor recreation during the COVID-19 pandemic in the United States? Results from a National Panel Study. *Land* **2021**, *10*, 1396. [CrossRef]
90. Zander, S.V.; Barton, D.N.; Gundersen, V.; Figari, H.; Nowell, M.S. Back to Nature: Norwegians sustain increased recreational use of urban green space months after the COVID-19 outbreak. *Landsc. Urban Plan* **2021**, *214*, 104175. [CrossRef]

91. Erdönmez, C.; Atmiş, E. The impact of the Covid-19 pandemic on green space use in Turkey: Is closing green spaces for use a solution? *Urban For. Urban Green* **2021**, *64*, 127295. [CrossRef] [PubMed]
92. Güngör, S.; Yıldız, F. Covid-19 Pandemisi öncesi ve sürecinde kentsel yeşil alanlardaki sosyal ilişkilerin incelenmesi. *JASA* **2022**, *7*, 27–39. [CrossRef]