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Article

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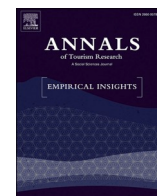
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Impact of user fees for visitors to national parks in the presence of alternative sites

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ABSTRACT

This study proposes an approach using the Kuhn–Tucker model to determine the extent to which the number of visitors to a recreational site would decrease if a user fee were introduced. This approach is promising in terms of consistency with economic theory and computational feasibility, assuming alternative recreational sites exist. An empirical analysis of national parks in Japan shows that a 1000 JPY fee would hardly decrease the number of visitors to a national park, whereas it would decrease the number of visitors to another national park over 45%. The results show that recreational sites with relatively high price elasticities experience a significant decrease in the number of visitors even with low user fees.

1. Introduction

1.1. Background

Protected areas and nature tourism sites worldwide charge user fees to cover management costs. In addition to the United States and Canada, which have a long tradition of charging user fees, many other countries are beginning to consider and implement user fees at recreation sites (Baral, Stern, & Bhattarai, 2008; Casey, Brown, & Schuhmann, 2010; Chase, Lee, Schulze, & Anderson, 1998; Reid-Grant & Bhat, 2009; Reynisdottir, Song, & Agrusa, 2008; Schuhmann et al., 2019; Schwartz & Lin, 2006; Shoji et al., 2021). This is because, in many countries, budgets for the management of such areas are inadequate and are being further reduced (Dharmaratne, Sang, & Walling, 2000; Eagles, McCool, & Haynes, 2002; Laarman & Gregersen, 1996; Watson, Dudley, Segal, & Hockings, 2014). Therefore, the degree of dependence on revenue from visitors to cover management costs through user fees is increasing worldwide (Weaver & Lawton, 2017). Research on user fees has been conducted from various perspectives including function, use, and equity (Buckley, 2003; Chung, Kyle, Petrick, & Absher, 2011; Miller, Jorgenson, Nickerson, & Pitas, 2018; Nyaupane, Graefe, & Burns, 2007; Park, Ellis, Kim, & Prideaux, 2010; Schroeder & Louviere, 1999; Zou, 2020). This study focuses on the setting of user fee amounts and the impact of

user fees on the number of visitors.

While considering the introduction of user fees or modifying the amount of user fees, managers must forecast the total revenue from user fees to confirm the economic feasibility of introducing a new fee owing to the cost of collection (Baral et al., 2008; Reid-Grant & Bhat, 2009; Reynisdottir et al., 2008; Schuhmann et al., 2019). The total revenue from user fees can be calculated by multiplying the user fee by the number of visitors. To determine the amount of user fees, previous studies have estimated the willingness to pay and/or consumer surplus of visitors using the revealed and/or stated preference approaches, and examined the extent to which visitors are willing to pay the said fee (Baral et al., 2008; Casey et al., 2010; Chase et al., 1998; Mulwa, Kabubo-Mariara, & Nyangena, 2017; Peters & Hawkins, 2009; Reid-Grant & Bhat, 2009; Reynisdottir et al., 2008; Schuhmann et al., 2019).

However, because some visitors may cancel their visits and the others may decide to visit an alternative recreation site, it is imperative to assess the decrease in the number of visitors when a certain user fee is introduced. For example, suppose that a user fee is introduced for recreation site A, and none is introduced for a similar recreation site B located in the vicinity. In this case, in addition to the visitors who would cancel their visit to recreation site A, a few would want to visit recreation site B instead of A. Furthermore, choice behavior, such as canceling one of the three visits to A and shifting one to visit B, is expected. In any

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case, the number of visitors to site A will be lower than expected, and so will be the revenue. With a few exceptions, existing studies have not considered the existence of alternative recreation sites when setting user fees.

1.2. Purpose of the study

This study employs the Kuhn–Tucker model (Hanemann, 1978; Wales & Woodland, 1983), which treats the choice of recreation sites and the number of visits as a single utility maximization problem, to answer two research questions. The first research question is: To what extent does the number of visitors to a recreation site decrease when a user fee is introduced at the recreation site, assuming the existence of alternative recreation sites? This question addresses the demand for an accurate prediction of the revenue from user fees. The present case study aimed to estimate the decrease in the number of visitors if a user fee of 1000 JPY is introduced at 34 national parks in Japan (1000 JPY is 7.2 USD or 6.9 EUR, as at November 15, 2022). It is assumed that a user fee will be introduced in only one of the 34 national parks, and not in the others; however, this could be a rather strict assumption. Therefore, for reference, we estimate the results of a scenario in which a user fee of 1000 JPY is implemented at all the national parks simultaneously. Although the 1000 JPY fee is comparable to or slightly lower than typical entrance fees for national parks in North America (e.g., National Park Service, 2023), it is on the higher end of the voluntary fees in Japan, which will be discussed later. The second research question is: How much of a user fee can be imposed at a recreation site if an acceptable rate of decline in the number of visitors is set, assuming the existence of alternative recreation sites? Specifically, if the acceptable rate of decrease in the number of visitors is set at 5%, the amount of user fees that can be imposed can be determined. This question also assumes a situation in which a user fee is to be introduced in one of the 34 national parks.

There is a limited amount of previous research that has addressed similar research questions. Chase et al. (1998) estimated price elasticities for three national parks based on a contingent valuation method with respect to increasing user fees in Costa Rican national parks. Melstrom and Vasarhelyi (2019) used visitor arrival data to construct a demand model by combining a Poisson regression model with a random utility model that can account for the presence of alternative recreation sites. Using this, they find that a 45 USD price increase in the most popular national parks in the US would result in a 13.9% decrease in the number of visitors to these parks and a 2.1% decrease in the national park system as a whole.

2. Method

Using the previous example, the Kuhn–Tucker model identifies the number of visits to be assigned to each of the following options: “visit site A,” “visit site B,” and “visit neither.” The most significant difference from previous approaches is the treatment of option “visit neither.” In most approaches proposed thus far, the percentage of abandoned visits has been estimated primarily by changing the price of user fees after the construction of the demand model. This approach did not indicate whether visitors who abandoned their visit to site A would shift their visit to site B or “visit neither.” However, in the Kuhn–Tucker model, the option of not visiting either site is originally built into the model, and its interpretation is clear and appropriate.

2.1. Literature review

Recreation demand modeling has been extensively studied in environmental economics (Phaneuf & Smith, 2005). Understanding how changes in individual attributes of visitors (e.g., age, gender and nature relatedness) and environmental attributes of recreation sites (e.g., facility development and ecological restoration implementation) affect

choice behavior is crucial for forecasting demand for recreation sites and deciding whether to implement a management project. The individual travel cost method, contingent valuation method, and contingent behavior have been applied to understand recreation demand for a particular recreation site (e.g., Champ, Boyle, & Brown, 2017; Haab and McConnell, 2002). Conversely, the random utility maximization model and choice modeling have been applied to do the same for multiple recreation sites (e.g., Herriges & Kling, 1999; Louviere, Hensher, & Swait, 2000). In addition, some have applied advanced models and mentioned substitutability among recreational sites (e.g., Kemperman, Ponje, & Timmermans, 2005). The former approach has been challenged by the treatment of alternative recreational sites, while the latter by the treatment of multiple visits. However, other methods have been proposed to address these issues, such as the seemingly unrelated Poisson regression model, linked RUM/count demand model, and repeated nested-logit model (Hausman, Leonard, & McFadden, 1995; Morey, Rowe, & Watson, 1993; Ozuna & Gomez, 1994). Therefore, an avenue to employ these models to understand the impact of user fees may exist. The Kuhn–Tucker model was adopted because it can simultaneously consider visit cancellations, including zero visit and alternative recreation sites. In addition, the Kuhn–Tucker model can construct a recreation demand model that considers both the individual attributes of people and the environmental attributes of the recreation sites; it is superior to the aforementioned methods in these respects. Thus, the Kuhn–Tucker model was a more straightforward choice to address the present study's research questions.

The theoretical framework of the Kuhn–Tucker model was presented by Hanemann (1978) and Wales and Woodland (1983). Later, Bockstael, Hanemann, and Strand (1986) elaborate the model further. However, until the early 2000s, empirical analyses using the Kuhn–Tucker model were almost nonexistent owing to the complexity of solving the utility maximization problem and identifying the utility function. To address these problems, Phaneuf, Kling, and Herriges (2000) and von Haefen, Phaneuf, and Parsons (2004) identify a utility function that can be used for empirical analysis, and also introduced the process of calculating the welfare measure. Hence, the Kuhn–Tucker model can now be effectively used in empirical research.

The Kuhn–Tucker model allows modeling the decision on the goods and services to purchase and how much to purchase. In particular, there have been previous studies on recreational behavior using this model. For example, von Haefen et al. (2004) and Kuriyama, Hanemann, and Hilger (2010) use the Kuhn–Tucker model to analyze recreational behavior on the beach. Phaneuf and Siderelis (2003) apply to model the demand for water trail trips. Sánchez, Baerenklau, and González-Cabán (2016) assess the impact of forest fires by analyzing recreational behavior. Andersson, Smith, Wikberg, and Wheat (2012) analyze the renewal of railroad tracks as an example of the application of the model outside of recreation. As for the reliability of the Kuhn–Tucker model, Herriges, Kling, and Phaneuf (1999) compare it with the link model (Parsons, Jakus, & Tomasi, 1999) and von Haefen and Phaneuf (2003) with the count model (Englin, Boxall, & Watson, 1998), and they obtain results consistent with existing methods.

2.2. Model

The Kuhn–Tucker model, as shown in Fig. 1, assumes that individuals, within the constraints of their income y , make decisions on the number of visits x and the consumption of other goods and services z to maximize their utility while considering site quality q and travel costs to site p . Using data obtained from respondents on how many times they visited (or did not visit) each site within the survey period, the utility maximization problem is solved by setting some parameters. The Kuhn–Tucker model is intuitively easy to understand because the theoretical model was proposed almost 50 years ago (Hanemann, 1978; Wales & Woodland, 1983), whereas the empirical model is rather complex. Supplementary material presents the econometric model details. For

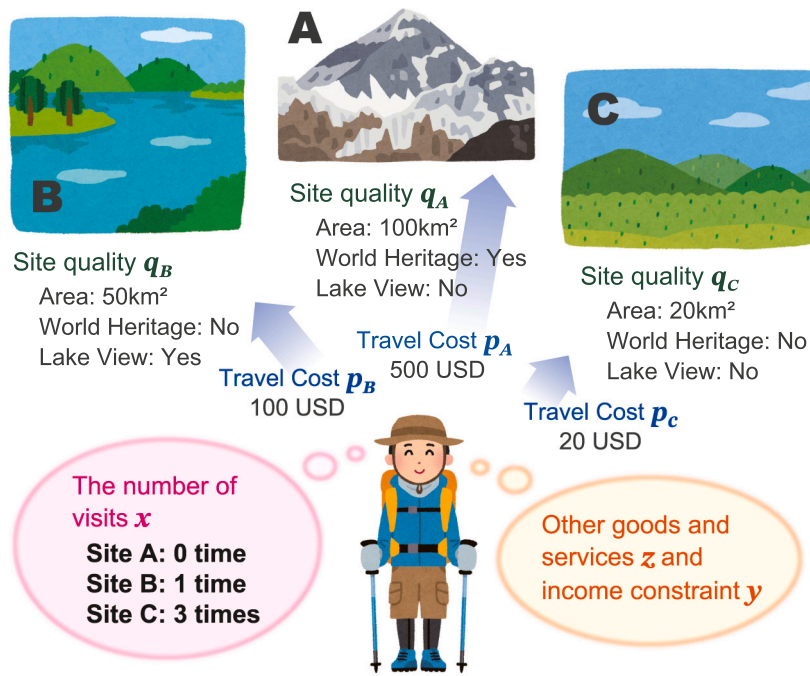


Fig. 1. A utility maximization problem for trekking destinations.

further details on the econometric model, please refer to the supplementary material.

Some models that can handle multiple and zero visits exist or substitution among sites, but the distinct feature of the Kuhn–Tucker model is that “satiation” is modeled (Bhat, 2005, 2008). For example, the repeated nested logit model (Morey et al., 1993) treats multiple visits as a repetition of a single-site choice but does not consider the fact that as the number of visits to a site increases, the marginal utility of that site decreases (Bhat, 2005, 2008). However, the Kuhn–Tucker model is straightforward and based on satiation. For example, in Fig. 1, multiple visits are interpreted as the result of continued visits to site A as long as the willingness to pay to visit site A exceeds p_A , whereas zero visits are interpreted as the result of the willingness to pay to visit site A not exceeding p_A . Substitution among sites is also modeled based on satiation in the form of visits conducted in the order of the greatest net benefit (willingness to pay – travel cost). However, this feature is characteristic of the multiple discrete-continuous extreme value model, more general than the Kuhn–Tucker model (Bhat, 2005, 2008). The multiple discrete-continuous extreme value model includes the Kuhn–Tucker model as a special case. However, unlike the Kuhn–Tucker model, the multiple discrete-continuous extreme value model assumes an error term in the consumption of other goods and services z (see the supplementary material and Bhat, 2005, 2008), imposing a significant computational burden when calculating demand and willingness to pay, which will be shown as the main simulation results of this study. The Kuhn–Tucker model was adopted to address this point.

2.3. Study area

Japan's first national park was designated in 1934, and as of January 2021, 34 national parks have been designated nationwide (Ministry of the Environment in Japan, 2022). National parks account for 5.8% of Japan's total land area (Ministry of the Environment in Japan, 2022). The name, area, and the number of visitors of each national park in 2019 are listed in Table 1. In recent years, approximately 370 million people have visited national parks annually (Ministry of the Environment in Japan, 2022).

In Japan, the budget for the management of national parks is inadequate. Accordingly, there is a growing movement to introduce user fees

Table 1
Japanese national parks in 2019.

	Name	Area (km ²)	Visitors (million)
1	Rishiri-Rebun-Sarobetsu	242	0.57
2	Shiretoko	390	1.77
3	Akan-Mashu	914	3.42
4	Kushiroshitsugen	288	0.50
5	Daisetsuzan	2268	5.48
6	Shikotsu-Toya	995	10.51
7	Towada-Hachimantai	855	4.70
8	Sanriku Fukko	285	4.10
9	Bandai-Asahi	1864	6.27
10	Nikko	1149	16.07
11	Oze	372	0.28
12	Joshin'etsukogen	1482	23.72
13	Chichibu-Tama-Kai	1263	13.39
14	Fuji-Hakone-Izu	1217	132.52
15	Ogasawara	66	0.03
16	Myoko-Togakushi Renzan	398	5.01
17	Chubu-Sangaku	1743	8.46
18	Hakusan	499	0.67
19	Minami Alps	358	1.87
20	Ise-Shima	555	7.86
21	Yoshino-Kumano	614	14.09
22	San'in-kaigan	88	6.47
23	Daisen-Okai	354	12.72
24	Setonaikai	673	44.54
25	Ashizuri-Uwakai	113	1.38
26	Aso-Kuju	727	16.06
27	Saikai	246	4.82
28	Unzen-Amakusa	283	5.70
29	Kirishima-Kinkowan	366	11.72
30	Yakushima	246	0.15
31	Amamigunto	422	0.56
32	Yambaru	174	1.03
33	Keramashoto	35	0.23
34	Iriomote-Ishigaki	407	2.50
Total		2,194,931	369.15

in recreation areas (Shoji et al., 2021). However, there are currently only a few cases of mandatory fees being implemented in national parks; most fees are voluntary, and payment cannot be enforced (Shoji et al., 2021). For example, Mt. Fuji (3776 m) in Fuji-Hakone-Izu National Park

introduced a voluntary fee for visitors, and in 2019, about 157,000 visitors paid the fee, leading to earnings of 157 million JPY (Fujisan World Cultural Heritage Council, 2022). Although this fee is not mandatory at present, visitors are asked to donate at least 1000 JPY, which is likely to become a mandatory fee in the future (Fujisan World Cultural Heritage Council, 2022). National parks in Japan are managed by zoning and regulation, which is unique in that land is not “set aside” for nature conservation (Hiwasaki, 2005). National parks in Japan account for 5.8% of the country's total land area, however, most of the land is used for other purposes. Therefore, the introduction of user fees requires building consensus with various stakeholders, including land-owners. The voluntary fee at Mt. Fuji is implemented by a council led by the government and prefectural agencies after the stakeholders reached a consensus (Fujisan World Cultural Heritage Council, 2022).

2.4. Survey

The survey was conducted through a website in January 2019. The target population comprised the public aged between 20 and 69 years throughout Japan, who were registered by the survey company. The respondents were selected using a stratified sampling method to represent sex and age. Respondents were asked about their visit experiences to each of the 34 national parks during the survey period from January to December 2018. Those who responded positively regarding their visit experiences to a specific national park were also asked about the number of visits they made to that particular national park. Furthermore, respondents were asked about their individual characteristics, such as age, place of residence, income, and gender.

Information on the attributes of site quality q in Eq. (3) was collected from the statistical data provided by the Ministry of the Environment (Ministry of the Environment in Japan, 2022). Information related to site quality was collected on the percentage of special areas (areas with a high level of nature conservation), whether the park was registered as a World Natural Heritage site, whether the park was located on an island area, the number of visitor centers in the park, whether there were hot spring resorts in the national park, and whether there were any restrictions on private cars.

Travel costs were calculated assuming a car visit for travel costs between residential areas and national parks located in the mainland of Japan, and an airplane and car for all other visits. Travel costs were calculated based on the average gasoline costs during the study period obtained from the Petroleum Products Cost Survey (Agency for Natural Resources and Energy, 2021), assuming that one liter of fuel is consumed every 10 km traveled by car. Travel time (opportunity cost) is valued at one-third of the wage rate, similar to Cesario (1976). The wage rate was calculated using Family Income and Expenditure Survey (Statistics Bureau of Japan, 2019). As an example, we can calculate the travel cost to Fuji-Hakone-Izu National Park, for a respondent living in Tokyo, assuming that the distance from their residence to Fuji-Hakone-Izu National Park is 112.7 km, and takes 79 min using express toll ways. We further assume that the price of gasoline is 150 JPY per liter, and driving a car with a fuel economy of 10 km per liter, the round-trip gasoline cost would be $112.7 \text{ km} / 10 \text{ km per liter} * 150 \text{ JPY} * 2 = 3381 \text{ JPY}$. Adding in the tolls of the expressways, the total cost would be 10,181 JPY. For a round-trip of 79 min each way, we assume an opportunity cost of $1/3$ of the 3492 JPY per hour wage (wage rate), so the cost of the round-trip would be $3492 * 1/3 * (79 * 2) / 60 = 3065 \text{ JPY}$, bringing the total cost of travel to 13,246 JPY.

3. Results

3.1. Descriptive statistics

The Kuhn–Tucker model requires information on respondents' income and travel cost to each national park based on their place of residence. The total number of respondents was 1686; however, 44

respondents were excluded since they did not answer the required questions. As shown in Table 2, the average number of trips respondents visited national parks during the survey period was 2.13. While some respondents did not visit the park at all, others reported that they had visited the park 125 times. Other descriptive statistics for variables related to gender, age, income, and site quality attributes are shown in Table 2.

3.2. The Kuhn–Tucker model

Table 3 presents the estimation results from the Kuhn–Tucker model. Looking at Ψ , which includes individual characteristics, the coefficients for the variables indicating male sex and age are positive and negative, respectively, and both are statistically significant. This indicates that men and younger age groups were more likely to visit national parks, ceteris paribus. Regarding the attributes of site quality, the coefficients of the variables indicating that the national park is a World Natural Heritage Site (inscribed = 1), the number of visitor centers in the national park, and the presence of hot spring resorts in the national park (yes = 1) were positive and statistically significant. National parks under these categories have a higher tendency to be visited, ceteris paribus. However, the coefficients of the variables indicating the percentage of special areas and the presence of any restrictions on private cars (yes = 1) were negative and statistically significant. The location of the national park on an island did not affect visiting behavior. Except for the sign of the variable indicating the percentage of special areas, the results of this study are as expected. Using this model, simulations to answer the two research questions were conducted.

3.3. Simulation results

Table 4 presents the results of visitors' mean travel costs for each national park and the simulation results for the initial research question. It explores the potential decrease in visitor numbers across 34 national parks in Japan if a user fee of 1000 JPY was introduced in one national park. The estimated results obtained by implementing the user fee simultaneously in all national parks are not included in this section due to the absence of a statistically significant difference between the previous and subsequent outcomes. The largest difference was observed in the case of the Ashizuri-Uwakai National Park, where the result under the former scenario was estimated to have decreased by 4.83%, while the one under the latter was estimated to have decreased by 4.60%. However, the estimated confidence interval for the former was [5.33–4.46%], and the value of 4.60% was within the statistical error of the former result. Fig. 2 combines the estimation results with a heat map

Table 2
Descriptive statistics.

Variables	Description	Mean	Std. dev.
$x = \sum_j x_j$	The number of trips to national parks per person per year	2.13	9.09
Price	Round-trip cost to each national park (JPY)*	64,333	38,463
Gender	1/0, 1 = male	0.49	0.50
Age	Age of respondent	46.6	13.7
Income	Household income (thousand JPY)*	6300	4055
Special area	Percentage of special areas to national park areas (%)	15.5	17.3
World heritage	1/0, 1 = World Natural Heritage site	0.21	0.41
Islands	1/0, 1 = national park is located on an island area.	0.21	0.41
Visitor center	The number of visitor centers	1.12	1.82
Hot spring	1/0, 1 = there are hot spring resorts in the national park.	0.35	0.49
Vehicle regulation	1/0, 1 = there are any restrictions on private cars.	0.56	0.50

* 1000 JPY is 7.2 USD and 6.9 EUR, as of November 15, 2022.

Table 3

Parameter estimates using the Kuhn–Tucker model.

Variables	Coefficient		t-stat.	p value
Scale parameter μ^*				
Constant and individual attributes Ψ				
Constant	0.218	***	13.01	0.00
Gender	3.298	***	4.95	0.00
Age	0.428	***	7.85	0.00
Translating parameter θ^*	−0.008	***	−3.81	0.00
	0.111	*	1.95	0.05
Site attributes parameter φ				
Special area	−0.005	***	−2.76	0.00
World heritage	0.598	***	10.47	0.00
Islands	0.143	*	1.75	0.08
Visitor center	0.160	***	10.12	0.00
Hot spring	0.498	***	8.35	0.00
Vehicle regulation	−0.538	***	−9.04	0.00
Income effect parameter ρ^*				
	−1.588	***	−7.72	0.00
N	1642			
Log-likelihood	−12,592.9			

** $p < 0.01$; * $p < 0.05$; $p < 0.10$.

of Japan's population. The results are shown on the heat map because the number of visits to national parks and the travel costs to national parks are highly related to population distribution. Table 5 shows the results for the second research question of what maximum user fee can be imposed when the acceptable rate of decrease in the number of users is set at 5%. Fig. 3 shows the estimation results on the heat map of the Japanese population assuming a situation in which a user fee is introduced in one of the 34 national parks.

Table 4

Effect of 1000 JPY user fee on national parks in Japan.

Name		Visitor's mean travel cost* (S.D.)	Demand		Decrease rate	
			Baseline	User fee 1000 JPY*	Mean	95% confidence interval**
1	Rishiri-Rebun-Sarobetsu	78,638 (26,922)	0.049	0.047	4.14%	[4.26–4.02%]
2	Shiretoko	84,968 (28,989)	0.048	0.046	2.76%	[2.99–2.57%]
3	Akan-Mashu	74,361 (30,831)	0.044	0.043	3.51%	[3.65–3.38%]
4	Kushiroshitsugen	80,644 (29,724)	0.042	0.041	2.63%	[2.76–2.52%]
5	Daisetsuzan	72,802 (35,941)	0.054	0.051	5.77%	[6.01–5.54%]
6	Shikotsu-Toya	55,439 (39,289)	0.083	0.077	7.21%	[7.53–6.95%]
7	Towada-Hachimantai	49,740 (34,366)	0.065	0.060	6.91%	[7.12–6.70%]
8	Sanriku Fukko	42,503 (31,170)	0.044	0.040	8.01%	[8.44–7.65%]
9	Bandai-Asahi	28,610 (28,437)	0.049	0.041	16.91%	[17.53–16.38%]
10	Nikko	28,358 (27,206)	0.089	0.078	11.78%	[12.16–11.43%]
11	Oze	23,010 (22,765)	0.040	0.034	13.89%	[14.70–13.19%]
12	Joshin'etsukogen	24,142 (23,693)	0.052	0.046	11.96%	[12.62–11.42%]
13	Chichibu-Tama-Kai	11,690 (22,122)	0.059	0.032	45.25%	[47.82–43.31%]
14	Fuji-Hakone-Izu	18,382 (18,924)	0.214	0.191	10.72%	[11.00–10.51%]
15	Ogasawara	69,782 (21,929)	0.015	0.015	2.61%	[2.84–2.43%]
16	Myoko-Togakushi Renzan	20,690 (19,941)	0.040	0.034	13.75%	[14.54–13.10%]
17	Chubu-Sangaku	31,521 (19,453)	0.054	0.050	6.95%	[7.30–6.60%]
18	Hakusan	27,567 (16,023)	0.037	0.031	15.52%	[15.89–14.89%]
19	Minami Alps	19,164 (18,174)	0.055	0.045	18.33%	[19.24–17.70%]
20	Ise-Shima	31,428 (18,564)	0.133	0.123	7.46%	[7.87–7.15%]
21	Yoshino-Kumano	24,550 (20,153)	0.048	0.039	18.43%	[19.85–17.31%]
22	San'in-kaigan	27,087 (20,245)	0.075	0.066	12.55%	[13.15–12.05%]
23	Setonaikai	32,657 (20,435)	0.218	0.197	9.81%	[10.06–9.58%]
24	Daisen-Okii	32,002 (21,033)	0.042	0.035	17.12%	[17.96–16.44%]
25	Ashizuri-Uwakai	63,580 (21,161)	0.023	0.022	4.83%	[5.33–4.46%]
26	Saikai	46,614 (35,893)	0.058	0.050	14.98%	[15.46–14.61%]
27	Unzen-Amakusa	40,976 (33,496)	0.055	0.048	13.49%	[13.96–13.02%]
28	Aso-Kuju	32,704 (32,257)	0.099	0.083	16.21%	[16.64–15.77%]
29	Kirishima-Kinkowan	44,288 (34,576)	0.068	0.062	9.74%	[9.97–9.51%]
30	Yakushima	102,759 (31,709)	0.042	0.041	1.66%	[1.78–1.56%]
31	Amamigunto	91,763 (8743)	0.023	0.022	1.88%	[2.03–1.78%]
32	Yambaru	124,476 (31,622)	0.036	0.035	1.26%	[1.32–1.21%]
33	Keramashoto	102,435 (21,824)	0.030	0.030	1.48%	[1.57–1.42%]
34	Iriomote-Ishigaki	91,104 (13,621)	0.049	0.048	1.54%	[1.62–1.47%]

* 1000 JPY is 7.2 USD and 6.9 EUR, as of November 15, 2022.

** The values in brackets are 95% confidence intervals calculated using the procedure reported by Krinsky and Robb (1986), based on 200 iterations.

4. Discussion

4.1. Effect of user fees

As shown in Table 4, if a user fee of 1000 JPY is introduced, the number of visitors to Yambaru National Park is expected to decrease by only 1.3%, whereas the number of visitors to Chichibu-Tama-Kai National Park is expected to decrease by 45.25%. The overall trend is that the rate of decrease is generally <5% in national parks located in remote areas in the northern and southern ends of Japan, while the rate of decrease is generally 10% to 20% in other national parks, except Chichibu-Tama-Kai National Park. As shown in Fig. 2, the number of visitors to national parks located in remote areas, including islands away from densely populated areas such as Tokyo and Osaka, has generally decreased at a much smaller rate, whereas the number of visitors to national parks near densely populated areas has decreased significantly. Chichibu-Tama-Kai National Park, located closest to the Tokyo metropolitan area, experienced the largest decrease. There are two possible reasons for this marked difference in the rate of decline.

First, the visitors' travel costs to a remote national park were generally higher than a national park near major cities (Table 4 and Fig. 2). Japan's population is concentrated in densely populated areas, and visitors from these areas account for a large percentage of visitors who come to national parks. These visitors cannot visit the remote national parks frequently, therefore the introduction of the 1000 JPY fee would have only a minor impact on the number of visits. The fact that a mean respondent visited Yambaru National Park once means that this respondent was willing to pay >124,476 JPY for the visit. If the respondent canceled the visit because of the 1000 JPY fee, the

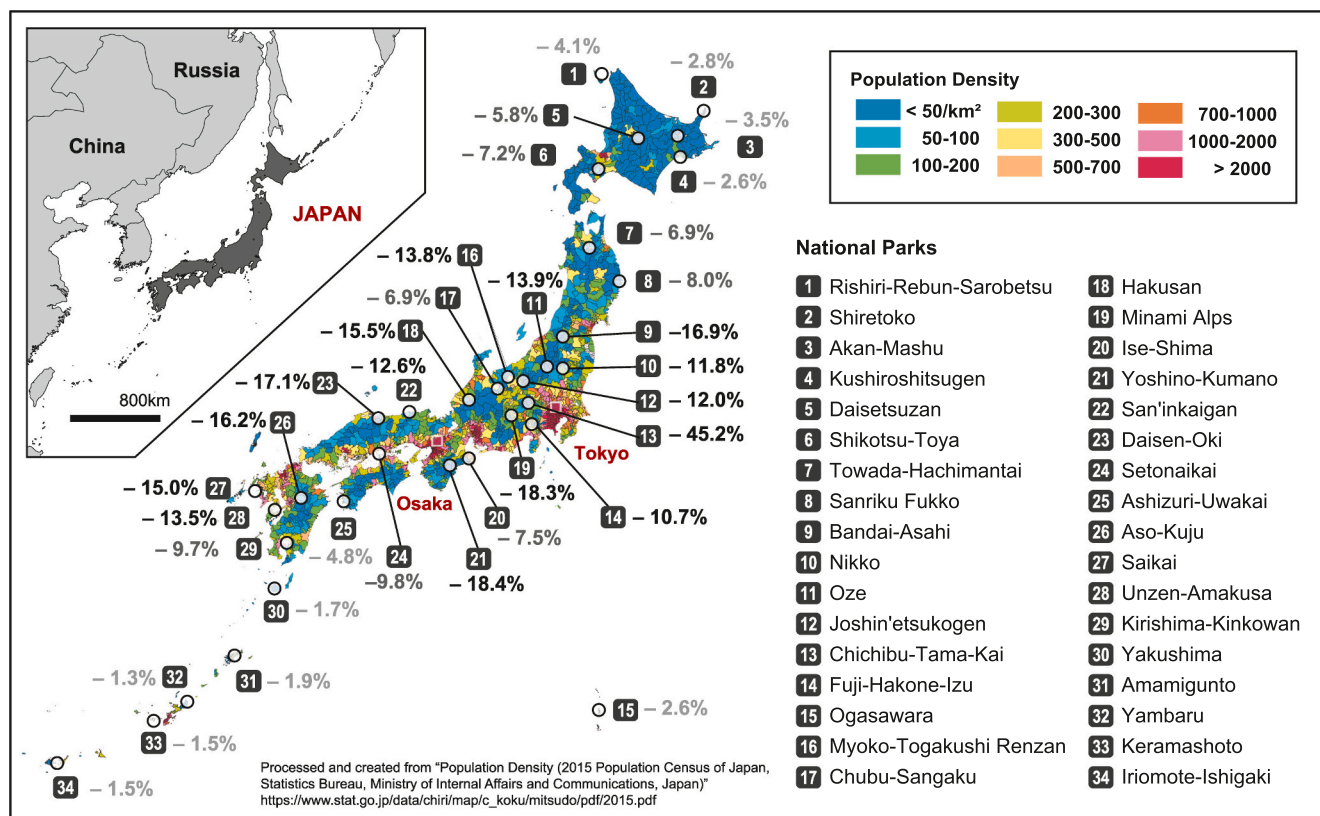


Fig. 2. Effect of 1000 JPY (7.2 USD and 6.9 EUR, as of November 15, 2022) user fee on Japanese national parks (on the heat map for the Japanese population).

willingness to pay was $<124,476 + 1000$ JPY. The number of respondents who were placed under such limited conditions would be quite small. Moreover, it was assumed that the travel cost for a mean respondent to visit Chichibu-Tama-Kai National Park would be 11,690 JPY. The 1000 JPY increase is about 8.6% of the mean travel cost. In addition, it is important to note the standard deviation of mean travel costs. The mean travel cost of visitors is low, and its standard deviation is significant, suggesting a large proportion of visitors whose travel costs are much lower than 11,690 JPY. For example, a respondent living in Tokyo visited Chichibu-Tama-Kai National Park once, which means that the respondent was willing to pay >4490 JPY for the visit. On the other hand, if the respondent canceled the visit because of the 1000 JPY fee, the willingness to pay was <5490 JPY. The number of respondents who were placed under the conditions would not be small.

Similarly, this could explain why there was no statistically significant difference between the results of the scenario in which the user fee is implemented only in one national park and not in others and the results of the scenario in which the user fee is implemented in all national parks. This is most likely due to the large difference in travel costs between alternative recreation sites and 1000 JPY, with 1000 JPY having little substitution effect. It was estimated that for a user fee of 1000 JPY, visitors would make changes their choice behavior little at national parks with higher average travel costs; whereas at national parks with lower average travel costs (e.g., Chichibu-Tama-Kai National Park), they would reduce the number of visits or cancel them, but not choose alternative recreation sites.

Second, national parks at the northern and southern ends of the country and on islands tend to be richer in natural environments and more primitive. National parks with a rich natural environment tend to be more attractive, and thus, visitors' willingness to pay for a visit to these parks such as Yambaru National Park in the southwest is higher. On the other hand, if a national park is located near a densely populated area but includes one of Japan's major tourist attractions, the impact of

the 1000 JPY user fee is somewhat mitigated. Chubu-Sangaku National Park and Ise-Shima National Park showed an estimated decrease of 6.95% and 7.46% visitors, respectively. Both national parks were expected to have less effect on the 1000 JPY user fee than other national parks in mainland Japan. Chubu-Sangaku National Park is home to Kamikochi, one of Japan's most famous mountain landscapes, and Ise-Shima National Park is home to the Ise Jingu Shrine, the pinnacle of shrines scattered across Japan. Both are representative of Japan's tourist attractions. Fuji-Hakone-Izu National Park is the second closest national park to the Tokyo metropolitan area after Chichibu-Tama-Kai National Park but also contains one of Japan's most representative landscapes, Mt. Fuji. Considering its spatial arrangement, the 10.72% decrease in the number of visitors is quite restrained compared to the 45.25% decrease in the neighboring Chichibu-Tama-Kai national park.

The last reason is also related to the counterintuitive result that the larger the percentage of special areas, the fewer the number of visits. Initially, it would seem that the more highly protected an area is, the more attractive and often visited it is. National parks with richer or more primitive natural environments tend to have a larger percentage of special areas. However, because these national parks are located in areas remote from densely populated areas, this likely reduces the number of visits.

4.2. Acceptable entrance fee

As shown in Table 5, Yambaru National Park can charge up to 4101 JPY, while Chichibu-Tama-Kai National Park can only charge 74 JPY. As in the case of the 1000 JPY user fee, these results show that the amount of user fees varies significantly among national parks. The reasons for these results are the same as those discussed above, but there is a large disconnect between the results for national parks located in areas far from densely populated areas and those for other national parks.

Based on the results of this study, the impact of voluntary fees

Table 5

Maximum amount of user fee when acceptable rate of decrease in the number of users was set at 5%.

Name	Entrance fee (JPY)*	95% confidence interval**
1 Rishiri-Rebun-Sarobetsu	1221	[1184–1261]
2 Shiretoko	1856	[1705–2002]
3 Akan-Mashu	1447	[1388–1507]
4 Kushiroshitsugen	1948	[1856–2038]
5 Daisetsuzan	859	[822–897]
6 Shikotsu-Toya	677	[647–703]
7 Towada-Hachimantai	703	[680–726]
8 Sanriku Fukko	590	[557–621]
9 Bandai-Asahi	223	[214–231]
10 Nikko	383	[371–396]
11 Oze	341	[322–360]
12 Joshin'etsukogen	391	[370–411]
13 Chichibu-Tama-Kai	74	[69–77]
14 Fuji-Hakone-Izu	440	[428–449]
15 Ogasawara	1946	[1785–2099]
16 Myoko-Togakushi Renzan	336	[317–354]
17 Chubu-Sangaku	698	[662–738]
18 Hakusan	241	[227–262]
19 Minami Alps	156	[143–166]
20 Ise-Shima	655	[620–685]
21 Yoshino-Kumano	229	[212–245]
22 San'in-kaigan	349	[331–364]
23 Setonaikai	413	[400–426]
24 Daisen-Oki	238	[227–249]
25 Ashizuri-Uwakai	1036	[936–1123]
26 Saikai	295	[286–303]
27 Unzen-Amakusa	289	[278–301]
28 Aso-Kuju	232	[225–239]
29 Kirishima-Kinkowan	480	[468–492]
30 Yakushima	3087	[2882–3294]
31 Amamigunto	2703	[2510–2869]
32 Yambaru	4101	[3907–4293]
33 Keramashoto	3455	[3254–3621]
34 Iriomote-Ishigaki	3338	[3166–3492]

* 1000 JPY is 7.2 USD and 6.9 EUR, as of November 15, 2022.

** The values in brackets are 95% confidence intervals calculated using the procedure reported by [Krinisky and Robb \(1986\)](#), based on 200 iterations.

currently in place in Japan can be considered. Yakushima National Park is classified as a remote national park away from densely populated areas. Yakushima National Park introduced a voluntary fee of 1000 JPY collected when entering the mountainous area for trail and toilet maintenance ([Yakushima Mountain Environmental Management Council, 2022](#)). Although this fee is not mandatory at present, if it becomes a mandatory user fee, 2.0% of visitors would give up visiting the park. On the other hand, in Myoko-Togakushi Renzan National Park, a voluntary fee of 500 JPY is collected in some mountain areas to maintain mountain trails and protect rock ptarmigans (*Lagopus muta*) ([Myoko Environmental Conference, 2022](#)). If a 336 JPY user fee is introduced, the number of visitors is expected to decrease by 5%; if a 1000 JPY fee is introduced, the number of users is expected to decrease by 13.75%. Therefore, if this voluntary fee becomes mandatory, the percentage decrease in the number of users is expected to be between the aforementioned values. Thus, if the acceptable rate of decrease in the number of users is set at 5%, the introduction of a 500 JPY user fee in Myoko-Togakushi Renzan National Park will exceed the set rate of decrease. However, even though the user fee for Yakushima National Park is set at 1000 JPY, twice as much as that for Myoko-Togakushi Renzan National Park, there is still room to exceed the set rate of decline of 5%.

4.3. Implications for management

Based on case studies of national parks in Japan, this study discusses two management implications regarding the introduction of user fees in protected areas and nature tourism sites, referring to the merits of the

Kuhn–Tucker model.

The authors were not expecting their findings to show that the substitution effect was almost non-existent. Nonetheless, this was a novel finding that had not previously been discovered. The voluntary user fees being implemented in Japan are inherently unfair due to the nature of the payments. The public would prefer a mandatory entrance fee with payment obligation that would apply to all national parks ([Shoji et al., 2021](#)). The presence of a strong substitution effect would imply that the imposing a mandatory fee on all national parks would be expected to significantly alter visitors' choice behavior. Hence, there is a considerable concern about applying the mandatory fee to all national parks. However, the present findings suggest that at a user fee of around 1000 JPY, visitors' choice behavior is unlikely to significantly change by the substitution effect. Based on this, it would be acceptable to promote the implementation of voluntary user fees at an amount appropriate for each national park, with the goal of eventually unifying voluntary fees to achieve a mandatory entrance fee that applies to all national parks.

By contrast, the substitution effect is built into the Kuhn–Tucker model and may have significant implications for simulations with higher price settings. For example, in Shiretoko National Park, participation in guided tours is required for certain trekking routes in the event of an encounter with a brown bear ([Shiretoko National Park, 2023](#)). The guided-tour fee is approximately 5000 JPY, which means that visitors must bear a cost comparable to travel costs between alternative recreation sites. If similar higher cost-sharing is implemented at national parks, or if higher user fees are required in response to a shortfall in management revenue, the consideration of the substitution effect will become more important.

Second, it is important to consider the spatial layout and population distribution of national parks when setting user fees. When considering the introduction of user fees, the primary focus is on the quality of recreational services for visitors and the conservation programs that are implemented. These are the purposes of introducing user fees in the first place, and it is natural that the amount of user fees should correspond to the necessary expenses to some extent. Therefore, in the same sense as in the case of benefit transfer ([Rosenberger & Loomis, 2003](#)), it may seem possible to predict the amount of user fees and the range of decrease in the number of users by referring to recreation sites with similar recreation settings where user fees have already been introduced. It may also be the case that the same type of user fees have already been introduced in the same area (state or prefecture), and for administrative reasons, the fees will be set accordingly.

However, in addition to the characteristics of recreation sites, the impact of user fees on the number of visitors is related to visitors' travel costs and their distribution due to the shape of the country, as well as population distribution (in particular, the distance from densely populated areas). Even if the recreational settings are almost the same and so is the amount of user fees, it does not necessarily indicate that the same kind of response will be obtained. Chubu-Sangaku National Park, Minami-Alps National Park and Hakusan National Park are both mountainous national parks with mountains over 2500 m high and have similar recreational settings. However, it is estimated that the introduction of a 1000 JPY user fee would reduce the number of visitors to the former park by 6.95%, whereas it would reduce the number of visitors to the latter two park by 18.33% and 15.52%, respectively. In some cases, it may not be appropriate to set the user fee based on recreational settings alone.

In addition, there are cases where national parks with very different price elasticities are adjacent to each other in the same area, such as the Fuji-Hakone-Izu National Park and Chichibu-Tama-Kai National Park. Even in the same area, the response to the introduction of a user fee in the former is completely different from that in the latter. Setting uniform user fees for administrative reasons may lead to unexpected results.

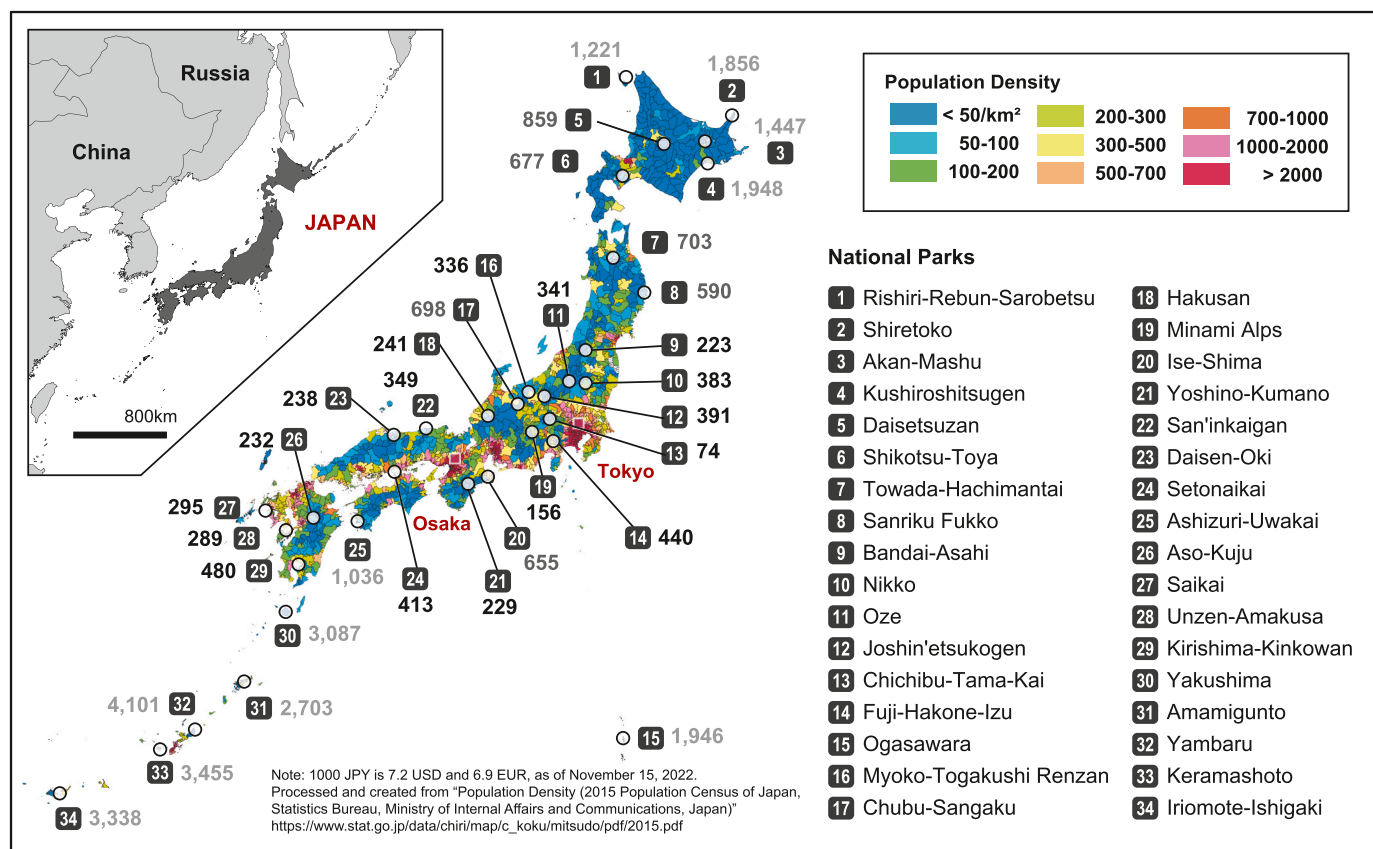


Fig. 3. Maximum amount of user fee when acceptable rate of decrease in the number of users was set at 5% (on the heat map for the Japanese population).

4.4. Limitations and future research

The results of this study, shown in Figs. 1 and 2, suggest that travel costs account for a significant portion of the impact of user fees. The model in this study assumes that people's preferences are homogenous (excluding factors of age and gender), and thus, the results strongly reflect the tendencies of densely populated areas that contain a large number of respondents with similar travel costs. However, individual attributes, such as loyalty, sense of place, place attachment, and nature-relatedness for national parks may contribute to their choice behavior (Chen, Hall, & Prayag, 2021; Halpenny, 2010; Kyle, Absher, & Graefe, 2003; Nisbet, Zelenski, & Murphy, 2008; Zhang, Fu, Cai, & Lu, 2014). For example, several studies found that place attachment affect individuals' attitude and behavior of park visitors (Halpenny, 2010; Kyle et al., 2003). The extent to which they influence choice behavior will need to be examined in more detail. Kuriyama et al. (2010) applied a latent class model that can model recreation demand by segments with heterogeneous preferences; we could consider adopting a similar approach in our future research. For example, a segment with strong nature-relatedness may continue to visit national parks even if high user fees are charged, while segments with weak nature-relatedness may be sensitive to user fees and cancel their visits to national parks in the event that even a nominal user fee is introduced. In addition, if different segments visit different types of national parks, (e.g., respondents with high nature-relatedness tend to visit national parks with richer natural environments), the impact of the user fee may be different from the results shown in Figs. 1 and 2, which is based on an average respondent.

The heterogeneous preferences may be largely related to whether visitors are tourists or excursionists, i.e., visitors with or without overnight stay(s). User fees' impact may affect excursionists more in general, as their travel costs tend to be lower than those of tourists. Further, it is possible that tourists and excursionists expect different activities even if

they visit the same national park, and this may contribute to the impact of user fees. Unfortunately, our survey did not identify whether each visit involved an overnight stay or not. This remains a topic for future research.

Finally, we briefly mention two additional limitations of this study. One is related to the Kuhn-Tucker model and to recreation demand models in general; however, issues with the recreation demand model regarding multipurpose trips and the calculation of travel expenses remain. These details have been organized by Randall (1994). This study does not encompass the choice behaviors of inbound travelers. Given that inbound tourism in Japan has gradually recovered from the COVID-19, it would be valuable to conduct further research that includes foreign travelers.

5. Conclusions

In many countries, budgets for the management of protected areas and nature tourism sites are inadequate; therefore, the degree of dependence on revenue from visitors to cover management costs through user fees is increasing. Understanding the setting of user fee amounts and their impact on the number of visitors is a major scholarly research theme. However, with a few exceptions, previous studies have not considered the existence of alternative recreation sites when setting user fees. The present study proposes a novel approach using a Kuhn-Tucker model to answer the following questions in the presence of alternative recreation sites: by how much will the number of visitors to a recreation site decrease if user fees is introduced to the site? Furthermore, what is the highest user fees that can be imposed on a recreation site if an acceptable rate of decrease in the number of visitors is set? We implemented this approach to user fees being considered for introduction into Japanese national parks.

For the former research question, the results show that the number of

visitors to national parks located in remote areas away from densely populated areas has generally decreased at a much smaller rate, whereas the number of visitors to national parks near densely populated areas has decreased significantly. For the latter research question, the results show that the amount of user fees varies significantly among national parks. These marked differences are assumed to be caused by the properties of the alternative recreation sites: (1) The cost of travel to a remote national park is generally higher than that to a national park near major cities; (2) Japan's topography is long and narrow from the north to the south, and the area around the center of the country is densely populated; and (3) National parks at the northern and southern ends of the country and on the islands tend to be richer in natural environments. The results of this study indicate in some recreation sites, such as Chichibu-Tama-Kai National Park, the introduction of a low user fee can significantly reduce the number of visitors. These findings are difficult to capture using conventional approaches; in this sense, the Kuhn-Tucker model, which can consider the influence of alternative recreation sites and can model the allocation of the number of visits including zero, is effective.

Finally, our approach is highly versatile and can be applied to any type of visiting behavior of tourism sites. That is, this approach is expected to be used not only in the management of protected areas and nature tourism sites, but also by the private sector. For example, theme park operators can apply this technique to predict the drop in attendance due to an increase in admission fees, and compare flow of attendance in a competitively related theme park with their own theme park. Therefore, the present approach is expected to be a useful tool, not only for public land managers, but also for consultants and planners in a wide range of tourism-related industries.

Declaration of Competing Interest

The authors declare that there are no known conflicts of interest associated with this publication and there has been no significant financial support for this work that could have influenced its outcome. However, we would like to refer to the financial support we received.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.annale.2023.100104>.

References

- Agency for Natural Resources and Energy. (2021). Petroleum product survey 2021. Retrieved November 15, 2022 from https://www.enecho.meti.go.jp/statistics/petroleum_and_lpgas/pl007/results.html.
- Andersson, M., Smith, A., Wikberg, Å., & Wheat, P. (2012). Estimating the marginal cost of railway track renewals using corner solution models. *Transportation Research Part A: Policy and Practice*, 46(6), 954–964. <https://doi.org/10.1016/j.tra.2012.02.016>
- Baral, N., Stern, M. J., & Bhattarai, R. (2008). Contingent valuation of ecotourism in Annapurna conservation area, Nepal: Implications for sustainable park finance and local development. *Ecological Economics*, 66(2–3), 218–227. <https://doi.org/10.1016/j.ecolecon.2008.02.004>
- Bhat, C. R. (2005). A multiple discrete-continuous extreme value model: Formulation and application to discretionary time-use decisions. *Transportation Research Part B*, 39(8), 679–707. <https://doi.org/10.1016/j.trb.2004.08.003>
- Bhat, C. R. (2008). The multiple discrete-continuous extreme value (MDCEV) model: Role of utility function parameters, identification considerations, and model extensions. *Transportation Research Part B: Methodological*, 42(3), 274–303. <https://doi.org/10.1016/j.trb.2007.06.002>
- Bockstael, N. E., Hanemann, W. M., & Strand, I. E. (1986). *Measuring the benefits of water quality improvements using recreation demand models* (Vol. 2). Washington DC: U.S. Environmental Protection Agency, Office of Policy Analysis.
- Buckley, R. (2003). Pay to play in parks: An Australian policy perspective on visitor fees in public protected areas. *Journal of Sustainable Tourism*, 11(1), 56–73. <https://doi.org/10.1080/09669580308667193>
- Casey, J. F., Brown, C., & Schuhmann, P. (2010). Are tourists willing to pay additional fees to protect corals in Mexico? *Journal of Sustainable Tourism*, 18(4), 557–573. <https://doi.org/10.1080/09669580903513079>
- Cesario, F. J. (1976). Value of time in recreation benefit studies. *Land Economics*, 52, 32–41. <https://doi.org/10.2307/3144984>
- Champ, P. A., Boyle, K. J., & Brown, T. C. (2017). *A primer on nonmarket valuation*. Dordrecht, the Netherlands: Springer Nature. <https://doi.org/10.1007/978-94-007-7104-8>
- Chase, L. C., Lee, D. R., Schulze, W. D., & Anderson, D. J. (1998). Ecotourism demand and differential pricing of national park access in Costa Rica. *Land Economics*, 74(4), 466–482. <https://doi.org/10.2307/3146879>
- Chen, N. C., Hall, C. M., & Prayag, G. (2021). *Sense of place and place attachment in tourism*. London: Routledge. <https://doi.org/10.4324/9780429279089>
- Chung, J. Y., Kyle, G. T., Petrick, J. F., & Absher, J. D. (2011). Fairness of prices, user fee policy and willingness to pay among visitors to a national forest. *Tourism Management*, 32(5), 1038–1046. <https://doi.org/10.1016/j.tourman.2010.08.016>
- Dharmaratne, G. S., Sang, F. Y., & Walling, L. J. (2000). Tourism potentials for financing protected areas. *Annals of Tourism Research*, 27(3), 590–610. [https://doi.org/10.1016/S0160-7383\(99\)00109-7](https://doi.org/10.1016/S0160-7383(99)00109-7)
- Eagles, P. F. J., McCool, S. F., & Haynes, C. D. (2002). *Sustainable tourism in protected areas: Guidelines for planning and management* (p. 183). Gland, Switzerland and Cambridge, UK: IUCN. <https://portals.iucn.org/library/sites/library/files/documents/PAG-008.pdf>
- Englin, J., Boxall, P., & Watson, D. (1998). Modeling recreation demand in a Poisson system of equations: An analysis of the impact of international exchange rates. *American Journal of Agricultural Economics*, 80, 255–263. <https://doi.org/10.2307/1244498>
- Fujisan World Cultural Heritage Council. (2022). Fujisan conservation donations. Retrieved November 15, 2022 from <https://www.fujisan-3776.jp/en/>.
- Haab, T. C., & McConnell, K. E. (2002). *Valuing environmental and natural resources: The econometrics of non-market valuation*. Northampton, MA: Edward Elgar Publishing.
- von Haefen, R. H., & Phaneuf, D. J. (2003). Estimating preferences for outdoor recreation: A comparison of continuous and count data demand system frameworks. *Journal of Environment and Management*, 45(3), 612–630. [https://doi.org/10.1016/S0095-0696\(02\)00024-4](https://doi.org/10.1016/S0095-0696(02)00024-4)
- von Haefen, R. H., Phaneuf, D. J., & Parsons, G. R. (2004). Estimation and welfare analysis with large demand systems. *Journal of Business & Economic Statistics*, 22, 194–205. <https://www.jstor.org/stable/1392178>
- Halpenny, E. A. (2010). Pro-environmental behaviours and park visitors: The effect of place attachment. *Journal of Environmental Psychology*, 30(4), 409–421. <https://doi.org/10.1016/j.jenvp.2010.04.006>
- Hanemann, W. M. (1978). *A theoretical and empirical study of the recreation benefits from improving water quality in the Boston area*. Dissertation. Harvard University.
- Hausman, J., Leonard, G. K., & McFadden, D. (1995). A utility-consistent, combined discrete choice and count data model: Assessing recreational use losses due to natural resource damage. *Journal of Public Economics*, 56(1), 1–30.
- Herriges, J., & Kling, C. (Eds.). (1999). *Valuing recreation and the environment: Revealed preference methods in theory and practice*. Northampton, MA: Edward Elgar Publishing.
- Herriges, J. A., Kling, C. L., & Phaneuf, D. J. (1999). Corner solution models of recreation demand: A comparison of competing frameworks. In J. A. Herriges, & C. L. Kling (Eds.), *Valuing recreation and the environment: Revealed preference methods in theory and practice* (pp. 25–34). Northampton, MA: Edward Elgar Publishing.
- Hiwasaki, L. (2005). Toward sustainable management of national parks in Japan: Securing local community and stakeholder participation. *Environmental Management*, 35(6), 753–764. <https://doi.org/10.1007/s00267-004-0134-6>
- Kemperman, A. D. A. M., Ponje, M. M. W., & Timmermans, H. J. P. (2005). Analyzing heterogeneity and substitution in trip-making propensity to urban parks: A mixed logit model. *Tourism Analysis*, 10(3), 223–232. <https://doi.org/10.3727/108354205775322925>
- Krinsky, I., & Robb, A. L. (1986). On approximating the statistical properties of elasticities. *Review of Economics and Statistics*, 68, 715–719. doi:1924536.
- Kuriyama, K., Hanemann, W. M., & Hilger, J. R. (2010). A latent segmentation approach to a Kuhn-Tucker model: An application to recreation demand. *Journal of Environmental Economics and Management*, 60(3), 209–220. <https://doi.org/10.1016/j.jeem.2010.05.005>
- Kyle, G. T., Absher, J. D., & Graefe, A. R. (2003). The moderating role of place attachment on the relationship between attitudes toward fees and spending preferences. *Leisure Sciences*, 25(1), 33–50. <https://doi.org/10.1080/01490400306552>
- Laarman, J. G., & Gregersen, H. M. (1996). Pricing policy in nature-based tourism. *Tourism Management*, 17, 247–254. [https://doi.org/10.1016/0261-5177\(96\)00016-7](https://doi.org/10.1016/0261-5177(96)00016-7)
- Louviere, J. J., Hensher, D. A., & Swait, J. D. (2000). *Stated choice methods: Analysis and applications*. Cambridge, UK: Cambridge University Press. <https://doi.org/10.1017/CBO9780511753831>

- Melstrom, R. T., & Vasarhelyi, L. (2019). Modeling recreation demand and fees at national parks. *Annals of Tourism Research*, 77, 175–178. <https://doi.org/10.1016/j.annals.2018.12.020>
- Miller, Z. D., Jorgenson, J., Nickerson, N. P., & Pitas, N. A. (2018). A cognitive hierarchy approach to understanding fee increases in the national parks of the United States. *Journal of Outdoor Recreation and Tourism*, 22, 18–25. <https://doi.org/10.1016/j.jort.2018.02.001>
- Ministry of the Environment in Japan (MOE). (2022). Natural Park system in Japan. Retrieved November 15, 2022, from <https://www.env.go.jp/en/nature/nps/park/>.
- Morey, E. R., Rowe, R. D., & Watson, M. (1993). A repeated nested-logit model of Atlantic salmon fishing. *American Journal of Agricultural Economics*, 75(3), 578–592. <https://doi.org/10.2307/1243565>
- Mulwa, R., Kabubo-Mariara, J., & Nyangena, W. (2017). Recreational value and optimal pricing of national parks: Lessons from Maasai Mara in Kenya. *Journal of Environmental Economics and Policy*, 7(2), 1–19. <https://doi.org/10.1080/21606544.2017.1391716>
- Myoko Environmental Conference. (2022). Voluntary fee for conservation of the natural environment (Japanese). Retrieved November 15, 2022 from <https://www.myokokankyokaigi.jp/fee/1577>.
- National Park Service. (2023). Entrance Fees by Park. Retrieved January 25, 2023, from <https://www.nps.gov/aboutus/entrance-fee-prices.htm>.
- Nisbet, E. K., Zelenski, J. M., & Murphy, S. A. (2008). The nature relatedness scale: Linking individuals' connection with nature to environmental concern and behavior. *Environment and Behavior*, 41(5), 715–740. <https://doi.org/10.1177/00139165083187>
- Nyaupane, G. P., Graefe, A. R., & Burns, R. C. (2007). Understanding equity in the recreation user fee context. *Leisure Sciences*, 29, 425–442. <https://doi.org/10.1080/01490400701394899>
- Ozuna, T., & Gomez, I. A. (1994). Estimating a system of recreation demand functions using a seemingly unrelated Poisson regression approach. *Review of Economics and Statistics*, 76(2), 356–360. <https://doi.org/10.2307/2109892>
- Park, J., Ellis, G. D., Kim, S. S., & Prideaux, B. (2010). An investigation of perceptions of social equity and price acceptability judgments for campers in the US national forest. *Tourism Management*, 31(2), 202–212. <https://doi.org/10.1016/j.tourman.2009.02.012>
- Parsons, G. R., Jakus, P. M., & Tomasi, T. (1999). A comparison of welfare estimates from four models for linking seasonal recreation trips to multinomial logit models of site choice. *Journal of Environmental Economics and Management*, 38, 143–157. <https://doi.org/10.1006/jeem.1999.1083>
- Peters, H., & Hawkins, J. P. (2009). Access to marine parks: A comparative study in willingness to pay. *Ocean and Coastal Management*, 52(3–4), 219–228. <https://doi.org/10.1016/j.ocecoaman.2008.12.001>
- Phaneuf, D. J., Kling, C. L., & Herriges, J. A. (2000). Estimation and welfare calculations in a generalized corner solution model with an application to recreation demand. *Review of Economics and Statistics*, 82, 83–92. <https://doi.org/10.1162/003465300558650>
- Phaneuf, D. J., & Siderelis, C. (2003). An application of the Kuhn–Tucker model to the demand for water trail trips in North Carolina. *Marine Resource Economics*, 18, 1–14. <https://www.jstor.org/stable/42629380>
- Phaneuf, D. J., & Smith, V. K. (2005). Recreation demand models. In K.-G. Mäler, & J. R. Vincent (Eds.), *Handbook of environmental economics: Valuing environmental changes* (pp. 671–761). Amsterdam: North-Holland. [https://doi.org/10.1016/S1574-0099\(05\)02015-2](https://doi.org/10.1016/S1574-0099(05)02015-2)
- Randall, A. (1994). A difficulty with the travel cost method. *Land Economics*, 70(1), 88–96. <https://doi.org/10.2307/3146443>
- Reid-Grant, K., & Bhat, M. G. (2009). Financing marine protected areas in Jamaica: An exploratory study. *Marine Policy*, 33(1), 128–136. <https://doi.org/10.1016/j.marpol.2008.05.004>
- Reynisdottir, M., Song, H., & Agrusa, J. (2008). Willingness to pay entrance fees to natural attractions: An Icelandic case study. *Tourism Management*, 29(6), 1076–1083. <https://doi.org/10.1016/j.tourman.2008.02.016>
- Rosenberger, R. S., & Loomis, J. B. (2003). Benefit transfer. In P. A. Champ, K. J. Boyle, & T. C. Brown (Eds.), *A primer on nonmarket valuation* (pp. 445–482). Dordrecht, the Netherlands: Springer Nature. https://doi.org/10.1007/978-94-007-0826-6_9
- Sánchez, J. J., Baerenklau, K., & González-Cabán, A. (2016). Valuing hypothetical wildfire impacts with a Kuhn–Tucker model of recreation demand. *Forest Policy and Economics*, 71, 63–70. <https://doi.org/10.1016/j.forpol.2015.08.001>
- Schroeder, H. W., & Louviere, J. (1999). Stated choice models for predicting the impact of user fees at public recreation sites. *Journal of Leisure Research*, 31(3), 300–324. <https://doi.org/10.1080/00222216.1999.11949869>
- Schuhmann, P. W., Skeete, R., Waite, R., Lorde, T., Bangwayo-Skeete, P., Oxenford, H. A., ... Spencer, F. (2019). Visitors' willingness to pay marine conservation fees in Barbados. *Tourism Management*, 71, 315–326. <https://doi.org/10.1016/j.tourman.2018.10.011>
- Schwartz, Z., & Lin, L.-C. (2006). The impact of fees on visitation of national parks. *Tourism Management*, 27(6), 1386–1396. <https://doi.org/10.1016/j.tourman.2005.12.015>
- Shiretoko National Park. (2023). World Natural Heritage Site: Shiretoko Goko Lakes. Retrieved January 25, 2023, from https://www.goko.go.jp/multilingual_eng.
- Shoji, Y., Kim, H., Kubo, T., Tsuge, T., Aikoh, T., & Kuriyama, K. (2021). Understanding preferences for pricing policies in Japan's national parks using the best–worst scaling method. *Journal for Nature Conservation*, 60, Article 125954. <https://doi.org/10.1016/j.jnc.2021.125954>
- Statistics Bureau of Japan. (2019). Family Income and Expenditure survey 2019 (Japanese). Retrieved November 15, 2022 from <https://www.stat.go.jp/english/data/kakei/>.
- Wales, T. J., & Woodland, A. D. (1983). Estimation of consumer demand systems with binding non-negativity constraints. *Journal of Econometrics*, 21, 263–285. [https://doi.org/10.1016/0304-4076\(83\)90046-5](https://doi.org/10.1016/0304-4076(83)90046-5)
- Watson, J. M. E., Dudley, N., Segan, D. B., & Hockings, M. (2014). The performance and potential of protected areas. *Nature*, 515, 67–73. <https://doi.org/10.1038/nature13947>
- Weaver, D. B., & Lawton, L. J. (2017). A new visitation paradigm for protected areas. *Tourism Management*, 60, 140–146. <https://doi.org/10.1016/j.tourman.2016.11.018>
- Yakushima Mountain Environmental Management Council. (2022). Yakushima's Mountain Environmental Conservation Donation program. Retrieved November 15, 2022 from <http://yakushima-tozan.com/english/>.
- Zhang, H., Fu, X., Cai, L. A., & Lu, L. (2014). Destination image and tourist loyalty: A meta-analysis. *Tourism Management*, 40, 213–223. <https://doi.org/10.1016/j.tourman.2013.06.006>
- Zou, S. W. (2020). National park entrance fee increase: A conceptual framework. *Journal of Sustainable Tourism*, 28(12), 2099–2117. <https://doi.org/10.1080/09669582.2020.1791142>

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