Ecological Economics 144 (2018) 124–128

Contents lists available at ScienceDirect

Ecological Economics

journal homepage: www.elsevier.com/locate/ecolecon

Analysis

Voluntary Contributions to Hiking Trail Maintenance: Evidence From a Field Experiment in a National Park, Japan

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ARTICLE INFO

JEL Classification:
C93
H41
Q28
Q50

Keywords:
Donation
Field experiment
Information provision
National park
Park management
Voluntary contribution

ABSTRACT

Donation is one of the most important solutions to inadequate funding for protected area management; however, there has been little agreement on the measures to be used to encourage visitors to donate. We conducted a field experiment in Daisetsuzan National Park, Japan, to examine the effect on donation behavior of providing information about two types of initial contributions. The first type of contribution is toward the fundraising campaign for trail maintenance and the initial amount of government funding (i.e., seed money) and information is provided about the target amount. The second type is for trail maintenance and information is provided on the value of one day's contribution by other participants. We found that announcing the seed money amount and the target significantly increased the probability of a positive contribution and raised the average contribution, compared with the control treatment of no additional announcements. When the participants knew others' contribution beforehand, the likelihood of a positive contribution increased; however, the average contribution tended to decrease. In conclusion, announcing the seed money and the fundraising target is superior to the other measures studied in this paper to raise funds in this specific context of protected area management.

1. Introduction

1.1. Study Background

With increased demand for biodiversity conservation and maintenance of ecosystem services, the coverage of protected areas expanded rapidly. By 2030, protected areas are likely to reach 15–29% of the surface area of the earth (Chape et al., 2005; Li et al., 2013; McDonald and Boucher, 2011). However, most protected areas do not receive sufficient funding for their management, even though their value has been realized (Emerton et al., 2006). Although these insufficient situations are mostly reported in developing countries (Emerton et al., 2006), other countries also face the challenges of sustainable park management because of poor funding. For example, Olympic National Park in the U.S. needed $13.3 million to operate the park; however, only $7.8 million was available (NPCA, 2015). The Japanese national parks face the same problems, and the government declared a law in 2015 that allows local communities to collect an entrance fee to resolve these problems (Ministry of the Environmental, Japan, 2015). Especially, insufficient funding has significant impacts on the maintenance of trails, visitor centers, and other facilities, and leads to a lack of development of new protected areas even if the costs are relatively small. Although donation or voluntary contribution is one of the most important options to aid in sustainable management of protected areas (Emerton et al., 2006; Thur, 2010), there is still much room to improve fund raising measures in most countries.

This paper analyzes the nature of measures that encourage people to donate for park management using a field experiment. That is, we investigate the effects of announcing previous contributions by park visitors at a national park, Japan, using a field experiment. In particular, we evaluate the effect of providing information about the target for the fundraising campaign for trail maintenance and the initial amount of government funding (hereafter *SEED*), as well as information about the amount contributed in one day by other participants to trail maintenance (hereafter *PREV*). As described further below, some field experimental studies have been carried out on the effect of information provision on the decision-making of park visitors about their contributions. However, no studies have investigated the effect of information about seed money and the amount of previous contributions, rather than that of a typical contribution.

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http://dx.doi.org/10.1016/j.ecolecon.2017.07.032
Received 20 November 2016; Received in revised form 14 June 2017; Accepted 29 July 2017
Available online 08 August 2017

1.2. Literature Review

In response to the lack of adequate financial resources of protected areas, a growing body of literature addresses finance mechanisms (e.g., entrance fee; voluntary contributions) using environmental valuation methods. Baral et al. (2008), for example, conducted a contingent valuation (CV) survey to estimate visitors' willingness to pay (WTP) a candidate entry fee at Annapurna Conservation Area, Nepal. They found that most visitors were willing to pay a higher than the current entry fee, and that their WTP were associated with their family size, their satisfaction, use of a guide, and group size. Similarly, Baral and Dhungana (2014) used a CV method and found that over 60% of visitors were willing to pay higher than the current entry fees in the same area. In Ecuador's Galapagos National Park, Viteri Mejía and Brandt (2015) used a choice experimental survey and found that tourists were willing to pay 2.5 times more for a tour with a high level of protection against invasive species than for a current tour. Their findings suggest that charging new access fees adjusts the number of tourists and reduces the risk of invasive species without revenue loss. As described above, the findings from many stated preference studies suggest that the implementation of new finance mechanisms could improve the financial conditions of protected areas.

However, stated preference studies have been the subject of criticism due to potential biases. One of the significant biases is *hypothetical bias*: the willingness to pay stated by respondents on a survey differs from their actual payment (see Foster and Burrows, 2017; Murphy et al., 2005). Thus, some policy makers are reluctant to implement a policy based on findings from stated preference studies. To address the bias and introduce an evidence-based policy, field experiments have received much attention recently; this is due to their substantial advantages in increasing external validity along with examining real world contexts (Harrison and List, 2004; List and Metcalfe, 2014; List and Price, 2016). That is, field experiments can empirically evaluate the influence of some policy interventions in a real world context and advert to the causal relationship between implemented policies and outcomes. The findings from field experiments are forthright and provide comprehensible information to policy makers.

Despite the substantial advantages of field experiments, surprisingly few applications have been conducted in the context of park and protected area management. Thus, there is still much room for improvement in understanding the contribution behavior of visitors in parks and protected areas. To our knowledge, only Alpizar and his colleagues have analyzed park visitors' donation behavior at a national park (Alpízar et al., 2008a, b; Alpízar and Martinsson, 2012, 2013). In terms of announcing contributions, Alpízar et al. (2008a) have shown that announcing the low typical contribution of others (i.e., $2) increased the probability of a contribution and decreased the conditional–given a positive–contribution, compared with no announcement; conversely, announcing a high typical contribution (i.e., $10) increased the conditional contributions. They have also found that participants' contributions increased when obtained in front of a solicitor instead of in private; further, giving a gift to participants increased the probability of a contribution and decreased the conditional contribution. Alpízar et al. (2008b) conducted a field experiment and a CV survey to evaluate the effects of information provision about a typical previous contribution by other visitors, and investigated the difference in actual and hypothetical contributions. Although they found a hypothetical bias concerning the amount of contributions, they found that information provision increased the share of positive contribution and decreased the conditional and sample average contribution in both approaches. Further, they investigated the effect of anonymity of donations using both approaches and did not find clear differences between anonymous and non-anonymous contributions.

There has been an increasing amount of experimental studies focused on behavior related to contributions (e.g., donations) in other areas. Especially, many recent studies have investigated the nature and manner of information provision that encourage donors to contribute more. Seed money, for example, is one of the best-known approaches (Gneezy et al., 2014). Researchers show that publicly announced seed money increases the number of contributors and the amount of contributions (List and David, 2002; Rondeau and List, 2008), which is consistent with theoretical predictions (Andreoni, 1998). Another popular approach is providing information about the contributions of other contributors. For example, Shang and Croson (2006) announced typical contributions to a radio station and used a field experiment to show that their highest reference amount resulted in a higher contribution. Further, Martin and Randal (2008) revealed the amount of contributions to visitors at an art gallery, and found that the average donation increases when a larger contribution amount is displayed. However, to the best of our knowledge, no previous studies have attempted to compare the influences of information about the initial amount of government funding with information about the amount contributed in one day by other participants, as is done in this present study.

2. Design

2.1. Research Site

The surveys were conducted at the Numameguri Hiking Trail (NHT) in the Daisetsuzan National Park, Japan, in mid-September 2015. This is the largest Japanese terrestrial park, receiving approximately 5 million visitors per year (Ministry of the Environmental, Japan, 2016). Visitors are not charged any entrance fee. The NHT is one of the most popular hiking trails in the park because of the beautiful color of leaves in fall. However, visitors face a high risk of bear attacks; thus, they are requested to attend a lecture at an information center at the trailhead before hiking (for detail, see Kubo and Shoji, 2014). In addition, they need to be registered before hiking and are required to report their safety after hiking using a logbook. The NHT faced the risk of an insufficient management budget, especially due to reduced government funding over the last few years. A donation box at the information center was provided to cover the budget shortfall; however, it accumulated only a few thousand JPY[1] per year until 2015 (personal communications with park staffs in July 2015). Thus, it was necessary for park authorities to find new measures to encourage park visitors to donate to the park management.

2.2. Experimental Design

When all participants (park visitors) reported their safety using the logbook at the trailhead, park staff informed them about the trail maintenance and potential voluntary fees at the park. All participants in the field experiment were requested to answer the questionnaires, which comprised questions concerning individuals' characteristics and their contributions to trail maintenance. In the experiment, participants were randomly allocated to three groups: the control, *SEED*, and *PREV*. To control observable and unobservable differences across days, two treatments were implemented in a day (see Appendix 1 for detail). First, participants in the control treatment received information about the current situation and maintenance of the trail. The necessity of fund raising to maintain the trails of the park was also described. Participants were asked to write their contributions on the questionnaire and put the same amount of money into the brown envelope with their questionnaires; then, they were asked to put their envelope into a white (non-transparent) box. Even if participants were not willing to donate, they answered the questionnaires, put them into the envelope, and placed the envelope into the box. The condition was not perfectly anonymous (even though brown envelopes were used so as not to see

[1] JPY: Japanese Yen; 100 JPY = 0.83 USD in September 2014.

each other's contributions), since there were some park staff and volunteers around to monitor their safety and distribute the questionnaires. The questionnaires that participants in the *SEED* treatment received had additional information about the seed money (500,000 JPY) and the fundraising target (a million JPY) in the current year. That is, they were informed that the governmental agencies and non-government agencies that were involved in park management had already covered half of the target. The remaining information and the operations were the same as for the control treatment. Finally, the questionnaires that participants in the *PREV* treatment received had the same information as the control treatment; however, participants were shown the amount that other participants had contributed during the first day of the experiment (40,088 JPY) by using a transparent box and bags, instead of a white box. Thus, participants were able to see a variety of contributions from 1 JPY coins to 1000 JPY notes. Appendix 2 shows the description that was included with the questionnaires. We excluded visitors on an organized tour from our samples, in accordance with previous studies (Alpízar and Martinsson, 2013).

3. Results

3.1. Summary Statistics

Table 1 shows the number of participants per experiment for each treatment and their characteristics.

3.2. Results of the Field Experiments

Table 2 presents summary statistics of the results for the three experimental treatments. Since there was only one outlier that paid 10,000 JPY while others donated less than 1000 JPY, we excluded the outlier from the analysis. Table 2 shows the distributions of contributions after this removal.

Of the 934 participants, 707 participants positively donated and raised a total of 32,5045 JPY. In the control treatment, 67.5% of participants donated. Furthermore, the sample average contribution was 311.3 JPY and the average conditional contribution was 461 JPY. In the *SEED* treatment, the share and the sample average contribution significantly increased to 81.6% ($F = 16.2$, $p = 0.00$) and 396.7 JPY ($z = -3.66$, $p = 0.00$), respectively. The conditional average contribution of the *SEED* treatment (486.1 JPY) was not statistically different from the control treatment, although it was higher than the control treatment. As for the *SEED* treatment, the share and the sample average contribution of the *PREV* treatment also significantly increased to 78.0% ($F = 8.56$, $p = 0.00$) and 336.3 JPY ($z = -2.14$, $p = 0.03$), respectively. However, the average conditional contribution of the *PREV* treatment (431.4 JPY) was smaller than the control treatment, even though the difference was not statistically significant.

Next, we conducted regression analyses to confirm the effects of announcing the initial and previous contributions and to control for observable and unobservable differences among participants. As described in Table 3, the above result was mostly supported by the regression analyses, although the *PREV* variable is not statistically significant. In addition to the confirmation of the above findings, the result of the regression analyses showed that older people were more likely to donate and contributed more; local people were less likely to donate and contributed less.

Table 1
Comparison of control and treatment groups.

	Control	*SEED*	*PREV*	Total
Participants	311	310	314	935
District of residence (%)				
Local: Hokkaido	192 (62.5%)	189 (61.6%)	202 (65.0%)	583 (63.0%)
Others	115 (37.5%)	118 (38.4%)	109 (35.0%)	342 (37.0%)
Gender (%)				
Male	147 (48.2%)	176 (58.1%)	160 (51.9%)	483 (52.7%)
Female	158 (51.8%)	127 (41.9%)	148 (48.1%)	433 (47.3%)
Age (%)				
10–19	9 (2.9%)	0 (0.0%)	2 (0.6%)	11 (1.2%)
20–29	5 (1.6%)	7 (2.3%)	14 (4.5%)	26 (2.8%)
30–39	42 (13.5%)	25 (8.1%)	26 (8.3%)	93 (9.9%)
40–49	73 (23.5%)	73 (23.5%)	57 (18.2%)	203 (21.7%)
50–59	69 (22.2%)	70 (22.6%)	86 (27.4%)	225 (24.1%)
60–69	74 (23.8%)	91 (29.4%)	102 (32.5%)	267 (28.6%)
Over 70	35 (11.3%)	40 (12.9%)	24 (7.6%)	99 (10.6%)

Table 2
Summary of results.

	Control	*SEED*	*PREV*[a]
Participants	311	310	313
Contributors	210	253	244
Share	67.5%	81.6%	78.0%
Total JPY Raised	96,818	122,972	105,255
Sample average contribution (JPY)	311.3	396.7	336.3
Conditional average contribution (JPY)	461.0	486.1	431.4
		Vs. control	Vs. control
The share of contributors[b]	–	16.2 (0.00)	8.56 (0.00)
Sample average contribution (JPY)[c]	–	−3.66 (0.00)	−2.14 (0.03)
Conditional average contribution (JPY)[c]	–	−0.89 (0.37)	0.26 (0.79)

[a] A field experimental survey has only one outlier who paid 10,000 JPY; we have excluded this outlier from the sample.
[b] F-value from Chi square test and *p*-value in parentheses.
[c] z-value from Wilcoxon-Mann-Whitney test and *p*-value in parentheses.

4. Discussion and Concluding Remarks

This study aimed to determine the effects of announcing *SEED* and *PREV* on voluntary contributions to trail maintenance in the national park. This is one of the first studies conducting a field experiment to investigate both effects at the same time. Thus, we will consider and then compare the effects of each treatment.

On the question of how the announcement of *SEED* funding affected

Table 3
Coefficients for estimated models on donations (standard errors in parentheses).

	Donation decision (probit)	Conditional contribution (OLS)	Sample contribution (OLS)
Observations	905	683	905
SEED	0.433***	12.71	73.87***
	(0.113)	(31.02)	(27.86)
PREV	0.344***	−34.47	28.50
	(0.111)	(31.08)	(27.69)
Age	0.0902***	46.85***	46.51***
	(0.0344)	(9.671)	(8.564)
Male	−0.142	26.89	3.130
	(0.0934)	(24.97)	(22.77)
Local	−0.235**	−132.2***	−134.6***
	(0.0972)	(25.29)	(23.33)
Constant	0.230	298.0***	165.2***
	(0.189)	(53.95)	(47.73)
Log likelihood	−488.45721		
Pseudo R2/ adjusted R-square	0.0312	0.0699	0.0691

Note: significance is indicated by ***, ** and * for the 1, 5, and 10% levels of confidence, respectively.

contributions: this study found that it increased the share of people who had positive donations and raised sample average contributions, while the effect on conditional contributions were unclear. That is, the increase in the total contributions relied on the ratio of people who donated, not on the average individual amount. These findings are consistent with findings from theoretical research (Andreoni, 1998; Landry et al., 2006) and other field experimental research (List and David, 2002; Rondeau and List, 2008). Since it is known that seed money is a generally effective mechanism to raise funding when project cost is fixed (Andreoni, 1998; Bracha et al., 2011), our findings indicate that the announcement of seed money is a useful mechanism for park management as well. This follows because most national parks have a certain budget within which the management cost needs to be fixed before implementation (e.g., trail maintenance cost). Our findings suggest that park authorities share information related to seed money and fundraising targets with park visitors to enhance funding. Still, we could not determine whether the 50% seed funding allocation was optimal, since practical constraints compelled us to fix the percentage of seed money in our experiment. Thus, further research is needed to investigate the effect of the initial amount of seed money that is available.

Publicly announced *PREV* increased the ratio of people who donated as well as the sample average contributions, although the parameter was not statistically significant in the regression model. Surprisingly, the conditional average contribution of *PREV* was smaller than that of the control, and the parameter of *PREV* was negative although both were not statistically significant. That is, this result implies that *PREV* could have a negative influence on fundraising campaigns in this specific park management context. A possible explanation for this is that participants to whom *PREV* were announced perceived the others' contribution as smaller than the reality. That is, participants could consider that more people donated a smaller amount than what was done in this field experiment, because the initial donations contributed by other participants on the first day of the experiment included a small amount of coins (e.g., 1 JPY coins). In this instance, we did not only announce the number of contributors but also showed the amount of the donations on the first day, so as to have practical implications. Martin and Randal (2008) found that the composition of the initial contents approximately reflected the composition of the donations by participants in the context of their art gallery experiment. While it is beyond the scope of this study, examining how participants perceived the donations could be an interesting future study.

To summarize the above findings: announcing the seed money and the fundraising target is a superior measure for raising funds to achieve sustainable park management.

We note some interesting findings from the field experiment that also have important implications for the understanding of actual donation behaviors. First, all treatments have three peaks in the distribution of their contributions—0, 500, and 1000 JPY—as described in Fig. 1. A possible explanation is that it is easy for people to choose these donations because 500 and 1000 are round numbers and because there are 500 JPY coins and 1000 JPY bills in Japan. Next, the findings from the regression analysis show that older and non-local participants contributed more than others. This is not surprising and supports previous studies (e.g., Johnston et al., 2006)—older people's income tend to be higher than that of younger people, and the higher travel costs of non-local tourists imply that they have greater motivations to hike on the mountains. However, these findings have practical implications for collection measures. That is, a few Japanese national parks have asked

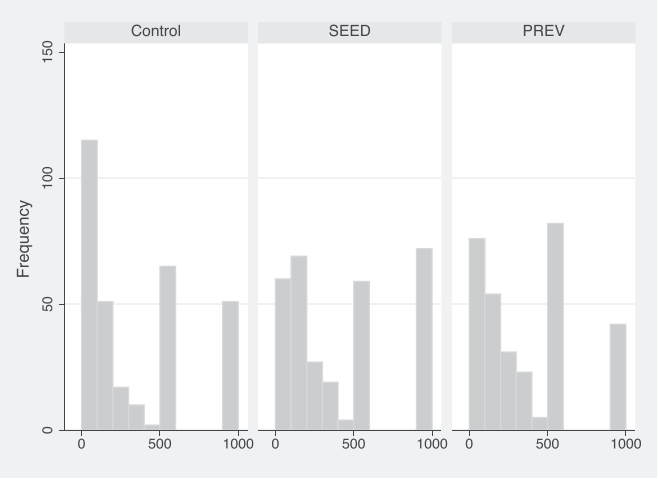

Fig. 1. Distribution of contributions by each treatment.

tourists to contribute some fixed amount; however, the above findings suggest that uniform contributions are not preferred, even when using an effective mechanism such as *SEED*. Finally, the proportion of respondents willing to donate anything was surprisingly larger compared with previous visitors' donations at the NHT. This could be because park staff were around people to check their safety and to distribute the questionnaires. To consider the finding from a practical management perspective, the benefits of these measures—that is, to gather donations by means of park staff—can exceed the costs, especially because the NHT needs to hire some staff to ensure visitor safety regardless of whether or not the experiments are conducted. Future research needs to investigate and confirm the effect of other people around participants in Japan. The study conducted by Alpizar and his colleagues would be a good reference, since they have found that the occurrence of solicitors increased individual contributions and participation rates in Costa Rica (Alpízar and Martinsson, 2013).

To date, most parks have faced financial shortages for park management, even in developed countries. Our findings show that announcing the seed money and the fundraising target is a superior measure by means of which to raise funding for sustainable park management. Since this study was conducted in the specific context of protected areas, this is just a step on the way toward understanding donation behavior. Further studies need to investigate the effect of announcing previous contributions to raise findings in other fields.

Acknowledgement

The authors would like to thank park staffs at Daisetsuzan National Park for their helpful comments and suggestions. We appreciate the helpful comments of Dr. Adamowicz of the University of Alberta on the early version of this paper. We are grateful to seminar participants at the 2016 Society for Environmental Economics and Policy Studies, Japan and the 2016 Applied Economics Workshop at Keio University. This work was supported by Ministry of the Environment, Government of Japan (the Environmental Economics and Policy Study) and the Japan Society for the Promotion of Science (Grant Number 16K00697).

Appendix 1. Treatment types

Appendix 1
The days on which treatments were implemented.

	Day 1	Day 2	Day 3	Day 4	Day 5
Control	42	76	109	84	
SEED	51		159		100
PREV		66		113	134

Appendix 2. Questionnaire

Note: the questionnaire that was distributed is outlined below. Only the SEED treatment contained the text in brackets.

Through sharing of responsibilities and cooperation, administrative agencies and private organizations carry out the maintenance and management of mountain trails in the Kamikawa district of Daisetsuzan National Park, including the Numameguri Hiking Trail. Administrative agencies and private groups are assigned an annual budget of over 10 million JPY for patrolling and upkeep of activities; however, as the total length of trails is considerable, adequate maintenance and management cannot be performed.

Therefore, beginning in 2015, the "Liaison Council for the Maintenance and Management of Mountain Trails"—formed by administrative agencies and civilian organizations—began seeking donations and conducting fundraising through the establishment of the "Mountain Trails Maintenance Account." Its purpose is to strengthen nature conservation initiatives by mountain trail maintenance through allotting funds for the purchase of sufficient trail maintenance materials. For example, this year, ten wooden walkways were installed on the Numameguri Hiking Trail using these funds, as countermeasures against mud [while funds of over 500,000 JPY have been raised this year, the goal for total donations and fundraising stands at one million JPY].

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