



Anna Bartczak • Tomasz Żylicz

WILLINGNESS TO PAY FOR FOREST CLEANING IN POLAND. RESULTS FROM A CONTINGENT VALUATION SURVEY

Anna Bartczak, Ph.D.

– University of Warsaw

Prof. Tomasz Żylicz, Ph.D.

– University of Warsaw

correspondence address:

Faculty of Economic Science

Warsaw Ecological Economics Center

00-241 Warsaw, Długa 44/50

e-mail: bartczak@wne.uw.edu.pl

GOTOWOŚĆ DO PŁACENIA ZA SPRZĄTANIE LASÓW W POLSCE. WYNIKI BADANIA WYCENY WARUNKOWEJ

STRESZCZENIE: Rekreacja należy do najważniejszych usług ekosystemowych lasów przynoszących znaczące korzyści dla społeczeństwa. W artykule tym skupiamy się na problemie zaśmiecenia, jako czynnika obniżającym jakość wizyt w lasach. Przy zastosowaniu metody wyceny opartej na preferencjach zadeklarowanych obliczamy gotowość do płacenia (z ang. *Willingness To Pay* – WTP) za zmniejszenie tego problemu. W tym celu przeprowadziliśmy badanie ankietowe na dużej próbie osób odwiedzających lasy. Badanie odbyło się w terenie, respondentami były osoby odwiedzające poszczególne lasy. Wybraliśmy pięć lasów znajdujących się w sąsiedztwie średniej wielkości aglomeracji miejskich. Respondenci zostali poproszeni o odpowiedzi na pytania otwarte dotyczące ich WTP za zmniejszenie zanieczyszczenia w lesie. Zastosowano dwa takie pytania: pierwsze odnosiło się do zmniejszenia zaśmiecenia w odwiedzanym przez respondenta lesie, drugie zaś dotyczyło zmniejszenia zaśmiecenia lasów w całym województwie. W pierwszym przypadku gotowość do zapłaty oszacowano na 27 PLN (6.75 €), w drugim zaś na 36 PLN (9.00 €) w postaci wzrostu rocznych lokalnych podatków. W analizie wykorzystano model regresji interwałowej. Otrzymane wyniki zostały omówione w kontekście innych badań dotyczących rekreacji i zaśmiecenia w Polsce

SŁOWA KLUCZOWE: usługi ekosystemowe, zaśmiecenie lasu, rekreacja w lasach, wycena nierynkowa, preferencje zadeklarowane

Introduction

Visiting forests and related recreation activities play an important role in Poland's consumer surplus. The recreation value of Polish forests was estimated several times using Travel Cost and other methods. Some of these studies were focused on the Bialowieza Primeval Forest.¹ One of them – based on ten different study areas – demonstrated that the value of forest recreation on a per hectare and on a per visit basis is much higher in Poland than in other European countries.² Contrary to earlier hypotheses³, it revealed that people's Willingness To Pay (WTP) for forest recreation is higher than in Western Europe.

While the high value attached to forest recreation in Poland may result from some country-specific characteristics, an interesting question is to what extent this value relates to forest-specific features. Using Choice Experiments, one recent study⁴ linked people's WTP to such site-specific – mainly biological – features as species composition, age, tree-stand density and so on.

This study focuses on littering which is an important aspect of a 'non-biological' feature of a forest. Littering has emerged as one of the most visible disamenities observed by forest visitors. At the same time, it is likely to be even more important in the future, since the government of Poland introduced new household waste legislation. According to its proponents, local authorities will be more effective at channelling waste flows into legal procedures. However, according to the opponents, the new legislation will result in an even stronger tendency for 'midnight dumping' and thus even more littered forests.

Forest littering in Poland includes not only plastic bags and napkins, but all types of beverage containers, furniture, refrigerators, car tyres, and even car bodies. Forest littering has attracted the attention of researchers at least since the 1970s⁵. There have been analyses of organic littering and its impact on ecosystem services⁶. There have also been studies of people's preferences with respect to plastic bag littering⁷ (e.g. Convery et al. 2007). Nevertheless, up to the best of our knowledge, there have been no systematic analyses of people's preferences with respect to forest littering. The Polish study attempts to address this problem by using mainly stated preference methods.

¹ See e.g.: M. Czajkowski, M. Buszko-Briggs, N. Hanley, *Valuing changes in forest biodiversity*, "Ecological Economics" 2009 no. 68(12), p. 2910-2917.

² A. Bartczak et al., *Valuing forest recreation on the national level in a transition economy: The case of Poland*, "Forest Policy and Economics" 2008 no. 10(7-8), p. 467-472.

³ *European Forest Sector Outlook Study 1960 – 2000 – 2020*, Main report, Geneva 2005.

⁴ T. Żylicz, M. Giergiczny, *Wycena pozaprodukcyjnych funkcji lasu*, Raport końcowy dla Generalnej Dyrekcji Lasów Państwowych, Warszawa 2014.

⁵ See e.g.: S. L. Crump, D. L. Nunes, E. K. Crossman, *The Effects of Litter on Littering Behavior in a Forest Environment*, "Environment and Behavior" 1977 no. 9(1), p. 137-146.

⁶ For a summary see: K. Thompson, *Life after death: the role of litter in ecosystems*, "Functional Ecology" 2011, www.functionalecology.org [20-09-2014].

⁷ See e.g.: F. Convery, S. McDonnell, S. Ferreira, *The most popular tax in Europe? Lessons from the Irish plastic bags levy*, "Environmental and Resource Economics" 2007 no. 38(1), p. 1-11.

Survey design and data

In July 2009 focus group meetings were conducted at the University of Warsaw in order to determine patterns of forest visitations, as well as specific reasons for choosing alternative locations. There were four such meetings each involving four subjects. This exercise convinced us that there were basically two key characteristics letting Poles choose among alternative forest locations. As anticipated by economic theory, distance emerged as the most important single attribute of a forest considered. In addition, focus groups demonstrated that littering was the second most important forest attribute considered by prospective visitors. This prompted us to design a survey to calculate WTP for reduced forest littering.

Carried out by a professional polling agency in October-November 2009, the survey included 709 respondents met in five forest locations in Poland. The five forests can be considered representative for different habitats and neighbourhoods. They are located in the vicinity of towns serving as regional administrative capitals. There are 16 such units in Poland. The regions vary with respect to the average forestation rate, species composition, and protection regime. Table 1 summarizes geographical and conservation characteristics of these sites.

Lasy Kozłowieckie (near Lublin) serve as an example of a forest in a mainly agricultural region where urban population has relatively low opportunities to select a place to visit. At the other extreme, visitors in Lasy Zielonogorskie (near Zielona Góra) have such opportunities available in abundant supply. Many forested areas subject to a particular tourist pressure are protected as 'Landscape Park' (a protection regime lower than that of a 'National Park'). However, one of the sites selected (Lasy Zielonogorskie) does not enjoy any specific protection regime.

Table 1
Characteristics of the forest sites

| | Site | Protection regime | Forest type | Dom. species | Town (inhabitants) | Regional forest rate [%] |
|---|---------------------|-------------------|-------------|--------------|------------------------|--------------------------|
| 1 | Puszcza Supraska | Landscape park | Conifer. | Pine, Spruce | Białystok (294,000) | 33 |
| 2 | Lasy Kozłowieckie | Landscape park | Mixed | Oak, Pine | Lublin (352,000) | 14 |
| 3 | Puszcza Kozienicka | Landscape park | Mixed | Oak, Pine | Radom (225,000) | 25 |
| 4 | Puszcza Bukowa | Landscape park | Broad-leaf. | Beech | Szczecin (408,000) | 32 |
| 5 | Lasy Zielonogorskie | none | Conifer. | Pine | Zielona Góra (118,000) | 49 |

Source: own elaboration.

Forest visitors were randomly polled along main paths, picnic areas and parking places during the day time and all days of the week. The target group was limited to adults only who came to the forest for recreation purposes. The questionnaire, which was tested in a pilot version by interviewing 50 respondents and evaluated by forest experts, consisted of two main components with the first one aimed at revealing forest visit patterns and the second part aimed at soliciting peoples' willingness to pay for reducing forest littering. The analysis presented in this paper is based on this second – Contingent Valuation (CV) – part. The scenario in the CV part referred to prevention, as well as to clean-up, since prevention can never be fully effective. Specific wording used was as follows.

“Our programme of keeping the forests tidy envisages hiring workers who remove the litter as well as those who try to prevent illegal dumping. In addition, it requires investing in equipment, such as e.g. nice looking garbage bins located by the forest entrances/exits. The cost of the programme will be partially financed by the fines imposed on those convicted of littering. Nevertheless the programme requires additional local taxes. The central government budget cannot be relied on in this case. The increased local tax revenues will go to the district forest management units ('nadesnictwa') and they will be earmarked for clean-up activities. The programme will be monitored by external specialists. Its effects – i.e. the litter-free forest – will be visible in several months. However, in order to maintain these effects, the programme should be financed on a permanent basis.”

There were two WTP questions asked. One referred to the programme of reduced littering in the forest visited, and the second one to a wider programme of reduced forest littering in the entire administrative region. The elicitation format was a payment ladder with zero and 14 positive bids, selected along an exponential scale. Respondent could also choose the option 'It is hard to say'. The payment mechanism was described as the annual tax paid lifetime. A series of debriefing questions was used in order to identify protest responses.

The model

Since the WTP question referred to respondent's maximum Willingness To Pay identified on a payment ladder, we used interval regression model (with 0 as the lower bound for the lowest interval and BID+1 as the upper bound for the highest interval).

The model can be written as:

$$y^* = x\beta + \varepsilon, \varepsilon \sim N[0, \sigma^2]$$

$$y = j \text{ if } A(j) \leq y^* \leq A(j+1) \text{ and } j = 0, 1, 2, \dots \quad (1)$$

where y – indicates the WTP, x – the vector of explanatory variables, β – parameters, A – the number of bid on the payment ladder, ε – the error term normally distributed.

In this case, the loglikelihood function is given by:

$$\ln L = \sum_{i=1}^N \ln \left[\Phi \left(\frac{UB_i - x\beta}{\sigma} \right) - \Phi \left(\frac{LB_i - x\beta}{\sigma} \right) \right] \quad (2)$$

where Φ is the normal cumulative distribution function, LB_i and UB_i denote, respectively, the lower and the upper bounds of the individual i 's WTP interval.

However, as noted by Cameron and Huppert⁸ (1989), using mid-points as proxies for the dependent variable in the standard OLS procedure produces biased results. The raw estimates were thus log-transformed in order to account for the naturally skewed distribution (Cameron and Huppert 1989, Lindhjem and Navrud 2011, Ahtiainen et al. 2012)⁹. Thus our mean WTP can be estimated as:

$$E(\text{WTP}) = \exp(x\beta + \sigma^2/2) \quad (3)$$

Table 2
Explanatory variables used in the interval regression model

| Acronym | Description |
|------------|--|
| GEN | Gender, dummy variable 1 for males |
| EDP | Education, dummy variable 1 for primary education |
| EDH | Education, dummy variable 1 for higher education |
| AGE | Age continuous variable (years) |
| INC | Net monthly income, continuous variable (in 100 PLN) |
| $\Delta+I$ | Future income, dummy variable 1 for income perceived as growing over the last 5 years |
| $\Delta-I$ | Future income, dummy variable 1 for income perceived as declining over the last 5 years |
| $\Delta?I$ | Future income, dummy variable 1 for respondents who were uncertain about their incomes over the last 5 years |
| VIS | Number of visits in a forest over the last 12 months, continuous variable |
| LIT | Littering, dummy variable 1 if respondent spotted an illegal dumping site in the forest |
| BIA | Białystok, dummy variable 1 for respondents interviewed in Puszcza Supraska |
| LUB | Lublin, dummy variable 1 for respondents interviewed in Lasy Kozłowieckie |
| RAD | Radom, dummy variable 1 for respondents interviewed in Puszcza Kozienicka |
| SZC | Szczecin, dummy variable 1 for respondents interviewed in Puszcza Bukowa |
| POP | Population of the neighbouring town (in thousands of inhabitants) continuous variable |

Source: own elaboration.

⁸ T.A. Cameron, D.D. Huppert, *Ols versus Ml estimation of non-market resource values with payment card interval data*, "Journal of Environmental Economics and Management" 1989 no. 17(3), p. 230-246.

⁹ See e.g.: Ibidem; H. Lindhjem, S. Navrud, *Are Internet surveys an alternative to face-to-face interviews in contingent valuation?* "Ecological Economics" 2011 no. 70(9), p. 1628-1637; H. Ahtiainen, et al., *Benefits of meeting nutrient reduction targets for the Baltic Sea – a contingent valuation study in the nine coastal states*, "Journal of Environmental Economics and Policy" 2014 no. 3(3), p. 278-30.

In order to explain WTP choices in terms of respondent and site characteristics we applied the explanatory variables described in Table 2.

Results

Respondents' perception of the scenario was fairly positive. Likert-like scale (1 – negative, 2 – neither negative nor positive, 3 – slightly positive, 4 – rather positive, 5 – definitely positive) was used. Percentage of respondents who chose 5 to describe their attitude towards the programme of reduced littering in the forest they visit was 27%; percentage of those who chose 5 for the programme of reduced littering in all the forests in the region was even higher: 46%. In both cases there was an option 'no opinion'. Only 4%-5% chose this option.

Respondents were also asked about reasons for visiting this particular forest. As anticipated, little littering ranked high on the list. As much as 27% of respondents indicated that littering was decisive when they selected a forest to visit. The shares of those who pointed at biodiversity and tourist infrastructure were somewhat higher – 35%.

Several questions addressed littering. 42% of respondents admitted spotting some litter such as plastic bags, cans or pieces of paper. 9% characterized the forest as 'excessively littered'. 29% saw illegal dumping sites. 20% declared that they would visit the forest more frequently, if it was less littered. Most of them declared at least a 50% increase of their visitation rate.

Table 3 shows the Willingness To Pay results for those respondents whose WTP declarations were positive (81% of respondents stated that they were willing to pay to reduce littering in the forest visited and 83% declared they would like to pay for cleaning all the forests in their administrative regions). To estimate the mean WTP the interval regression was run without covariates and bootstrapped using 500 repetitions to obtain 95% confidence intervals. The protesters (8% of the sample) were excluded from the analysis. We identified them using the following responses to debriefing statements: 'Strongly disagree' with the statement 'The program can be implemented within a few years'; and 'Strongly disagree' with the statement 'The money collected would indeed be used in an efficient way to clean up the forest'.

Table 4 presents our interval regression models (I for the visited site, and II for all the forests in the administrative region) investigating determinants for WTP in order to reduce littering in forests. The dependent variable is WTP identified through the payment ladder. As explained in Section 3 above, explanatory variables are gender, age, education, net income, prediction of income change over the next 5 years, number of forest visits, spotting by the respondent an illegal dumping site in the visited forest, size of the neighbouring town and dummies for the forest sites analyzed.

An important result of both estimations is the statistically significant (positive) value of β_{LIT} , i.e. the parameter of the dummy variable LIT recording the fact

Table 3
WTP for reduced forest littering [PLN]

| Category | Mean WTP | Standard Error | 95% Conf. Interval |
|--------------------------------------|----------|----------------|--------------------|
| Single (visited) forest | 27.45 | 1.76 | 24.00 – 30.90 |
| All forests in administrative region | 35.61 | 2.44 | 30.83 – 40.40 |

Source: own elaboration.

Table 4
Results of the interval regression models

| Category | Model I WTP for clean-up of this forest | | Model II WTP for clean-up of all the forests in the region | |
|------------------------|--|-----------------------|---|-----------------------|
| | Coefficient (β) | Robust standard error | Coefficient (β) | Robust standard error |
| GEN | -5.61 | 5.27 | -6.39 | 6.65 |
| EDP | 0.02 | 0.13 | -0.29* | 0.18 |
| EDH | -2.68 | 5.30 | -12.17 | 8.66 |
| AGE | 5.07 | 5.43 | -7.86 | 6.84 |
| INC | 0.45** | 0.23 | 0.57* | 0.31 |
| $\Delta+I$ | 10.87 | 7.40 | 14.38* | 8.76 |
| $\Delta-I$ | -17.13 | 18.70 | -16.43 | 21.93 |
| $\Delta?I$ | -1.46 | 4.98 | -2.26 | 6.25 |
| VIS | 0.13*** | 0.04 | 0.18*** | 0.05 |
| LIT | 14.57*** | 5.05 | 20.67*** | 7.76 |
| BIA | -27.41** | 11.63 | -39.29*** | 13.05 |
| LUB | -0.83 | 9.63 | 9.54 | 10.46 |
| RAD | -22.99** | 10.19 | -27.31** | 10.72 |
| SZC | -28.06** | 13.83 | -26.20* | 14.17 |
| POP | 0.04*** | 0.02 | 0.04** | 0.02 |
| Constant | 18.45 | 13.48 | 36.33** | 17.85 |
| Log-pseudolikelihood | -1619.23 | | -1682.93 | |
| Chi2 (df) | 48.74(15)*** | | 76.87(15)*** | |
| Pseudo-R2 | 9% | | 12% | |
| Number of observations | 573 | | 621 | |

*, **, *** significance at 0.1, 0.05 and 0.01 levels, respectively. In our analysis we excluded protesters, those respondents who did not declare their income, and those who were uncertain about their WTP.

Source: own elaboration.

that respondent had a recent experience of forest littering. It suggests that littering is indeed perceived as a disamenity which can be mitigated effectively.

Discussion

WTP estimates indicate that people are willing to pay for reduced forest littering, although the amount depends on many factors. First, and perhaps most important is its positive and significant correlation with the number of visits. Respondents understand that the use value derived from their multiple visits will be enhanced if the litter reduction programme is implemented. Additionally, WTP declarations differ widely between sites. Lasy Zielonogorskie hosts respondents who stated highest bids; the other four sites were characterized by lower bids. This could have been influenced by extremely high bids declared by few respondents interviewed; nevertheless we did not decide to exclude these observations as they were below the peak of the ladder (the top numbers were not declared by anybody). Some of the socio-economic characteristics – like income and age – are taken care by variables listed in section 3 above. The geographical characteristics is captured by the variable POP explaining the intensity of recreational demand. As anticipated, it is positive and significant. However, there may be a number of other important factors contained in site-specific dummies. The data gathered do not allow for more specific interpretations.

We confronted the WTP data with additional observations on the forest-littering problem. Two supplementary qualitative (in-depth) surveys were carried out: one with local officials, and another one with forest managers. The first one included 25 respondents. Most of them (61%) admitted that their municipalities suffered from forest littering. On the other hand, a much smaller fraction (38%) admitted that their municipality had an illegal dumping site. It seems that some of the officials refuse to acknowledge that they fail to manage the household waste in their jurisdictions. The second one included 38 respondents. All of them (100%) admitted that their forests were littered. Most of them (87%) admitted there were illegal dumping sites in forests. These two problems dominated over all the other ones listed, like stealing timber, excessive populations of some herbivores, poaching, and loss of flora and fauna. It seems that foresters are fully aware of the forest littering problem.

As revealed in another study¹⁰, littering turned out to be the most important single factor explaining attitudes towards forests. Respondents in that study were concerned with the problem mainly because forest littering compromised their consumer surplus from forest recreation. In a Choice Experiment, the implicit price calculated for the attribute '50% reduction in forest littering' ranged from 4.97 € for non-users to 7.97 € for users, and for the attribute '90% reduc-

¹⁰ M. Czajkowski et al., *Providing Preference-Based Support for Forest Ecosystem Service Management in Poland*, "Forest Policy and Economics" 2014 no. 39, p. 1-12.

tion in forest littering' ranged from 5.34 € for non-users to 11.76 € for users. These results are somewhat higher than calculated in this study, but they refer to a national scenario rather than a local one.

This study was carried out as a part of the POLFOREX project ("Forest as a public good. Evaluation of social and environmental benefits of forests in Poland to improve management efficiency"; PL0257) funded by EEA Financial Mechanism, Norwegian Financial Mechanism and Polish Ministry of Science and Higher Education. Funding support is gratefully acknowledged.