Case Study

The economic recreational value of a white stork nesting colony: A case of ‘stork village’ in Poland

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A B S T R A C T

In this paper, we estimate the economic value of selected ecosystem services provided by white storks in a Polish ‘stork village’. A stork village is a common name for a village with a white stork breeding colony, often inhabited by more storks than people. Żywko, the best known stork village in Poland, receives approximately 2000–5000 tourists annually, many of whom come from abroad. The village has approximately 20–40 white stork nests and several amenities designed to improve its recreational attractiveness. To estimate the economic benefits provided by the stork village, we apply the Travel Cost Method (TCM). This study is the first of this type for a stork village and the first related to the value of birds in Poland. Our results represent a useful contribution to tourism management, indicating that nature has economic value and illustrating how this value can be translated into economic benefits. It also serves as a clear illustration that the degradation of nature may entail economic losses.

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1. Introduction

Birds attract not only the attention of birdwatchers but also other tourists, especially when a given species is easy for the general public to watch (Prokop & Rodák, 2009; Whelan, Wenney, & Marquis, 2008). Similar to rarity, other exceptional circumstances related to birds (such as particular type of nesting or behaviour) reduce the dissuasive effect of distance which tourists are willing to travel or of the prices they are willing to pay to enjoy a particular spectacle (Nicolau & Más, 2006). Colonial nesting of white storks (Ciconia ciconia) provides an example of such an exceptional sight, and we use it to illustrate the recreational value of birds. Our study aims to demonstrate how tourism and conservation can mutually support each other. We use an economic method to illustrate the broad economic benefits related to maintaining a site for the benefit of both tourism and conservation.

The white stork is a charismatic species and an icon of nature conservation (Schulz, 1998; Tryjanowski, Sparks, & Jerzak, 2006). Approximately 23% of the global white stork population breeds in Poland. It is one of the most widely recognized bird species by nature lovers and the general public. The bird is large (2 m wingspan), long-lived (c. 30 years) and generally both site- and mate-faithful. White storks nest in close proximity to human settlements, are generally welcomed and tolerated, and even viewed as ‘part of the family’. People like to see storks in their natural environment, especially in large numbers, which is possible in so-called stork villages. In Poland, there are at least 10 white stork colonies counting at least 10 pairs each (Tryjanowski et al., 2006), probably the best known of which is Żywko. In the past, colony nesting was more common (Lewandowski & Radkiewicz, 1991); today only a small part of the eastern European population of white stork lives in breeding colonies — solitary nesting is much more common. Thus, people decide to visit a stork village not only to see this particular species but also to experience a ‘stork’ atmosphere (Dolata, 2006).

Tourism and conservation can mutually support each other as long as the tourism carrying capacity is respected (Collins-Kreiner, Malkinson, Labinger, & Shtainvaz, 2013). Management of natural tourist sites is entangled in numerous additional considerations — for the main attraction to remain there as a magnet for tourists, specific management is required, maintaining its connections with a larger network of natural areas (Puhakka, Salo, & Sääksjärvi, 2011). Managing natural areas is complex and involves looking not only at the main attraction (the specific phenomenon of white
stork colonial nesting in our case) but also at the complex system on which its presence depends. For example, in a stork village, the relevant decisions need to ensure the availability of the surrounding foraging grounds for white storks which may entail additional costs. In such circumstances, it is useful to be able to estimate an economic value of benefits related to ecosystem management and contrast it with the costs which may be raised by some other stakeholders.

There are different types of birdwatchers, with different needs and interests, just as there are different types of nature-based tourists in general (Mehmetoglu, 2007). Some of these classifications are based on how many birdwatching trips they undertake per year and on their identification skills — from casual or novice to advanced or experienced (Hvenegaard, 2002; McFarlane, 1994; Scott, Ditton, Stoll, & Eubanks, 2005; Scott & Thigpen, 2003). In particular in the case of specialized birdwatchers, the rarer an observed species is, the higher is its recreational value (Booth, Gaston, Evans, & Armsworth, 2011). Although rarity sometimes brings tourism in conflict with the protection of a resource (Karp & Guevara, 2011; Kerbiriou et al., 2008), the direct negative impacts of protection on tourism may be offset by the future benefits related to maintaining this resource (Gilbert & Halstead, 1997). This highlights the sustainability aspect of tourism; indeed, not all of what is broadly called ecotourism can be defined as sustainable (Sharples, 2006; Simpson, 2009; Steele, 1995).

Classifications and categorizations are all the more important as majority of those who classify themselves as birdwatchers in US surveys are able to recognize only up to 20 bird species (Scott et al., 2005). These casual birdwatchers also constitute the main group that visits stork villages in Poland. To avoid conflict between tourism and conservation, it is particularly important to bring to the attention of the broader public those resources which are not endangered and yet can be considered very interesting. In this way, at least some tourists are diverted away from places where their presence might be less desired from a conservation point of view. A stork village features a species which is common in Poland and accustomed to the presence of people, and yet it is an important tourist attraction. Consequently, using an example of such a charismatic species, a stork village provides a good opportunity for environmental education of tourists which is yet another aspect of its recreational value.

1.1. Economic value of a birdwatching site

Birdwatching is increasingly perceived as an important segment of the tourism and recreation market (Carver, 2009; Connell, 2009; Watson, 2010). Indeed, it is one of the fastest growing segments of the tourism and recreation market (Carver, 2009; Connell, 2009; DTI, 2010). Opportunities to develop birdwatching tourism (consumer surplus) offer an opportunity to capture a bigger part of these broader values. These benefits can be calculated to highlight the social importance of birdwatching (Eubanks, Stoll, & Ditton, 2004) or, more specifically, to provide arguments for new management schemes for bird-related tourist destinations (Naidoo & Adamowicz, 2005) or events (Lee et al., 2010). Thus, such studies may indicate to what extent the local earnings could increase had the economic potential of tourism been harnessed to a larger extent (not necessarily in terms of increasing tourist numbers, rather by improving the services offered to tourists and changing site access regimes).

Some approaches used so far to estimate this broader value of birdwatching sites included adding simple contingent questions to the surveys eliciting information on tourist spending. For example, Hvenegaard et al. (1989) and Eubanks et al. (2004) asked about the highest acceptable increase of the trip’s cost before a tourist decides not to go birdwatching in the places they were studying. A more complex approach (known as a choice experiment) requires designing different hypothetical scenarios that involve changes to some important attributes of a birdwatching site or event and the related cost. Respondents rank these scenarios, indicating how much they value the different attributes (Lee et al., 2010; Naidoo & Adamowicz, 2005; Urban and Melichar, 2008) and Kaval and Roskrug (2009) provided useful reviews of several dozen contingent valuation studies of birds. However, these methods focus on stated preferences (declared by the tourists), and depict mostly non-use values.

Revealed preference valuation techniques, such as the Travel Cost Method (TCM), make it possible to estimate the (recreational) use value of birds. They only indirectly incorporate some other aspects of the birds’ cultural importance, such as the species occurring in folklore and literature. However, these types of studies are relatively rare, partly because the values estimated with the TCM are associated with a specific location, rather than a particular species. Thus, using the TCM to estimate the recreational value of a given species is plausible when a particular species attracts visitors to a specific location. However, it is relatively rare that a place is visited solely because of birds or especially an individual bird species.

1.2. Birdwatching and the travel cost method

In the TCM, the value of a given good — storks in stork villages in our case — is estimated based on how much people pay to access
and ‘use’ this good. In the absence of access prices, the willingness to pay for observing stork colonies is associated with the costs that people pay to travel to a stork village. These costs include both direct travel costs and the cost of time spent travelling. By examining the distances that visitors travel and the related costs, it is possible to calculate the net benefits that they derive from their visits. The demand function illustrates the relationship between travel costs and the number of visits, and the net benefits (consumer surplus) are equal to the difference between what people are willing to pay and what they actually pay.

One of the earliest applications of the TCM to value birds relied on zonal averages to estimate the value of a swallow roost in Pembroke, Ontario, Canada (Clark, 1987). As in the case of stork villages, the study focused on common birds in an uncommon setting — the roosting of up to 150,000 swallows. The swallow roost attracted up to 10,000 visitors annually, and a guest book held by a local bird club was used as a basis for further calculations. The TCM was used to calculate ‘intangible’ social benefits. Apart from costs related to travel (vehicle costs), Clark (1987) calculated the costs of the time spent travelling, accommodation, and food. The net benefit to visitors (consumer surplus) was calculated at 5.06 USD per visit or 35,400 USD per year in total. In our study, we conservatively decided to omit the two latter categories (accommodation and food), as it is believed that they may be associated with ‘goods’ other than the birds (Fletcher, Adamowicz, & Graham-Tomasi, 1990). Besides, in the case of Zywkowo, there are no formal accommodation opportunities, and there is no place to procure food there.

Navrud and Mungatana (1994) combined the TCM with a contingent valuation of Lake Nakuru National Park (LNNP) in Kenya that owes its popularity to large numbers of flamingoes. The study was based on a sample of 185 visitors in 1991, when the total number of visitors amounted to 178,881. For multiple visits, they estimated the recreational value of flamingo viewing as the part of the value of the overall visit to LNNP proportional to the percentage of time spent flamingo viewing. Both zonal and individual observations were included in this study. According to its results, the total recreational value of visiting LNNP in 1991 was 13.7–15.1 million USD, of which the recreational value of flamingo viewing was estimated at 5.0–5.5 million USD.

Becker, Inbar, Bahat & Chores (2010) combined the TCM with a contingent valuation of Griffon Vultures in two nature reserves in Israel to estimate the marginal value of a single bird for the purposes of evaluating the efficiency of its protection measures. In the TCM component of their study, Becker et al. (2010) also used a zonal approach and regression analysis with a semi-log functional form. The sample included 449 questionnaires and the site is visited by about 100,000 people annually. The total values of both reserves as sites for viewing vultures were estimated at 2.5 million USD and 9.84 million USD, as of the end of April 2004.

Gürlük and Rehber (2008) estimated the economic value of Kuşçenneti National Park at Lake Manyas in Turkey as a recreational birdwatching site. They also followed a zonal approach and performed a regression analysis, using data from 228 interviews and a census of park visitors (ca. 10,000 people visit the site per year). Gürlük and Rehber (2008) estimated the consumer surplus at 2.6–4.7 USD per person or a total of 103 million USD annually, indicating that this value far exceeds the annual investment and operation expenditures of the National Park.

One of the most recent studies (Edwards, Parsons, & Myers, 2011) adopted a negative binomial count data travel cost model, paying special attention to potential biases introduced by on-site sampling. Their study area was Delaware Bay in the US, where thousands of birds feed during their spring migrations, attracting significant numbers of birdwatchers (5583 in the spring of 2008). The sample included 224 questionnaires and the focus was not on zones but the individual households that visitors represented. Edwards et al. (2011) concentrated on day trips only and included both travel expenses and the cost of time, arriving at an average consumer surplus of 38 USD per trip per person. Extending their estimates to the whole population of spring birdwatchers, the authors estimated the birdwatching recreational use value of Delaware Bay at 215,000 USD.

All of the above studies provided implications for tourism management, by indicating the economic recreational values of the studied sites and thus offering arguments for increased conservation efforts. In particular, Navrud and Mungatana (1994) suggested raising entrance fees for non-residents to capture a larger share of their consumer surplus. These funds should be used to maintain the LNNP as an attractive site for flamingoes. Gürlük and Rehber (2008) suggested using the results of their study to help to solve conflicts among local stakeholders, some of whom opposed conservation because of the lack of economic benefits. These benefits could be created, had these stakeholders been compensated by the visitors. Clark (1987) confirmed the social benefits related to protecting the swallow roost, thus justifying the investment made by local stakeholders in developing tourism around it.

The TCM is sometimes used to describe the socio-economic features of the participants of birdwatching-related events, such as in the case of the Grand Isle Migratory Bird Celebration in Louisiana, US (Isaacs & Chi, 2005). Apart from the TCM studies that focused on birds in general or specific bird species, others referred to sites that not only are important for the protection of birds but also are used for other recreational purposes. These include TCM studies of the value of Cley Marshes in Norfolk (Klein & Bateman, 1998), the Montgomery and Lancaster Canals (Willis & Garrod, 1990) in the UK, and the Apalachicola River region in Florida, US (Shrestha, Stein, & Clark, 2007). Finally, some contingent valuation studies also attempt to estimate the value of a given locality to tourists as opposed to valuing a particular species (e.g., Amiry, Yacob, Radam, Samdin & Shuib, 2009; Hvengaard et al., 1989).

In this paper, we present the results of a single-site travel cost model using data from an on-site sample of recreational birdwatchers visiting Zywkowo, the best known ‘stork village’ in Poland. Using a negative-binomial count-data travel cost model, we pay particular attention to potential biases introduced by on-site sampling — endogenous stratification (oversampling frequent visitors) and truncation (only observing visitors making at least one trip during the season). To the best of our knowledge, this study is the first of this type for a stork village and the first that estimates the economic value of birds in Poland. The methods that we present can be used in many applications to offer important tourism-relevant conclusions. Finally, estimating the economic value of white storks may be crucial for discussing effective protection of the species in the context of the more general concept of ecosystem services.

2. Methods

As indicated above, some valuation techniques applied to estimate the social benefits of nature are based on stated preferences (Bateman et al., 2004; Bateman, Willis & Arrow, 2002; Hensher, Rose & Greene, 2005; Mitchell and Carson, 1989) and others on preferences revealed in a market (Freeman, 2003). Among the latter, the TCM is by far the most frequently used technique to estimate recreational use value. This method has been in use since 1947, when Harold Hotelling, in his famous letter to the Director of the National Parks Service, proposed it as a way of estimating the benefits that national parks provide to society (Hotelling, 1947). Hotelling was the first to make a connection between the frequency
of visits from a given zone and the average cost of the visit depending on how far the zone was from the park, and briefly described how consumer surplus could be derived from these observations. This idea was later applied by Clawson (1959) and Clawson and Knetsch (1966) in the so-called Zonal Travel Cost Model.

With the subsequent development of econometrics, the TCM was able to capture variations in cost and visitation at the individual level instead of relying on zonal averages, inducing a shift to the individual travel cost method (Brown & Nawas, 1973). This shift required that the researcher address the problems of selection and truncation in the number of trips per person (Bockstael, Hanemann, & Kling, 1987). The problem was solved with truncated normal distributions or, more conveniently, with count data models (Smith, 1988). Thus, the number of individual visits per period is regressed on the cost of the visit and other explanatory covariables. Then, the average individual consumer surplus can be estimated (Cree & Loomis, 1990).

2.1. Econometric model

The individual travel cost method treats trips to a site as the quantity demanded, while the cost of the trip is treated as the price. These assumptions result in a demand function of the following form:

\[ r_n = f(p_n, p_n^*, z_n), \]

where \( r_n \) is the number of trips taken by person \( n \) to a given site during the season, \( p_n \) is the cost of reaching the site (which usually includes the cost of travel and opportunity cost of time, i.e., the value of other things a respondent could have done during the time he spend travelling), \( p_n^* \) represents a vector of travel costs to substitute sites, and \( z_n \) is a vector of individual characteristics that are believed to influence the number of trips an individual takes.

In this setting, the seasonal consumer surplus associated with accessing the site by an individual \( n \) is represented by:

\[ CS_n = \int f(p_n, p_n^*, z_n)dp_n, \]

where \( p_n^* \) is the current trip cost to the site and \( p_n^* \) is the cost level at which the number of trips goes to zero, also called individual \( n \)'s 'choke price'.

A standard practice is to derive single-site recreation demand functions using count data models. A theoretical basis for the use of count data to model recreational demand is presented in Hellerstein and Mendelsohn (1993).

The two most frequently used count models are Poisson and Negative Binomial. These models are flexible enough to handle truncation, a large number of zero trips in the data, and preference heterogeneity. In the case of a Poisson model, the probability of making \( y \) trips to the site is given by:

\[ Pr(Y = y) = \frac{e^{-\lambda_y} \lambda^y}{y!}, \quad y = 0, 1, 2, \ldots \]

where \( \lambda_y \) is the expected number of trips taken by respondent \( n \). This model can be extended to a regression framework by parameterizing the relationship between \( \lambda_y \) and a set of regressors \( x \). An exponential mean parameterization is commonly used: \( \lambda_y = \exp(B'x) \), where \( x \) corresponds to the variables \( p_n \), \( p_n^* \), and \( z_n \) defined previously. The vector of parameters \( (B) \) is estimated using the maximum likelihood technique, in which each person's probability of taking the observed number of trips is used as an entry in the likelihood function.

The Poisson model was our initial model. Its main advantage is its simplicity, however, it requires a property known as equidispersion – the first two moments of a distribution are equal, i.e., \( E(Y) = \mu = V(Y) \).

Because the assumption of equidispersion could not be justified for our data, we turned to a Negative Binomial model that relaxes this constraint. The Negative Binomial and Poisson models are closely related. On any choice occasion, the decision of whether to take a trip can be modelled with a binomial distribution. As the number of choices increases, the distribution asymptotically converges to a Poisson distribution. However, when overdispersion is present, i.e., \( V(Y) > E(Y) \), the parameter estimates are consistent but the standard errors are no longer valid.

The Negative Binomial method allows for the relaxation of the equidispersion assumption, but it does not automatically account for the bias introduced by on-site sampling. Because of on-site sampling, the sample is endogenously stratified. This is because frequent visitors are more likely to be sampled, hence the likelihood of sampling observations is dependent on a choice made by the subject being studied (dependent variable). The problem of choice-based sampling was first addressed for the Poisson model by Shaw (1988). Englin and Shonkwiler (1995) extended their analysis with an application of the truncated and endogenously stratified negative binomial model.

In this paper, we use a model proposed by Englin and Shonkwiler (1995) that accommodates three features of on-site samples concerning count data: overdispersion, truncation at zero, and endogenous stratification due to oversampling of frequent users of the site. The model takes the following form:

\[ Pr(x_i | x_i > 0) = \frac{\Gamma(x_i + \alpha^{-1})}{\Gamma(x_i) \Gamma(\alpha^{-1})} \Gamma(x_i \Gamma(\alpha^{-1})^{-1}) (y_i + \alpha^{-1})^{-1} (y_i + \alpha^{-1})^{-1} (y_i + \alpha^{-1})^{-1}, \]

\[ x_i = 1.2, \ldots \]

where \( \Gamma \) represents the gamma function, the parameter \( \alpha \) determines the degree of dispersion, and the expected number of trips taken by visitor \( n \) is given by \( E(x_i) = \lambda_n = \exp(B'x_n) \). A special case of the negative binomial model includes the Poisson model (\( \alpha = 0 \)).

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Std. dev.</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visits in the last 12 months</td>
<td>1.307</td>
<td>2.309</td>
<td>1</td>
<td>50</td>
</tr>
<tr>
<td>Language – Polish</td>
<td>0.069</td>
<td>0.394</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Language – English</td>
<td>0.038</td>
<td>0.181</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Language – German</td>
<td>0.144</td>
<td>0.379</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Distance travelled (one way)</td>
<td>108.898</td>
<td>153.268</td>
<td>0</td>
<td>1000*</td>
</tr>
<tr>
<td>Male</td>
<td>0.398</td>
<td>0.465</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Age</td>
<td>40.684</td>
<td>14.757</td>
<td>15</td>
<td>82</td>
</tr>
<tr>
<td>University</td>
<td>0.435</td>
<td>0.478</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Household income &lt; 2500 PLN</td>
<td>0.398</td>
<td>0.477</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Household income 2501–4499 PLN</td>
<td>0.133</td>
<td>0.336</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Household income &gt; 4500 PLN</td>
<td>0.263</td>
<td>0.438</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Income not reported</td>
<td>0.189</td>
<td>0.391</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Bird-watching – never</td>
<td>0.309</td>
<td>0.466</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Bird-watching – sometimes</td>
<td>0.599</td>
<td>0.503</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Bird-watching – frequent</td>
<td>0.094</td>
<td>0.297</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Bird species recognized 0–20</td>
<td>0.608</td>
<td>0.513</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Bird species recognized 21–50</td>
<td>0.347</td>
<td>0.494</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Bird species recognized &gt; 51</td>
<td>0.077</td>
<td>0.276</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

* Respondents reporting having travelled distances greater than 1000 km were considered outliers and removed from the sample.
Finally, in most applications, $a$ is assumed to be the same for all respondents. This assumption is unrealistic, as it is equivalent to assuming homogeneous respondent preferences. Instead, we use a more flexible approach that allows the overdispersion parameter to be a function of visitor characteristics, which allows us to introduce preference heterogeneity in the model (c.f. Nicolau & Más, 2006).

The expected number of trips taken by visitor $n$ is given by: $\lambda_n = \exp(\beta T C_n + \beta^* Z_n)$ that serves as our travel cost recreation demand function. The parameter $T C_n$ represents individual’s cost of reaching the site, and $Z_n$ is a vector of individual-specific characteristics that are assumed to influence the number of trips an individual takes. As the majority of visitors did not specify any other site as a good substitute for the stork village, a vector of trip cost substitute sites was not included in the recreation demand function.

Whether and how to incorporate the value of travel time in the TCM studies were discussed ever since the earliest applications of this method (e.g. Clawson & Knetsch, 1966; Johnson, 1966). Estimating the value of time (or, in most cases, rather the opportunity cost of time) is one of the most frequently discussed problems in the literature on TCM (e.g. Fletcher et al., 1990; Garrod & Willis, 1999; Hanley & Barbier, 2009). Overall, the literature suggests two most commonly used approaches to incorporate the value of time in TCM studies — using a fraction of respondent’s wage rate, with 33% being the most broadly accepted level (Englin & Cameron, 1996; Englin & Shonkwiler, 1995; Garrod & Willis, 1999; Hellerstein & Mendelsohn, 1993) or not incorporating time costs at all (Alberini & Longo, 2006; Alberini, Zanatta, & Rosato, 2007; Fleming & Cook, 2008; Hanley, Bell, & Alvarez-Farizo, 2003). In our analysis we present the results for both these approaches — the trip cost was defined in two variants, with and without the cost of time; in both cases a round trip was assumed.

The average cost per kilometre was assumed to be 0.45 PLN$^{1,2}$; when calculating cost per person, we took the size of the travelling party into account. The value of time depended on a visitor’s origin and was assumed to be 8 PLN/h for Polish visitors and 16 PLN/h for foreigners (in both cases the value of time was assumed to be equal to 1/3 of the average hourly wage rate, which is a common practice in TCM studies; Cesario, 1976). The average vehicle speed was assumed to be 60 km/h, and the mean distance travelled was 109 km (one way).

Finally, the vector $Z_n$ included respondent characteristics that may be associated with his or her interest in birdwatching: the number of bird species that a person could recognize, reporting being a frequent birdwatcher, and socio-economic characteristics including age, income, gender, and education. The summary statistics of the variables used in the analysis are presented in Table 1.

### 2.2 Study site

Zywkowo lays in the north-east of Poland (Fig. 1), on the periphery of one of the most attractive parts of the country to tourists, the Masurian Lake District, and is thus sometimes included into a visit to this area. However, it is not located near any major tourist attraction and is relatively far from larger cities (the closest cities are: Olsztyn with 175,000 inhabitants, 80 km away; Elblag — 125,000 inhabitants, 100 km away; and Gdansk — 450,000 inhabitants, 160 km away).

Although Zywkowo is the best known stork village in Poland, it attracts only approximately 2000–5000 tourists annually, many of who come from abroad. The village has approximately 20–40 white stork nests and only approximately 10 households (Fig. 2). To reach Zywkowo, one has to come with the intention to watch storks, as there are no other attractions in the village. The village has a stork-watching tower, a gift shop, and an exhibit that is used for educational purposes. Zywkowo can be reached by public transportation, although this is rather complicated and most people come by car (84% in our sample) or as part of an organized tour (13%); with some coming by bicycle (1%). Fig. 3 presents the time distribution of visits to Zywkowo in 2011 and Fig. 4 presents frequency of trips depending on distance travelled (one way).

### 2.3 Survey and data

Tourists visiting Zywkowo were surveyed on site between April and September of 2011, i.e., from when the storks returned from

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$^1$ 1 PLN = 0.25 EUR = 0.33 USD.

$^2$ We used the official average operating cost according to the Polish Automobile Association. This rate is commonly used for reimbursing employees who use private vehicles for official business.
their spring migration to when they left for autumn migration. Throughout the whole survey period questionnaires were available to tourists visiting an exhibition room which can be considered a central point of touristic activity in the village. Questionnaires were placed in a central place of a room, next to a big and highly visible box where the filled in questionnaires were supposed to be deposited. In addition, the local employees, assisted by interviewers who stayed in the village throughout most of the season, prompted the visitors to take part in the study and conducted some of the surveys face-to-face.

In 2011, 2850 tourists visited Zywkowo, of whom 583 agreed to complete the questionnaire, i.e. 20% of all visitors. Thus, our surveyed fraction of visitor population was much larger than in the case of previous studies using TCM to estimate the value of bird sites (see Section 1.2).

Unfortunately, the visitor statistics available in Zywkowo do not provide detailed information on the characteristics of visits (e.g., the length of stay) nor on the socio-economic characteristics of visitors. As in other similar studies (e.g. Navrud & Mungatana, 1994), we have no definite check on how representative our sample is, however, we have taken steps to increase the representativeness of the sample by randomly selecting respondents, surveying the relatively large share of visitors, and performing the interviews throughout the entire season.

In the questionnaire, we asked about the main reasons for visiting a given stork village and the perceived importance of storks on a 0 to 10 scale where 10 was ‘storks only’ and 1 was ‘not related to storks’ (‘To what extent is your visit linked with the large numbers of storks in the village?’) – the mean response was 9.02. In addition, in order to control for the possibility of multiple itineraries of respondents’ trips, we asked where the tourists came from, distinguishing between their most recent stop (if they visited more than one place during their trips) and their place of residence. We also asked how long the travel took and what means of transportation were used. We then asked about the time spent in the stork village, including — separately — the time spent watching storks and stork-related attractions. Further questions referred to previous visits to the stork village and the number of people travelling in a party. Finally, respondents were asked socio-economic questions, providing information about their age, gender, income, level of education, and basic birdwatching preferences. Questionnaires were available in Polish, German and English.

3. Results

The estimation results of the two models are shown in Table 2 – one assuming the opportunity cost of time to be zero (Model 1) and the other assuming the opportunity cost of time to be one-third of an hourly wage (Model 2). As expected, the coefficient of trip cost was negative and statistically significant in both models. The two birdwatching intensity variables, i.e., the number of species a person could recognize and how frequently the person observes birds, had positive and significant coefficients. Income, age and whether a person has a university degree are good predictors in our recreation demand models. Our estimates suggest that ceteris paribus the older a person is and the higher income the person has the more visits he or she makes. Furthermore, males and individuals with university degrees ceteris paribus make more visits. However, because of the distance, visitors from Germany and other foreigners make ceteris paribus fewer visits than birdwatchers from Poland. Our parameter estimates also suggest that our data have substantial over-dispersion that could be explained by the dummies for university degree and age.

In Table 3, we report welfare estimates along with a sensitivity analysis on the opportunity cost of time. Using zero cost of time instead of 1/3 of wage resulted in welfare estimates (consumer...
the tourists. The approach employed, for example, by the RSPB that calculates man communities living in stork villages can earn, as opposed to public awareness, information, and education. The results support tourism management especially with regard to the annual recreational use value generated by Zywkowo – was therefore calculated to be 570,000 USD. These results support tourism management especially with regard to public awareness, information, and education.

The above values are not directly related to what the local human communities living in stork villages can earn, as opposed to the approach employed, for example, by the RSPB that calculates the tourists’ contributions to local economies (Molloy et al., 2011; RSPB, 2010). However, the value we estimated can translate into direct benefits for local economies in at least two ways:

1. when local authorities or potential donors realize the importance of social benefits provided by storks in stork villages and, as a result, make decisions that assist local residents in coping with the storks’ presence (e.g., through incentives to maintain foraging grounds for storks or to improve roof structures); and
2. when local residents and managers realize the potential that developing tourist infrastructure might bring and make or increase their own investments in tourist infrastructure or if they introduce an entrance fee to capture part of the estimated consumer surplus.

In both cases, the estimates can help to ensure that storks continue to deliver the public benefits that they have delivered thus far.

Our study focused on the recreational value specifically related to tourism which is much smaller than the total economic value of a stork village. Nonetheless, it may be used as a lower bound and is based on conservative, i.e., less controversial, assumptions. The recreational value of a stork village might further increase had its managers catered more broadly for the needs of the tourists. Apart from creating accommodation and eating opportunities, these could include guided tours, horse riding, and renting binoculars or bicycles. Indeed, in the absence of these amenities, the recreational value we have estimated can very clearly be attributed to the white stork nesting colony. Broader information on the stork village (promotion) would also help to bring more people to this place, ensure that this additional tourist infrastructure is more efficiently used. So far, our study confirms that the managers of Zywkowo are not capitalizing on the tourism opportunities which this site offers, similar to the managers of many other natural areas (Booth et al., 2011).

Table 2
Estimation results of the individual travel cost models.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Model 1 (without cost of time)</th>
<th>Model 2 (with cost of time)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coefficient</td>
<td>Asympt. r-stat</td>
</tr>
<tr>
<td>Cost</td>
<td>-0.005</td>
<td>-2.69</td>
</tr>
<tr>
<td>Birdwatching — sometimes</td>
<td>0.549</td>
<td>2.76</td>
</tr>
<tr>
<td>Birdwatching — frequent</td>
<td>1.554</td>
<td>5.66</td>
</tr>
<tr>
<td>Bird species recognized 21–50</td>
<td>0.494</td>
<td>2.81</td>
</tr>
<tr>
<td>Bird species recognized &gt; 51</td>
<td>0.593</td>
<td>2.19</td>
</tr>
<tr>
<td>Male</td>
<td>1.145</td>
<td>7.13</td>
</tr>
<tr>
<td>University</td>
<td>0.394</td>
<td>2.25</td>
</tr>
<tr>
<td>Age</td>
<td>0.171</td>
<td>2.94</td>
</tr>
<tr>
<td>Household income 2501–499 PLN</td>
<td>0.555</td>
<td>2.46</td>
</tr>
<tr>
<td>Household income &gt; 4500 PLN</td>
<td>2.933</td>
<td>2.25</td>
</tr>
<tr>
<td>Income not reported</td>
<td>0.469</td>
<td>1.97</td>
</tr>
<tr>
<td>Language — German</td>
<td>-1.363</td>
<td>-4.04</td>
</tr>
<tr>
<td>Language — English</td>
<td>-1.238</td>
<td>-1.94</td>
</tr>
<tr>
<td>Constant</td>
<td>-17.645</td>
<td>-3.88</td>
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<tr>
<td>Covariates of α</td>
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<td></td>
</tr>
<tr>
<td>Age</td>
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<tr>
<td>University</td>
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<td>-2.26</td>
</tr>
<tr>
<td>Constant</td>
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<td>3.52</td>
</tr>
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<tr>
<td>Log-likelihood</td>
<td>-520.32</td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td>583</td>
<td></td>
</tr>
</tbody>
</table>

Table 3
Welfare estimates associated with visiting the stork village (consumer surplus per person per trip) [PLN].

<table>
<thead>
<tr>
<th>Variable</th>
<th>Model 1 (without cost of time)</th>
<th>Model 2 (with cost of time)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Std. dev.</td>
</tr>
<tr>
<td></td>
<td>195.41</td>
<td>67.58</td>
</tr>
</tbody>
</table>

Table 4
TCM estimates are often used as a basis for cost-benefit analyses (e.g., Becker et al., 2010; Clark, 1987; Gülük & Rehber, 2008). In our case, comparing the costs of creating and maintaining stork villages to the benefits provided to visitors would offer further interesting and tourism management-relevant conclusions. In some countries, ‘stork villages’ have been created artificially (e.g., Zegveld in the Netherlands) to become tourist attractions; however, in Poland there are other stork colonies that may be relatively easily marketed as ‘stork villages’ to attract tourists. In these cases, the costs of creating a stork village are primarily the costs of abandoning intensive agricultural practices and preventing secondary succession in the surrounding area. Additionally, the costs of marketing the village as a tourist attraction and creating tourist infrastructure need to be considered.

Valuation studies may also provide useful inputs to damage assessments. Zywkowo is currently experiencing problems related to the decay of traditional extensive agriculture. Reducing the village’s attractiveness to storks will also make it less attractive to tourists, diminishing the non-market benefits it now generates. Our analysis provides a new argument for the discussion on the local and country-level importance of this and similar sites. By being able...
to estimate the monetary benefits associated with the opportunity to see storks in their natural environment, we provide a clear short message to policy makers. Our study is also a demonstration of how applying state-of-the-art valuation techniques can inform tourism managers and enable them to make rational choices.

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References


