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Case study

# Valuing a historic site with multiple visitor types and missing survey data



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## ARTICLE INFO

### Article history:

Received 31 August 2013

Accepted 20 March 2014

Available online 13 April 2014

### Keywords:

Cultural heritage  
 Cultural heritage tourism  
 Historic sites  
 Outdoor museums  
 Outdoor recreation  
 Travel cost method

## ABSTRACT

This study offers several insights into valuing cultural heritage sites. Foremost, the travel cost method is used to estimate the economic use value of a unique historic site from the American Revolutionary Period. The site is primarily an indoor and outdoor history museum but also acts as an outdoor recreational park. We estimate several demand models using a 2003 intercept survey of visitors and find that the results are sensitive to how visitor type and non-response in the sample are handled. National parks and outdoor heritage sites frequently protect elements of both nature and culture, and missing data is a common problem in survey-driven research, so this study has broad relevancy. Overall, the results indicate that the economic value of the historic site is substantial.

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## 1. Research aims

This paper estimates the use value of Cowpens National Battlefield, an American Revolutionary War heritage site in South Carolina, USA. This site preserves both cultural and natural heritage and therefore draws in both cultural and recreational tourists. The data on park visitors was collected from a survey and suffers from item non-response in the returned questionnaires, so ignoring the missing data results in a large reduction in the sample size. We analyze the sensitivity of the results to strategies that account for multiple visitor types and missing data.

## 2. Introduction

Cultural heritage tourism makes up a significant portion of the demand for leisure but, given its largely public good-like characteristics, market measures of value fail to reveal the true economic importance of cultural heritage [1]. Assigning resources for heritage site preservation or cultural activities is therefore an important social question. To guide public decision-making, modelling the demand for sites or activities can provide useful information on cultural heritage tourists' preferences, such as their propensity to visit/participate and willingness to pay. Depending on what aspect of tourist behaviour is of interest, several different modelling

strategies can be employed. One popular strategy involves the travel cost method, which models visitation rates as a function of trip price to derive estimates of the economic use value of heritage sites.

The travel cost method is a useful means of non-market valuation but problems in its application can threaten the validity of the value estimates. For one, the method typically uses data from a survey of the relevant population, such as through personal interviews or a mailed questionnaire. Questionnaire non-response and item non-response can lead to problems of sample selection bias [2]. Due to time and financial constraints, achieving high response rates or large sample sizes is not practicable for many researchers [3]. Furthermore, in cultural heritage research, sample sizes typically number a few hundred individuals [3–5], so dropping observations with missing data may significantly affect the quality of estimates.

A second problem can arise by misspecifying the demand model. In particular, omitted variables bias can arise if certain visitor-related features are left out of the model. Research on the demand for outdoor recreation demonstrates the importance of including prices for substitute sites and measures of congestion in the demand model [6]. Other papers examine the role of accounting for multi-destination and incidental visitors on estimates of value [7,8], and in general, the outdoor recreation literature shows that controlling for different visitor types is important in demand modelling. Research indicates that cultural heritage sites can also attract a wide variety of visitor types [9–11]. However, little work has examined the consequences of ignoring visitor type in valuing cultural heritage sites.

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It is important to note that the economic definition of “value” is used in this paper. In this sense, a good’s value is defined as the maximum amount of resources (money) a person would be willing to give up (pay) to get the good. However, the metrics used to express economic value may insufficiently describe cultural value [12], and there remain significant weaknesses in the economic valuation of cultural heritage [13]. For further discussion on the problems attached to notions of value, see Throsby [12].

This paper makes several contributions to research on the economic valuation of cultural heritage. First, the travel cost method is applied to a unique historic site: Cowpens National Battlefield in South Carolina, USA, which preserves the site of a key battle in the American Revolutionary War. Second, measures of visitor type are included in the demand model to determine whether these characteristics affect a person’s propensity to visit. Third, the multiple imputation technique is used to fill in missing data. For comparison, we estimate models that ignore the visitor type and missing data problems. Finally, we compute estimates of the battlefield’s use value and compare these with the known costs of maintaining the site.

### 3. Historic site and visitor data

The Battle of Cowpens was a major engagement in the American Revolutionary War. The battle took place on January 17, 1781, when a crack British troop attacked a portion of the American Continental Army. The opposing forces were similar in number but the attackers suffered from overexertion. The battle ended in a decisive American victory and turned the war in the South in favour of the Americans. Today, the battle carries great weight in American cultural memory, as evidenced by the significant amount of media associated with it (including several movies).

The Cowpens battlefield area was protected as a National Battlefield Site in 1929. The current preserved battlefield exceeds 800 acres in size and includes numerous amenities. A museum and film presentation about the battle are housed in a visitor centre, a walking trail provides access to the centre of the original battlefield and a historic road, and an autoroute circles around the perimeter of the site. Outdoor exhibits about the battle line the trail and the road. Several hundred plant and animal species are also found at the site, thus, there are ample opportunities for visitors to learn about and experience both American history and nature.

Data on visitors to Cowpens National Battlefield (CNB) was made available from the Visitor Services Project at the University of Idaho’s Park Studies Unit [14]. The data was collected through a combination of in-person interviews at the park and a return by mail questionnaire. The interviewing took place May 28 to June 4, 2003. Contacted visitors were briefly told the purpose of the survey and asked to participate. Of 457 contacted visitors, 388 agreed to participate. Participants had their name, address and telephone number recorded and were given a questionnaire to return by mail along with a pre-addressed and postage-paid envelope. A reminder postcard was mailed after two weeks, a replacement questionnaire was mailed to non-respondents after four weeks and a final replacement questionnaire was mailed to non-respondents after seven weeks. This resulted in 301 returned questionnaires. The response rate was therefore 67% among contacted visitors and 78% among participants.

The visitor survey was designed to elicit visitor demographic information and opinions about CNB. Collected data includes the number of trips to CNB over the past year, trip purpose, site activities, time on-site as well as visitors’ age, race, travel group size, group type, disability status and home zip code. Following standard practice in the recreation demand literature, respondents were dropped from the sample if they did not report the frequency of

their trips to CNB or they indicated that the visit was not a part of their original travel plans.

The sample used in this paper included 200 observations. Table 1 contains descriptions and sample statistics of visitor characteristics. The questionnaire did not inquire about travel costs, so this information was devised from reported home zip codes. Round-trip mileage was computed using Google Maps. Travel cost was calculated as the sum of driving and time costs, where driving cost is round-trip mileage  $\times$  \$0.36/mile, based on the US IRS reimbursement rate for 2003, and the time cost is  $\frac{1}{2} \times$  wage rate  $\times$  round-trip mileage/60mph, where the wage rate is the median household income in respondents’ zip code from the 2000 US Census divided by 2000, which is approximately the number of hours worked in a year. Kings Mountain National Military Park (KMP), another preserved battlefield in South Carolina, was used as a substitute site.<sup>1</sup> The typical visitor is middle-aged, travels in a small group and stays at the site for about two hours. About half of all visitors reported that outdoor recreation was their primary reason for visiting, while a quarter reported that their trip included planned destinations other than CNB.

The incidence of non-response can be interpreted from the last column in Table 1. Many respondents omitted at least one answer in the questionnaire so most variables suffered from missing data. Observations with missing data could be dropped from the analysis, but this would produce a substantial drop in the sample size. This problem is taken up in the next section.

## 4. Methods

### 4.1. Trip demand model

The demand for CNB trips was estimated in a Poisson regression, with the number of trips expressed as an exponential function of visitor characteristics. Formally, the demand model was:

$$E(y_i|p_i, x_i, z_i) = \exp(\beta_p p_i + \beta_x x_i + \beta_z z_i) \quad (1)$$

where, for visitor  $i$ ,  $y$  is the number of trips,  $p$  is the travel cost to the site,  $x$  is a vector of visitor characteristics (e.g. age, travel group size) and  $z$  is a group of measures to account for different visitor types (e.g. cultural tourist, recreational visitor). One could estimate separate models for each visitor type but this may only be practicable when sample sizes are large [8]. On the other hand, ignoring visitor type could induce omitted variables bias: if  $z$  is correlated with  $p$  and/or  $x$  but omitted from the model,

$$E(y_i|p_i, x_i) \neq \exp(\beta_p p_i + \beta_x x_i) \quad (2)$$

and  $\beta_p$  and/or  $\beta_x$  will be estimated with bias.

Bias can also arise from the nature of the survey. The sample was gathered on-site so only individuals with  $y > 0$  are observed and individuals who more frequently visit the battlefield are oversampled [15]. To correct for on-site sampling, the Poisson probability density function was amended to:

$$Pr(y_i = n) = \exp(-\lambda_i) \lambda_i^{n-1} / (n-1)!, \quad n = 1, 2, 3, \dots \quad (3)$$

where  $\lambda_i = \exp(\beta_p p + \beta_x x + \beta_z z)$ .<sup>2</sup>

<sup>1</sup> The travel cost to KMP was calculated in the same manner as CNB. There are no entrance fees to either park.

<sup>2</sup> The Poisson often suffers from misspecification of the variance because it assumes the conditional mean and variance are equal. It is therefore common in count data modeling to estimate a negative binomial and parameterize the variance as a function of the mean. The structure of the Cowpens visitor data did not support this extension (as in [16], p. 432), so appropriate caution should be exercised in interpreting the results.

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