The recreational value of German national parks – consumer surplus analyzed with travel cost models

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Introduction

National parks (NLP) provide several ecosystem services like biodiversity and habitat protection, but also regulating and supporting services as well as cultural services like recreation and spiritual functions. Existing research about cultural ecosystem services of German NLP often focus on economic impact studies proving their role as major tourism attractions in rural areas (Job et al. 2016, Mayer & Job 2014, Woltering 2012). However, these studies only offer an incomplete view of the willingness to pay for recreation in NLP as they rely solely on the onsite expenditures of visitors while the travel and time costs to reach the parks are not considered. This paper presents the preliminary results for the recreational value of 14 out of 16 German NLP. The recreational value is determined using travel cost models (TCM). Although well established and criticized for years (Ward & Beal 2000), theseare its first applications to German NLP.

Methods

The TCM are based on economic impact studies in 14 German NLP conducted between 2004 and 2015 (Job et al. 2016, Mayer & Job 2014, Woltering 2012). These representative studies use the same methodology allowing us to use 24,548 detailed interviews for the calculation of our TCM. However, extensive data preparation work was still necessary.

The travel distances between the visitors' origin and the parks were calculated as follows: Based on the five-digit postal code of visitors' municipality of residence we used GIS to determine the straight-line distance. Relations between these distances and shortest road/railway distances were determined based on mean values from Bavarian Forest NLP (Mayer 2014) and samples for each visitor group. The same procedure was undergone for the travel time. The population figures of the zones were determined on a county level. The very low shares of foreign park visitors were excluded from the TCM in most parks because these visitors were not asked for their place of residence.

We calculated the mean travel cost rate for cars using statistics differentiated according to car type published by the ADAC. We used only the operating costs and divided thesecar cost rates by the average group sizes in the parks. For visitors travelling by train and bus, information by bus operators and from the Deutsche Bahn website were used.Weighted with the shares of the park visitors' means of transportation and adjusted for inflation but also for price variation using official price indices, average travel cost ratesrange between €0.0374 and €0.1181 per person and km.

The opportunity costs of travel time were only taken into account for self-employed visitors, using the average gross/net income per working hour as a proxy. Following the recommendation of Ward and Beal (2000) to set a third of the wage rate for the opportunity costs of time, the estimated consumer surplus has to be raised by 7.5 to 24.2% or 4.9 to 15.7%. We dealt with the multiple-trip bias by assigning the full consumer surplus to the visitors with high NLP affinity(Woltering 2012) and half of the consumer surplus to the group of visitors partly motivated by the park. Visitors not motivated by the parks were excluded from the consumer surplus aggregation. Based on these assumptions, reaction functions wereestimated for each park for zones of mostly 30 km width as double-log regression models.

Preliminary results

In total, the lower bound consumer surplus (CS) (100 € truncation; multiple-trip-bias; opportunity costs of time net wage rate) of recreation in German NLP surpasses EUR 350 million while an upper bound value (200 €, gross wage rate) is higher than EUR 610 million. The highest per visitor day CS are calculated for Müritz, Jasmund and Bavarian Forest (lower bound) respectively Jasmund, Müritz and Vorpommersche Boddenlandschaft (upper bound) NLP.These parks all have in common relatively high shares of visitors with high NLP affinity as well as comparatively high mean distances due to high shares of vacationists.

The following factors influence the recreational value of German NLP while model specifications and assumptions remain constant for all parks:

- The number of visitor days per NLP: Similarly to the economic impact studies the maritime NLP in the Wadden and Baltic Sea are strongly dominating (>80%) over the smaller forest NLP with a usually weaker tourism orientation.
- The mean distance to visitors' residences: This factor is again influenced by the attractiveness of the destination for vacationists, i.e. the visitor structure, as well as by the geographical location in Germany. In that way the maritime and alpine peripheries cause the higher travel distances compared to more centrally located destinations like Harz NLP.
- Travel costs:As inflation in Germany was relatively low and carbon fuel prices varied in both directions the parks differ mostly in terms of means of transportation.Ferries required to accessislands and high shares of railway users lead to higher travel costs compared to destinations with high shares of car transport and bigger travel party sizes.

Outlook

The considerable recreational value of German NLP most likely exceeds the already impressive economic impact of tourism in German NLP (9.51 million visitor days with high national park affinity per year, EUR 252.1millionincome, Job et al. 2016: 25). However, these results are not directly comparable as economic impact creates jobs in the park regions while recreational value merely constitutes paper benefits not leading to concrete payment flows. Therefore, these figures should be treated with caution. Nevertheless, the recreational value of the German NLP transports three important messages: First, the parks generate enormous values for the German so-

ciety as a whole by providing highly valued recreational opportunities. Thus, our results provide further arguments in favor of NLP because they reflect societal benefits not expressed in monetary flows. Second, the recreational value allows a better comparison of German NLP in terms of their attractiveness for recreation as the travel costs per km are more or less constant all over Germany and not influenced by e.g. price levels. Third, the TCM allow predictions about the sensitivity of park visitors with regard to changing travel costs (e.g. parking fees, carbon tax).

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