



# Effects of travel cost and participation in recreational activities on national forest visits

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## ABSTRACT

In the face of higher travel costs due to rising gasoline prices and scarce budget resources, we explored differences in the impacts of travel costs on recreational demand for visitors participating in various recreational activities. Five individual travel cost models were estimated, one for each of 5 national forests (i.e., Allegheny, Coconino, Mount Baker-Snoqualmie, Ouachita, and Wenatchee). Travel cost had a consistently negative effect on the number of visits (and thus caused losses in aggregate consumer surplus) across all recreational activities and national forests, although the magnitudes of the effects varied significantly. For example, decreased visit numbers (and thus the aggregate loss of consumer surplus) resulting from hypothetical increases in travel costs are greater for non-trail and backpacking-activity participants than for trail and backpacking-activity participants in the Allegheny national forest. This finding implies that increases in funds allocated towards improving non-trail and backpacking-based recreational activities may stem the loss of consumer surplus due to the decline in visits to the Allegheny national forest caused by the increase in travel cost more than similar increases in funds allocated to trail and backpacking-activities. These results are important because many national-forest managers are facing declining visits resulting from the effects of higher gasoline prices on travel costs. Thus, they can use our results in making decisions about allocating scarce budget resources to recreational activities that have the greatest potential to stem the decline in national-forest visits.

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## 1. Introduction

### 1.1. Background

The gasoline price, a major component of travel cost, has remained historically high since 2004 (see Fig. 1 for the average retail gasoline price during 1994–2012). The U.S. average gasoline price for all grades and all formulations has increased by 94% from \$1.90 per gallon to \$3.68 per gallon during 2004–2012 (average increase of more than 10% per year). A rise in the gasoline price, triggering increased travel cost, affects recreational travel decisions negatively (Fantazzini et al., 2011). The recreation and leisure literature has shown that higher gasoline prices lead to decreased recreation demand (e.g., Clawson and Knetsch, 1966; Kamp et al., 1979). Earlier studies have focused on the comparison between the impacts of gasoline rationing and higher gasoline prices on recreational travel (e.g., Corsi and Harvey, 1979; Kamp et al., 1979; William et al., 1979), and the impacts of rising travel cost on visitors' travel mode, length of trip, destination, time spent traveling and frequency of trips (Aronsson and Brännäs, 1996; Brännäs and Laitila, 1992; Bhat, 1995; Hausman et al., 1995; Gurmu and Trivedi, 1996; Morgan, 1986). More recent literature has focused on the effects of gasoline price on travel participation and behavioral adaptations such as willingness to substitute alternative recreation sites (e.g., Oh

and Hammitt, 2011), and the effects of travel cost on the number of trips to different regions by different income groups (e.g., Lundevaller, 2009).

Although the abovementioned literature has explored the effects of gasoline prices on travel participation from different perspectives, little, if any, research has explicitly suggested solutions to stem the decline in visits resulting from rising travel costs related to gasoline prices. From among the many travel cost analyses that could suggest solutions to declining recreational visits, we focus on the impacts of rising travel costs on travel decisions made by visitors participating in different types of recreational activities. Our research is motivated by the need to distribute increasingly scarce budget resources for national forest management to curtail the decline in visits to recreational sites. Thus, if rising travel costs have different impacts on travel decisions by visitors participating in different types of recreational activities, budget resources can be allocated to stimulate recreation demand for those activities with the greatest impact on visits.

Previous studies have explored market segmentation using participation in various types of recreational activities in relation to visitor benefits or motivations, preferences, use patterns, and recreational specializations (e.g., Galloway, 2002; McCool and Reilly, 1993; Donnelly et al., 1996; Fredman and Emmelin, 2001; Ryan and Sterling, 2001; McFarlane and Boxall, 1996; Warzecha and Lime, 2001; Lai et al., 2007; Poudyal et al., 2009; Bhuvanewor et al., 2012). These studies commonly used a demand-oriented approach to categorize recreation-activity participants by demand characteristics, and found that preferences

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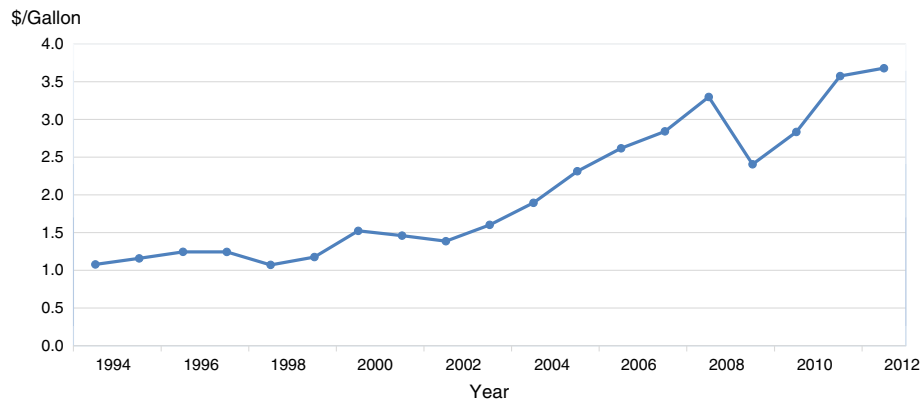


Fig. 1. Trend in average retail gasoline price (nominal values) for all grades in the United States.

about recreational activities differentiate recreational participants. Although this branch of research has emphasized the heterogeneity in recreational activities in relation to recreational demand, little, if any, research has explicitly considered this heterogeneity in regard to rising travel costs with a focus on the implications for mitigating the decline in visits.

### 1.2. Objective and significance of our analysis

The objective of our research is to evaluate the effects of travel costs on recreational demand by visitor participation in various types of recreational activities, and to determine the implications for slowing the decline in visits. We test the hypotheses that (1) the impact of travel cost on visits is lower for individuals who participate in specific recreational activities than those who do not participate in the specific activities and (2) the impact of travel cost on visits varies by participation in different types of recreational activities.

We tested the hypotheses with travel cost models for 5 national-forest cases in the United States (i.e., Allegheny, Coconino, Mount Baker-Snoqualmie, Ouachita, and Wenatchee). Using the estimates from the travel cost models, we predicted the number of visits for recreational-activity participants and non-recreational-activity participants under the *status quo* travel cost and hypothetical increases in travel cost of 30%, 60%, and 90%, *ceteris paribus*. The hypothetical increases in travel cost were loosely based on increases in the U.S. average gasoline price in recent years (e.g., 94% increases during 2004–2012). The predicted numbers of visits for recreational-activity participants and non-recreational-activity participants were used to examine the effects of higher gasoline prices on visits and consumer welfare from participation in various types of recreational activities.

Our research contributes to the travel cost literature in two ways. First, our empirical finding of the heterogeneity in the impacts of travel cost on number of visits to national forests by recreation activities has a direct and explicit implication for mitigating declining visits due to higher gasoline prices. Participation in recreational activities has recently become a prominent theme among researchers, policymakers, and managers involved with forest and nature-based recreation and tourism (Elands and van Marwijk, 2012). Although such research has emphasized the heterogeneity among recreational activities in relation to recreational demand, it has neglected the potential implications for curtailing the decline in visits. Our research fills this gap by evaluating implications and solutions for stemming the tide of declining visits through simulated changes in visits and consumer welfare based on participation in alternative recreational activities under hypothetical increases in travel cost.

For example, our finding of a more price-elastic demand for non-water-activity participants relative to water-activity participants suggests that higher gasoline prices trigger a greater decline in visits for non-water-activity participants relative to water-activity participants.

Correspondingly, *ex ante* simulations suggest that aggregate consumer welfare declines more for non-water-activity participants than for water-activity participants when the gasoline price increases. These findings imply that increases in funds allocated to improving non-water-based recreational activities may stem the decline in visits (and the decline in consumer welfare) to the Coconino national forest by more than similar increases in funds allocated to more price-inelastic water-based activities.

Second, we evaluate the robustness of our impacts by evaluating travel cost models for 5 national forests across the United States. This 5-case analysis is a significant contribution to the literature because previous empirical studies have relied on estimates using one recreational site (or sites) in a limited geographic area. For example, Galloway (2002) examines park-related attitudes and behaviors of visitors to parks in Ontario, Canada. McCool and Reilly (1993) explore forest and recreation management preferences of forest recreationalists in Alberta, Canada. Donnelly et al. (1996) recognize the diversity of benefits visitors seek from a particular recreation engagement in Colorado State Parks. Thus, the robustness of the heterogeneity in recreational activities in relation to recreational demand has never been established because of the limited diversity in recreational sites studied in previous literature. In contrast, our evaluation is based on 5 diverse national forests using survey data from the USDA Forest Service's National Visitor Use Monitoring (NVUM) program that adopts a nationally consistent and statistically valid sampling approach (White and Wilson, 2008).

The remainder of the paper is organized as follows: The study area, NVUM survey methods, and data are described in Section 2; methods and procedures for selecting the empirical model and predicting visit numbers and consumer welfare are presented in Section 3; the empirical results are discussed in Section 4; and Section 5 offers conclusions.

## 2. Study area and NVUM survey

### 2.1. Study area

Five national forests with different characteristics (i.e., Allegheny, Coconino, Mount Baker-Snoqualmie, Ouachita, and Wenatchee) were chosen for the analysis. (See Fig. 2 and Table 1 for the locations and brief descriptions of the 5 national forests.) These national forests represent recreational sites with different climate zones and landscapes (hence various recreational opportunities) and different demographics and local cultures of visitors (hence various recreational demands). While the Mount Baker-Snoqualmie and the Wenatchee National Forests are adjacent each other, the Allegheny, Coconino, and Ouachita National Forests are far apart geographically. By examining national forests that are both geographically dispersed and adjacent, we test our hypotheses with national forests that share similar and different visit characteristics, visitor characteristics, and visitor preferences, while

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