

# Financing Outdoor Recreation: An Introduction

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**ABSTRACT** *The increased use of our public lands raises the question of how to finance them. General revenues, gate fees, and gear taxes are leading candidates, and each has characteristic strengths and weakness. Addressing these issues requires combining public finance and environmental economics as well as historical and institutional knowledge of how public lands are actually managed. The articles in this special issue of Land Economics creatively combine these forms of expertise to address the financing of public lands. (JEL H21, Q26)*

In recent years, participation in outdoor recreation on U.S. public lands has been steadily increasing (at least until the pause for the COVID-19 pandemic). This increasing use has strained the capacity of our recreational resources, causing congestion and depreciating natural and humanmade resources. For example, the National Park Service (NPS) alone claims \$11.9 billion in deferred maintenance for its trails, roads, and other facilities (Comay 2021). Other federal land agencies face similar problems, as do state and local lands. These revenue needs will only worsen if current trends continue: politically, we seem to prefer to add more public lands than fund routine maintenance of existing lands.

There are three main strategies for meeting these revenue needs. The first is to fund public lands through general revenues. This is largely the status quo approach and arguably has not found political support. The second is to rely on entrance fees, which conceptually can be thought of as a tax on trips to recreation sites. This strategy would represent a major expansion of the fee demonstration

program from the 1990s, which currently collects about \$440 million annually for NPS. The third is the so-called gear tax, which would tax equipment associated with outdoor recreation. This strategy can be viewed as an expansion of the Pittman-Robertson Wildlife Restoration Act (1937) and Dingell-Johnson Act (1950), which authorize federal taxes on hunting and fishing gear. These programs currently provide about \$1 billion annually to states in matching funds, on top of the \$1.6 billion in the states' revenue from hunting and fishing licenses.<sup>1</sup>

When evaluating these revenue-raising strategies, policy analysts can draw on a vast literature evaluating efficient and fair tax systems, developed along an outline laid out by John Stuart Mill (1870, V.ii). One consideration is efficiency. Because deadweight loss increases with the square of the tax rate, an efficient tax will fall on a broad base, as it requires a lower rate to meet a given revenue target. Additionally, it will fall on more inelastically supplied or demanded goods. Another consideration is the fairness and justice of the tax system. Although there may be as many views about a just tax system as there are about justice, political theorists have emphasized two main principles. First, according to the ability-to-pay principle, a tax system should be equitable. A progressive tax that imposes a greater proportionate burden on the rich than on the poor would perform better according to this principle. Second, according to the benefit principle, a tax system should impose burdens that are proportionate to the benefits people receive. For example, local property taxes fall on the residents

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<sup>1</sup>On fee revenue, see the article by Kerry Smith and me in this special issue. On the Pittman-Robertson and Dingell-Johnson Acts and license revenue, see [https://www.fws.gov/news/ShowNews.cfm?ref=states-receive-more-than-\\$1-billion-for-recreation-access-conservation-&\\_ID=36382](https://www.fws.gov/news/ShowNews.cfm?ref=states-receive-more-than-$1-billion-for-recreation-access-conservation-&_ID=36382); <https://www.fws.gov/wsfrprograms/Subpages/LicenseInfo/LicenseIndex.htm>.

who enjoy the local public goods provided by the tax; similarly, the gasoline tax falls on the people who enjoy the roads it supports.<sup>2</sup> In the case of public lands, entry fees fit this principle very well, and gear taxes do so to a lesser degree, depending on the gear and the public project in question. In contrast, general federal revenues score poorly according to the benefit principle.

Yet as important as these classic principles are, in the abstract they are not sufficient for informing a comparative appraisal of proposals for financing public lands. Any such appraisal must bring these broad principles of public finance to the particular history, politics, and economics of outdoor recreation. For example, an evaluation of gate fees will draw on the literature of travel cost models estimating the demand for trips to public lands, account for the feasibility of collecting fees, and assess the incentives of the scheme for land management.

A 2019 workshop at the Property and Environment Research Center, funded with generous support from the Searle Freedom Trust, sought to bring together the literatures on public finance and outdoor recreation. In doing so, it also brought together academic economists and practitioners, including prominent managers of public lands. The workshop's fruits are represented by the articles in this special issue of *Land Economics*. Collectively, they explore theoretical, historical, political, and empirical aspects of financing public lands. As many of us realized while working on them and discussing them together, addressing these issues is not simply a matter of applying off-the-shelf theories and models to new questions. Rather, it often requires thinking creatively in new ways. To take just one example, economists routinely use the travel cost method to measure the demand for outdoor recreation based on how much people are willing to pay, in travel costs, to visit a site. Almost invariably, they use it to measure the consumer surplus for the existence of a site or perhaps

for improvements in its quality. They measure this consumer surplus by simulating the hypothetical entry fees that people would be willing to pay for the site but do not actually have to pay. Only rarely have they used these tools to estimate the effect of actually having fees. Although the value of, for example, Yellowstone's existence may be interesting in the abstract, because the park is not likely to go away, it may be more practical to know the answers to questions like the following:

- How much revenue would a fee of \$ $x$  raise?
- How many trips would the fee discourage?
- Who would bear the greatest burden of the fee?
- What incremental improvements in various site amenities could such a fee fund (i.e., what is the budget set associated with those revenues)?
- What improvements in amenities would park managers actually choose to fund, given their current priorities?
- How would park managers' incentives change?
- Given the jointness of the tax and the amenity improvements it funds, what would be the net effect on trips and users' welfare?

To date, most resource economists have ignored these questions, instead focusing on willingness to pay for the existence of a site or changes in quality, without explicitly linking them to revenue.<sup>3</sup> This decision is somewhat ironic because in his original work on the travel cost model, Marion Clawson was particularly interested in using the tool to measure potential revenue (Clawson 1959; Clawson and Knetsch 1966; see also Banzhaf 2010 for further discussion).

Moreover, addressing such public finance questions rather than valuation questions sometimes requires a subtle change in thinking. Consider something as seemingly simple as computing the own-price elasticity of demand for recreation trips, a common summary statistic in the taxation literature. This statistic's formula includes the baseline price,

<sup>2</sup>For some local parks and beaches, the property tax may play a role analogous to gate fees or the gear tax, with the taxed property being a private weak complement to the recreation site. Mullin, Smith, and McNamara (2019) consider these issues in the context of beach nourishment; see also Kriesel, Keeler, and Landry (2004).

<sup>3</sup>Exceptions include Alpízar (2006); Kim, Shaw, and Woodward (2007); Chung et al. (2011); Aadland et al. (2012).

but does that include travel costs or only the tax? The answer may depend on which demand curve we are talking about. As Clawson emphasized long ago, the travel cost method really requires thinking about two demand curves. First, there is the distance-decay function, showing how trips decline as travel costs increase (*ceteris paribus*). Second, there is the demand for what Clawson called “the site per se.” This demand curve is constructed by horizontally summing the demand from all sites, taking the quantity demanded at their actual travel distance but associating it with a fee of zero. Thus, demand for the site per se has a quantity-intercept (at  $p = 0$ ) equal to baseline trips, even though those trips are associated with nonzero travel costs. Decreases in quantity demanded as we move up the demand curve at higher prices are simulated by hypothetically increasing the travel cost for each group, which has heterogeneous effects even if the underlying distance-decay function is homogeneous because of the different baseline travel distances.<sup>4</sup> Thus, how we calculate elasticity depends not only on the slope of the latter demand curve but also on what we assume “counts” as a baseline cost.

So, to return to the question, do we include travel cost? The answers may depend on the precise question, but for most public finance questions, it is probably best to take only the demand for the site per se and use only the fee when computing changes in price. After all, trips are a complement to the natural resource, and we do not routinely include the price of, for example, hot dogs when computing the price elasticity of hot dog buns.

<sup>4</sup>As a simple mathematical example, suppose per capita demand is  $\text{trips} = 10 - \text{TC}$  for everybody (a linear distance decay function with a slope of 1). There are three origin zones, each with one representative person. The three zones have travel costs to the site of \$0, \$5, and \$9, respectively. With no fees, we have  $10 + 5 + 1$  trips, or 16 total. What happens when we raise the fee from zero to \$1? Trips fall to  $9 + 4 + 0$ , or 13 total. The slope of the (inverse) demand curve over that range is  $-1/3$  (i.e., with a \$1 increase, we lose three trips, or one from each origin zone). What happens when we raise the fee from \$1 to \$2? Trips fall to  $8 + 3 + 0$ , or 11 total. The slope over this range is now  $-1/2$  because the potential users from the most distant site are already choked off, and their quantity demanded cannot fall below zero. Consequently, although it is constructed from three identical, linear demand curves, the demand for the site per se is nonlinear.

Moreover, using the demand for the site per se and ignoring travel costs maps best into our intuition about the connection between price and tax revenue collected. For example, using that procedure, revenue is maximized at an elasticity of one.

In this way and others, the articles herein all think creatively about how to use existing models to answer different kinds of finance questions. The first two consider theoretical aspects of dedicated taxes for a public good. Opening the special issue with their article, “Funding Public Goods through Dedicated Taxes on Private Goods,” Nathan Chan and Matthew Kotchen depart from the usual public finance treatment of these issues. In their model, households consider the payment—whether through a gate fee or a tax on gear—as a bundle of a private good (the trip or the gear) and a “contribution” to a public good. Thus, a trip becomes a “mixed public good,” having both private and public aspects. Aggregate behavior is derived from the Nash equilibria, in which households take the revenue derived from others as given. As with the classic results from Bergstrom, Blume, and Varian (1986), this creates the possibility that the policies crowd out voluntary donations to public lands (e.g., through the National Park Foundation). As Chan and Kotchen show, this free-riding behavior and the constraint on what goods can be taxed imply that dedicated taxes for public lands cannot be the most efficient option, although their efficiency relative to the current tax system remains an open question. Interestingly, Chan and Kotchen show that the equilibrium quantity demanded of the taxed good may actually increase if the public good is valued highly enough and is a complement to the taxed good. They also show that the second-best dedicated tax can be higher or lower than the first best, depending on whether demand for the taxed good increases in equilibrium in response to the tax and the quality improvement from the recycled revenue.

In “Bundling Private Complements to Finance Public Goods,” Kerry Smith and I make a similar point. Drawing on a long literature, we argue that the quality of public lands and trips to visit the lands are “weak complements”: one does not enjoy the land unless one visits it. We show that, to a first-order

approximation, weak complements are also ordinary complements. Thus, improvements in the quality of public lands increase the demand for trips. We next derive a simple “sufficient statistic” for a welfare improvement from gate fees. As in the standard treatment of taxes, the gate fee shifts demand down, but the improved quality from reinvesting the revenue shifts demand up. We show that, households are better off if and only if their demand shifts up on net. We further show that the logic extends to the gear tax, even with supply-side responses.

We illustrate how our test can be implemented under hypothetical improvements to public lands that come with the revenue. These hypotheticals were required because, perhaps naively, we were surprised by how difficult it was to find a master list of needed investments at national parks and their cost, given the widely broadcasted and precisely stated claims about maintenance needs. Future research might look further into this matter. With such a list, one could identify potential projects that could be made with a given revenue projection and then estimate the feedback effects on demand using either existing or new studies of the willingness to pay for such projects through the logic of weak complementarity and the connection to price effects (Smith and Banzhaf 2004). Examples might include the effects on recreation demand of boat ramps, bathrooms, picnic areas, trails, campgrounds, and so forth.

Transitioning to more empirical work, in “Federal Funding and State Wildlife Conservation,” Dean Lueck and Dominic Parker examine the history of state wildlife departments, especially the political economy surrounding their finances. They find that, up to 1937, states were diverting a large share of the revenue they collected from hunting and fishing licenses to programs unrelated to wildlife. Under this system, wildlife agencies had little incentive to manage lands in a way that would sustain hunting and fishing activity, nor to price licenses competitively. After that period, the Pittman-Robertson Act provided matching funds to state wildlife programs provided they stop such diversions. It also had the effect of increasing sales of hunting and fishing licenses. There are at least three

potential reasons for this effect. One is that Pittman-Robertson incentivized more competitive pricing. Supporting this theory, Lueck and Parker find some evidence that it led to a decrease in the average price of a license. Because they also find evidence that demand for hunting licenses is highly elastic ( $\sim -3$ ), this price effect induces a large effect in the quantity demanded. Of course, this elasticity assumes that all else is held constant. However, Pittman-Robertson may have given agencies the incentive and the funds to improve wildlife habitat, which would cause demand to shift outward at the same time the price effect causes a movement down along the demand curve. Finally, Pittman-Robertson may simply have given agencies an incentive to “game” their license numbers. While further research might investigate these mediating factors, the article aptly demonstrates that finance policies do not exist in a vacuum. They are sure to have effects on the incentives of managers within the agency but also induce strategic responses in other agencies and levels of government.

The next three articles all use travel cost methods to estimate the effects of entry fees on recreation demand. In “Revenue and Distributional Consequences of Alternative Outdoor Recreation Pricing Mechanisms,” Yongjie Ji, David Keiser, Catherine Kling, and Daniel Phaneuf estimate the effect of recreation fees on recreational trips to Iowa lakes. This is an interesting setting because the destinations are relatively modest, so the trips are likely to be much more responsive to fees than signature sites such as Yellowstone. Ji and colleagues find that a \$5 increase in fees at all sites would reduce per household trips from about 6.6 trips annually (including many with zero trips) to about 5.1, thus generating about \$25 in revenue per household, or \$32 million statewide. It would create a deadweight loss of about \$4 per household, suggesting an excess burden of about 16% of the revenue raised. Quadrupling the fee to \$20 would only double the revenue, at the cost of a whopping excess burden of 67%, indicating fees of that level would be unsupportable in this context.

In an important new contribution to this literature, Ji and colleagues show that an optimal Ramsey taxation scheme can significantly reduce the deadweight loss relative to

these uniform fees. In particular, they find that optimal fees generating the same revenue as the \$20 uniform fee would range from \$4 to \$25 across sites (10th and 90th percentiles) and reduce deadweight loss by a third. In considering this question, they have opened the door to a new line of research, which might investigate questions like how sensitive such results are to limits on the substitution patterns among sites. Ji and colleagues also consider how increasing fees can actually increase demand when the revenue is invested in improving site quality. To do so, they consider the hypothetical increase in site quality needed to be welfare-neutral, as suggested in the article herein by Kerry Smith and me. Measuring site quality through an index, they find that with the \$5 uniform fee site quality would have to increase by about 16% (10% with Ramsey fees) to be welfare-neutral for recreators.

In "How Does Congestion Affect the Evaluation of Recreational Gate Fees?," Roger von Haefen and Frank Lupi consider a different kind of positive feedback loop associated with gate fees. They note that just as reinvesting the revenue from fees into the quality of a site feeds back onto demand, so does the effect of ameliorating congestion (Deyak and Smith 1977; Cesario 1980; Boxall, Englin, and Rollins 2003; Timmins and Murdock 2007). As public land is increasingly being used, this congestion problem is growing more intense. Von Haefen and Lupi evaluate the effects of daily gate fees at Gulf Coast beaches of \$5 for local residents and \$10 for out-of-state residents. Ignoring the congestion feedback effects, they estimate that the fees would raise about \$10 per trip, or \$424 million total. This revenue comes with a deadweight loss of \$132 million, or 31% of revenue, which is double the amount estimated by Ji and colleagues for a \$5 fee. Gulf Coast trips fall by 34% and trips to substitute sites increase 11%. However, accounting for congestion effects, including increased congestion at substitute sites and decreased congestion at the sites with fees, substantially alters these conclusions. For example, if households value a halving of congestion levels at \$10 per trip, revenue from the \$5 fee increases to \$471 million, and deadweight loss decreases to \$67 million, or 14%, which is more in line with the estimate

by Ji and colleagues. Of course, these estimates are premised on hypothetical values for congestion, so further research might embed estimates of such values into the estimation (e.g., Timmins and Murdock 2007).

In a third and final application of travel cost modeling, Lupi, von Haefen, and Li Cheng consider the effect of gate fees on trips to Great Lakes beaches among a sample of Michigan residents. In "Distributional Effects of Entry Fees and Taxation for Financing Public Beaches," they find that a \$5 fee per trip would raise \$127 million, which is equivalent to a 0.03 percentage point increase in the state's income tax rate. They estimate trips would decline by about 9%. They find a much lower excess burden than do Ji and colleagues and von Haefen and Lupi, at about \$0.22 per trip, or 4% of revenues.

Turning from gate fees to the gear tax, in "Efficiency and Equity of an Outdoor Recreation Equipment Tax to Fund Public Lands," Margaret Walls and Matthew Ashenfarb consider the gear tax as an alternative to entrance fees. Using data from the Consumer Expenditure Survey, they estimate the demand for gear using a quadratic almost ideal demand system, while accounting for censoring in the data at zero (for households that purchase no gear in a given year). Walls and Ashenfarb find that a 5% sales tax on recreation gear would raise \$3 per household quarterly, or about \$21 for those households purchasing any gear, for a national total of \$1.6 billion annually. It would result in a deadweight loss of \$0.12 per household, for an excess burden of about 4% per dollar of revenue. This finding is at the lower end of the range of those from the recreation studies, which is consistent with the fact that it involves a broader tax base, especially when we consider that the recreation fees studied were only on a subset of local sites.

Just as important as these estimates of efficiency are estimates of who bears the burden of a tax, and all four articles looking at gate fees and the gear tax consider such distributional effects as well. In their analysis of gate fees, Ji and colleagues, von Haefen and Lupi, and Lupi, von Haefen, and Cheng find that trips are a normal good but with income elasticities below one. This finding suggests that recreation fees will be somewhat regressive.

For example, Ji and colleagues estimate a uniform fee of \$5 would generate \$18 in per household revenue from households earning \$25,000–\$50,000 compared with \$35 from those earning \$75,000–\$100,000, a less than proportionate increase.<sup>5</sup> Similarly, von Haefen and Lupi find that the second-lowest quintile bears 27% of the burden and the second-highest bears 16%. Lupi, von Haefen, and Cheng find that, although burdens increase with income, burdens as a share of income are monotonically decreasing and are 10 times higher for the lowest income quartile than for the highest. This pattern is consistent with previous work as well (Kim, Shaw, and Woodward 2007).

As with the studies of trip demand, Walls and Ashenfarb find that the demand for recreational gear is a normal good but with an income elasticity of less than one, at least at lower income levels. Thus, although the second-lowest income quintile is estimated to pay double the hypothetical taxes as the lowest quintile, it pays only half as much as a percentage of income. However, from the second-lowest to the highest quintile, additional changes are roughly proportional to income, even slightly progressive. Thus, the overall regressivity of the tax is more nuanced in this case.

In these ways, this collection of articles makes important contributions toward the study of financing public lands. Nevertheless, it has left some lacunae waiting to be filled while raising new questions for future research. With respect to distributional effects, more research might consider the distribution of net benefits rather than just tax burdens alone. For example, the regressivity of gate fees and gear taxes is largely driven by the fact that trips and gear purchases do not increase proportionately with income. But if benefits from reinvestments of revenue similarly are proportionate to trips or gear, net benefits may still scale proportionately with income, making the overall effect less regressive. This offsetting effect would depend not only on the quantity of the private goods demanded but also on the value for the quality improvements per unit of the private complement. The

relative scaling of these factors with income is an open question.

As mentioned, additional work might explore the political economy of how park administrators and other stewards of public lands would actually use an expanded budget and the net value of those investments for users, given their cost and the tax rate required to fund them. While improvements in environmental quality are frequently studied, more pedestrian investments in bathrooms, roads, and the like have garnered less interest, though they may be driving much of the budget. Because policy decisions like these are not static, future research might also consider the incentives of different financing schemes and how they affect such decisions. For example, I suggested that gate fees can be thought of as a tax on trips. Although that comparison is useful when leveraging insights from the optimal tax literature, it may neglect nuanced differences between a tax and a fee. For example, a tax set by a central office that also receives the revenue and redistributes it might have a very different set of incentives on local administrators than one controlled by the administrators themselves. Although the article by Lueck and Parker highlights these possibilities, there are many such political economy questions that remain open.

Another area for future study might center on questions of practical administration. For example, how would a gear tax be collected? Would it be possible to expand the architecture of the Pittman-Robertson and Dingell-Johnson Acts? Similarly, how would gate fees be collected and enforced? An attendant at a physical gate may be appropriate at major destinations but surely not at every entry point of every park or forest. Remote enforcement, honor system payments, and even pay-what-you-want systems may be appropriate in some settings and should themselves be subject to benefit-cost tests.

Finally, research might consider the actual marginal cost of an additional user of public lands, both in terms of congestion at a point in time and in terms of cumulative depreciation of trails, restrooms, and so on. Nearly 70 years ago, Samuelson (1954) outlined the conditions for an efficient allocation of public goods as contrasted with private goods. Since

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<sup>5</sup> Averaging across models 1 and 2 from their table 6.

then, much of public economics has assessed the comparative strengths and weaknesses of various institutions relative to Samuelson's standard. But few goods and services fit the template of a pure private or a pure public good. In the real world, most goods fall in the middle. This is certainly the case for recreation, which has the characteristics of a mixed or congested public good. Some of the financing questions discussed in this special issue of the journal can affect the provision or availability of resources and their use. Understanding the effect of use on the availability of recreational resources for others is a crucial part of any discussion of who pays for maintaining public assets.

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