State governments are pivotal in the national effort to supply adequate outdoor recreation opportunities through their provision and administration of state park lands. As of 2009, collectively, state park properties account for approximately 13.9M acres of supply (NASPD 2009). By performing their traditional roles of protecting natural resources and providing outdoor recreation opportunities, state parks contribute to public well-being by offering accessible opportunities, which can contribute to recreationists’ physical conditioning and mental well-being. During July 2008 to June 2009, the attractions of state parks to residents and out-of-state tourists account for 725M visits.

**VITAL SIGNS**

The Annual Information Exchange (AIX) of state park operations is a state-level survey that consists of data from 1986 to 2009 submitted annual by state agencies. This 2010 outlook provides insights into the trends of the determinants of supply common to all state park systems. The determinants are the total costs (capital and operating), operating costs, revenues, labor, visitation, and park acreage. The values and resulting trends reflect the aggregate performance of the 50-state park systems. In presenting the trend analyses, we deflate the cost and revenue data to uncover the real growth in the determinants of supply.

**AVERAGE TOTAL COSTS**

![Average Total Costs Graph](image)

Note. Values deflated (base 2009).
Total costs included the capital expenditures for land acquired by cash or equivalent value (and not by other means), periodic fixed capital expenditures for park construction, and operating expenditures for operation and maintenance of the state park system per se. We observe total costs rising from $15M in 1986 to $39M in 2009, an average year-over-year growth rate of 4.8 percent. The 2008 to 2009 increase in total costs reflects the lag in capital outlays and transfer payments from the prerecession peak. For 2010, we project a decline in the growth by 5.6 percent.

Since 1986, operating expenditures increased year-over-year an average of 4.5 percent. Having observed an increase in the growth of the operating expenditures in the 2008 to 2009 AIX reporting periods, we forecast a 9.7 decline in operating expenditures for 2010, followed by an increase in 2011.
Since 1986, the reported revenues rose by an average year-over-year rate of 4.9 percent. Following the current trend in revenue, we project revenues from all park operations to increase by 4.2 percent per year through 2011.

State park labor included full-time, part-time, and seasonal workers. Since 1986, the average year-over-year growth in labor rose 1.3 percent. For 2010, we project a less than one percent increase in labor with the hiring of additional park employees at current levels through 2011.
ANNUAL VISITATION

The trend in the reported annual visitation displays a somewhat volatile pattern in the 8.4M to 9.2M range. For the 50 state park systems, we project a 1.5 percent growth in visitation for 2010.

PARK ACREAGE

Since 1986, the amount of park acreage increased by 21 percent. We project a nominal less than one percent increase in acreage under state park management for 2010.
Figure 1 displays the aggregate supply curve for state park systems. We construct the curve with the determinants of supply shown in Table 1 and the statistical analysis of the AIX data from 1986 to 2009.\(^4\)

The systematic evaluation of the AIX supply costs suggests the average total cost resulting from increased visitation exhibit decreasing cost production. This situation is evident in the downward sloping aggregate supply curve in the Figure 1, and is why state park systems require continued additional state subsidies to cover losses above the park-generated revenues.

The decreasing cost production is attributable to a variety of factors like the dispersed geographical locations and operations of the state parks, legal restrictions on salary levels of park employees, restrictions on permissible debt, and lack of competitors. In our attempt to explain the decreasing cost production, we first identify its presence. Evidence of decreasing cost production is an average total cost elasticity of less than zero, meaning the average total costs decline continuously as visitation increases with increasing returns to scale.

Overall, the test for the presence of decreasing cost production is a statistically significant Wald chi-square (Table 1). All the elasticities are highly statistically significant. The coefficients reported in Table 1, column 2, are the elasticities, which are useful to planners in forecasting visitations. The elasticity implies that a one percent change in the average cost corresponds to a subsequent percent change in annual visits. In this instance, the average total cost has a negative influence on visits with each one percent increase in the average total cost accounting for a negative 0.436 percent decrease in annual visitation. As previously suggested, this observation is indicative of decreasing production cost.
Labor has a positive and statistically significant influence on visitation with each one percent increase in the labor force accounting for a 0.568 percent increase in annual visitation. Labor’s influence on visitation conforms to the supply model’s expectation that the park systems are highly labor-intensive due to on-going resource protection and maintenance. The park acreage under management has a positive and statistically significant influence with the larger park systems attracting more consumers.

**Table 1.** Determinants of supply

<table>
<thead>
<tr>
<th>Determinant</th>
<th>Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average total cost</td>
<td>-.436</td>
</tr>
<tr>
<td>Labor (workers)</td>
<td>.568</td>
</tr>
<tr>
<td>Supply (park acreage)</td>
<td>.205</td>
</tr>
<tr>
<td>Constant</td>
<td>10.407</td>
</tr>
</tbody>
</table>

**Summary Statistics**

<table>
<thead>
<tr>
<th>Statistic</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wald $\chi^2$(3)</td>
<td>449.27</td>
</tr>
<tr>
<td>Number of states</td>
<td>50</td>
</tr>
<tr>
<td>Number of time years (1986 - 2009)</td>
<td>24</td>
</tr>
</tbody>
</table>

We now have the information necessary to estimate the transfer payments and the direct benefits-received by state park consumers. The benefits-received reflects welfare values of state parks, above what the consumers have paid, and the values due accrue to consumers in the form of outdoor recreation benefits (Tresch 1981). However, be careful not to confuse benefits-received with consumer surplus or other willingness-to-pay welfare benefit measures, which are different economic concepts.

We begin with an update of state government revenue. Against that backdrop, we briefly discuss pricing practices. We follow with a brief explanation of the distribution issues regarding government transfer payments to state park systems. In addition, we provide an explanation of consumers’ responses to a price increase under decreasing cost production and conclude with our outlook.

**STATE REVENUES UPDATE**

State tax revenue is likely to remain below its prerecession peak for quite some time. Collections from all state tax sources declined by 4.8 percent in the fourth quarter of 2009 to the comparable quarter in 2008. The Rockefeller Institute reports that despite indications the national recession may be over, the revenue situation remains gloomy in most states. State tax revenue will continue to be insufficient to support current spending commitments, and more spending cuts and tax increase are most likely on the way for many states (Rockefeller Institute 2010).

Looking ahead, the paths of the state park systems are subject to an unusual degree of uncertainty, partly because of the continued risks affecting the state economies and partly because the future courses of the states’ fiscal policies are uncertain. Against this backdrop, careful assessment of the transfer payments to continue funding ongoing state park operations balanced against the needs to increase revenues is important debate within many state governments.
The rules governing the pricing practices for the 50 different state park operations are indeterminate because price determination depends in part on the distribution of the incomes and the wealth of a state’s residents. The different distributions in wealth result in the different charges, that is, the consumer’s ability-to-pay for state parks (Tresch 1981). It is apparent though that park officials practice some form of cost pricing with respect to the consumers' ability-to-pay the charges (NASPD 2009).

What is apparent is that park officials are practicing some form of average total cost pricing in the short-term. They are attempting to match the annual total costs with revenues from all operations mixed with private sector profitability criteria and various non-price curve-shifting factors, like their state’s land-management orientation, in making investment decisions (Puttakammer 2001). This attempt to reduce the total costs as visits increase to a future point where there is a need to hire more people, purchase more equipment, and construct more facilities is what economists refer to as “decreasing cost production” (Tresch 1981). It is also associated with the over-pricing of services when in actuality entry fees are at low prices or even freely provided to the public. The average total cost resulting from increased visitation exhibit decreasing cost production. Consequently, state park systems require continued additional state subsidies to cover losses above the park-generated revenues. This situation is evident in the downward sloping average total cost curve in the Figure 1.

Officials face difficult decisions regarding the choices between the economic efficiency of attempting to maintain minimum costs and revenue self-sufficiency under the condition of decreasing cost production. The debate surrounds this need for self-sufficiency by imposing either the marginal cost or the average cost pricing practices for outdoor recreation. The marginal cost is the increase in total costs resulting from an increase in park use by one visit. Research concludes that neither of the pricing practices attempts to maintain minimum costs. There is no special incentive for officials to practice marginal cost pricing to attain gains in efficiency because of the lack of competitors. In summary, the equity gains from average cost pricing probably outweigh the efficiency loss relative to marginal cost pricing. Because of this, average cost pricing practices are entirely reasonable outcomes.

In reviewing Figure 1, the aggregate supply curve is the bold gray line. The bold black horizontal line is the average cost of $3.35 per visit. The corresponding vertical bold black line is the annual visitation of 14.51M.5

The average revenue is the annual park-generated revenues from all operations by a state divided by the annual visitation. Average revenue often goes by a simpler and more widely used term price. We set two prices in Figure 1 where the lines and arrows intersect the aggregate supply curve. The current price is $0.89. The triangle area to the left of the aggregate supply curve that is between the (a) average cost of $3.35, (b) $0.89 price, and (c) 14.5M visitation is the initial subsidy is the additional lump-sum subsidy from a state government for the ongoing operations of the state park. In this instance, the additional lump-subsidy is $9.4M, which is the total transfer payment received of $45.2M for park system operations minus the $35.8M required to cover the fixed costs.6 The outdoor recreation benefits-received is $3.11 per visit to a state park.7
We display a 100 percent price increase from $0.89 to the hypothetical price of $1.77 with the broken line and arrow in Figure 1. The additional lump-sum subsidy from state government shrinks to $4M to maintain park system operations. Meanwhile, the consumer’s utility increases even though it costs the consumer more because the price is still less than the $3.35 average cost. It follows then that the consumer would be willing-to-pay the hypothetical price because the utility of the park services is greater. In fact, the consumer’s utility is greater at any price above $0.89 because the initial transfer payment on a per visit basis is less than the consumer’s charge at the $0.89 price, assuming a positive marginal utility of income.

With the hypothetical price, which we assume the consumer is willing to pay, the cost for a state park visit increases from the consumer’s perspective. This assumption is not without support. Past research finds that increases in charges for outdoor recreation has no to only a small income effect on consumer spending to gain access to campgrounds and parks (see Puttakammer, 2001). We predict 14.5M visits at the average cost of $3.35 (Figure 1).

In summary, we estimate that the 50 state park systems require an additional lump-sum subsidy of $470M at the $0.89 price. At the 100% hypothetical price increase to $1.77, the additional lump-sum subsidy would decrease to $198M.

**OUR VIEW**

In our view, park officials accept the average cost pricing option for continued park operations as a reasonable compromise among the pricing alternatives on both equity and efficiency grounds, even though recreation economic theory rejects it. However, as long as the benefits-received exceed the transfers of payments for the fixed costs of state park operations, the distribution equity issues of outdoor recreation among state residents will continue to be the more compelling to society. Nevertheless, it is our perception that public deliberations will consider the efficiency argument in setting charges for states’ parks. As Clawson and Knetsch remarked in 1966, “society through their state legislators will continue to debate whether access to state parks can be truly free given the real costs incurred” (p.313). In this regard, society will determine the degree to which consumers should pay individually, via fees and charges, relative to what they pay collectively via taxes and state revenues.

**REFERENCES**


NOTES

1 The statistical methods that we apply just manipulate the observed data and are generally not the problem. In cases where values are missing from the AIX database, we assume that this is due to the incomplete recordings of information by state contact personnel and/or previous data management issues in updating the archive and its handling. There are also variations in continuities of cell observations, which may have been attributable to the varying interpretations of the definitions and data requirements by state contact persons. As a final disclaimer, if there are inaccuracies in the data from the contact’s interpretation of the reporting requirements, those errors are systematic in that they would be the same reoccurring errors over the past years of reporting.

2 Trend analysis is the forecasting of future financial price movements based on an examination of past movements in the determinants. Like weather forecasting, trend analysis does not result in absolute predictions about the future. Instead, trend analysis can help planners anticipate what is "likely" to happen to the determinants over time. We apply a moving-average filter to eliminate the noise surrounding the reported values (Makridakis, Wheelwright, and McGee 1984). We use a symmetric moving average with a span of six. This means that we average the first three lag variables, the current value, and the first two forward terms in the data series, with each term in the average receiving a weight of one. The smoother was:

\[ (1/6)*[x(t-3) + x(t-2) + x(t-1) + x(t) + x(t+1) + x(t+2)]; \]

\[ x(t)= \text{the key indicator of interest.} \]

3 Total operating and capital expenditures deflated with the producer's price index (PPI). Revenues deflated with the consumer’s price index (CPI). The reported lognormal distributed values for the determinants are medians to avoid the implied non-normality of the error distributions.

4 The estimation of the aggregate supply costs is via the panels-corrected standard errors to allow for heteroskedasticity across state panels, spatial correlation, and serial correlation over time. We transformed visitation, the dependent variable, and the determinants to natural logarithms for statistical analysis. The action met the certain statistical assumptions for the normal distribution of the dependent variable and the removal of the statistical dependency in each case between the means and variances of the reported entries for the determinants in the AIX.
We correct the visitation predictions for logarithmic bias with Duan’s (1983) smearing estimate because the annual visits underestimate the actual mean visits (14.7 versus 14.51) in the calculations of the transfer payments.

The summary presented in this section is from the manuscript, Social value of outdoor recreation at state parks (Siderelis, C., J. W. Smith, and R. L. Moore 2010), which is in a peer-review process.

Numerical integrations to approximate the areas under the supply curve followed Simpson’s rule for over 100 price intervals to increase accuracy.