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Editors: V. KERRY SMITH
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OVERALL INTRODUCTION

V. Kerry Smith

This third volume of *Advances in Applied Micro-Economics* expands the range of topics considered in a single volume. Three areas of considerable academic and professional interest among applied micro-economists are treated in this volume.

The first considers the modeling and valuation of amenity resources. Benefit-cost analyses have begun to play an increasingly important role in the design and evaluation of environmental policies. Benefits analysis is now a major preoccupation of environmental economists. Part I assembles a collection of papers that deal with some of the current research issues in this area as they relate to the valuation of the recreational and amenity services provided by environmental resources.

The second part also deals with a timely topic—climate change and the role of economic analysis in evaluating its effects. The contrast between two recent government sponsored reports[1] on the implications of the accumulation of carbon dioxide for climate changes has focused increased attention on this subject. To date, economic analyses of the problems

posed by climate change has been limited. Consequently, these authors provide background on the subject and a consideration of some of the conceptual issues associated with using conventional economic methods in this area.

The last part of the volume considers empirical and methodological issues associated with economic models of the public provision of education and crime protection.

Since each part of the volume has rather different topics, separate introductions discussing the relationships between the papers in each have been prepared. Volume 3 of the series also introduces a guest editor of this volume, Ann Dryden Witte of the University of North Carolina at Chapel Hill. Ann was responsible for assembling the papers in Part III of this volume. Her input has enhanced the scope and quality of the papers in the volume and was greatly appreciated.

In an effort to expand the range of topics that can be reflected in the series, I plan to invite guest editors to work with me in the development of sections in future volumes of the series.

NOTE

1. The two reports were:

   Changing Climate, the Report of the Carbon Dioxide Assessment Committee (Washington, D.C.: National Academy of Sciences, 1983)

   and

   Stephen Seidel and Dale Keyes, *Can We Delay a Greenhouse Warming?* Strategic Studies Staff, Office of Policy Analysis, U.S. Environmental Protection Agency, September 1983.

CONTENTS

PART I

ISSUES IN MODELING AND VALUING AMENITY RESOURCES

INTRODUCTION TO PART I

V. Kerry Smith

Benefit estimation has become a major preoccupation of environmental economists. Nearly all of the funded research in this area is concerned with some aspect of the valuation of environmental amenities. In many respects this represents a remarkable transformation in the interests of the policymakers who have provided much (but not all) of the support for this research. While it would be inappropriate to attribute all of the impetus for this change to the growing acceptance of benefit-cost analysis as a legitimate component of the information used in the design of environmental policy, *it has played a role*. Indeed, Executive Order 12291, issued by President Reagan in February 1981 can be viewed as a logical step in a process that began during the Ford Administration. These efforts progressively increased the required evaluation of regulations, moving ever closer to detailed analysis of their economic consequences.

Executive Order 12291 requires that all new major regulations be subjected to a benefit-cost analysis.[1] Moreover, it admonishes regulatory agencies to seek to define regulations so as to maximize the aggregate net benefits they realize. Of course, this requirement can only be imposed

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on those decisions where statutory provisions do not explicitly prohibit the use of benefit-cost analysis.[2]

To the extent some form of these requirements remains in force in the future, and this seems plausible regardless of the politics of the next administration, then attention to problems posed by valuing environmental amenities is unlikely to diminish. The papers in Part I of Volume III of *Advances in Applied Microeconomics* offer an ideal cross-section of the research issues that are likely to occupy a prominent place in that future research agenda.

Environmental quality has many dimensions. When we consider how individuals utilize environmental amenities for recreational purposes, these dimensions are tacitly understood to influence these decisions (especially by those analysts of the recreational activities under study who are themselves participants during their leisure time). Skiing, when there are long lift lines or crowded slopes, is a different experience than under conditions with ready access to the slopes. Similarly, solitude, or more properly the ability to select the group of individuals with whom one interacts, is an important dimension of low density recreation.

McConnell and Sutinen provide a careful and insightful discussion of how congestion and the associated conditions of access to an environmental resource will affect the measurement of the benefits associated with modifying that resource. For example, expansions to the size of a skiing facility or improvements in the water quality of a flat-water recreation site can each have different values depending upon the management practices in effect for each type of facility.

These authors develop their arguments in analytical terms for decisions involving a single site and for two interrelated sites. Their analysis reflects their appreciation and direct involvement in a substantial amount of the empirical research on the effects of congestion in outdoor recreation. It is clear that there are many factors that can serve to affect an individual's willingness to pay for amenity services. Given heterogeneous preferences, we can expect that management practices which influence these characteristics will also implicitly lead to non-price rationing that affects who uses a facility. For example, some individuals will not be willing to incur the costs to visit a recreation site when they expect the recreational experience will have undesirable characteristics. While the McConnell-Sutinen framework assumes homogeneous individuals, it is careful to identify how this assumption would affect their conclusions. Moreover, they acknowledge that perceptions and individuals' expectations about an experience (and how these expectations change over time) are critically important to characterizing the equilibrium conditions in these types of markets. Thus, this paper not only enhances our appreciation of the role of congestion and management practices designed to affect its level for

benefit measurements, it also lays the groundwork for the additional research needed to understand how the markets for these types of resources operate in the real world.

The second paper in this section also addresses a difficult and important problem for the benefit analyses associated with modifications to natural and environmental resources. It considers the relationship between the user and the intrinsic (or nonuser) benefits associated with these resources. Since Krutilla's (1967) classic paper "Conservation Reconsidered," economists have recognized that natural and environmental resources provide benefits that extend beyond the direct uses which are made of them. Krutilla identified option, existence, and bequest values as considerations that were likely to be especially important to unique natural environments. Subsequent research has suggested that these values might be important to a variety of environmental amenities.

Unfortunately, the measurement of these values has proved especially difficult. By nature, if we define a motivation for valuing a good or service that is not associated with an act of consumption (as economists have ordinarily defined consumption), it will be difficult to observe actions based on these values. That is, most economic descriptions of individuals' motives for valuing goods and services "tie" that valuation to some form of consumption. Intrinsic values do not necessarily lead to (nor do they require) a tangible act of consumption. Our models of their role in individual decision-making remains at a fairly elementary and crude level. Basically, what is at issue is establishing some basis for judging how the presence of these values might be detected and the magnitude measured.

To date, our empirical estimates have been based on contingent valuation surveys. In these surveys, the researchers have attempted to elicit individuals' valuation of resources and, at the same time, identify the motives for these valuation responses using direct questions. In some cases a total "bid," including user and intrinsic values was requested and a subsequent partitioning was elicited. In others separate components were requested. Fisher and Raucher's paper draws these findings together for the case of water quality improvements. It relates the design of these empirical studies to the theoretical literature providing the basis for the motivations leading to intrinsic values. By considering the relationship between intrinsic and user values across studies and types of resources, this paper provides the first comprehensive review of the empirical research in this area to date. Equally important, this appraisal evaluates the prospects for transferring existing estimates of the intrinsic to user benefits ratio to new areas. This practice has been proposed as one means for estimating intrinsic values for resources where estimates of only the user values are available.

There has been increasing awareness of the need to use survey based

or contingent valuation methods in valuing many types of environmental amenities. Often indirect market methods, such as the hedonic property value model, are not available. Nonetheless, contingent valuation methods are viewed with skepticism by many (if not most) economists. As a consequence, recent research has attempted to provide comparative evaluations of contingent valuation and indirect market based estimates of the valuations of particular environmental amenities. Brookshire et al. (1982), provided the first such evaluation, comparing a contingent valuation and hedonic property value model's estimates of the benefits associated with air quality improvements. More recently, Desvousges, Smith, and McGivney (1983) compared the travel cost recreational demand framework with a contingent valuation survey for water quality changes. While both studies indicated the indirect method and the survey approach provided comparable estimates in order of magnitude terms, they also highlighted a number of reasons for varied performance of both approaches to benefit estimation. Accordingly, it is clear that a full understanding of the relationship between the direct (or survey) and the indirect approaches to benefit measurement will require replication of these comparative studies under a wide array of circumstances.

The third paper in this section provides one such replication. In his paper, Duffield reports a comparative analysis of the travel cost and contingent valuation methods for the valuation of a recreational site—the Kootenai Falls in northwestern Montana. Duffield's results are generally consistent with the two earlier comparative analyses. However, by considering the effects of single versus multiple destination trips and the specification of the functional form for the travel cost model, his analysis serves to illustrate some additional potential sources of discrepancy between these methods' benefit estimates.

This section closes with an application of a new methodology to recreation demand analysis—the hedonic travel cost framework originally proposed by Brown and Mendelsohn (1980). In this paper, Mendelsohn illustrates how the method can be applied to provide a recreational demand model consistent with the needs of wildlife management. As we noted in introducing this section, the characteristics of recreational experiences influence an individual's valuation of the resources' providing those experiences. McConnell and Sutinen demonstrated that if we know these relationships and understand management practices we must incorporate *both* in our evaluation of projects intended to modify the resources providing these services. What remains, of course, is to determine how individuals' value the characteristics of the recreational experience. Brown and Mendelsohn's innovation recognizes that we can characterize how individuals might perceive their opportunities in an implicit price function. That is, under the assumption of complete information, an in-

dividual faces the prospect of recreating at a number of different sites, each with differing characteristics. These prices and sets of characteristics provide a description of the locus of opportunities, together with implicit marginal prices of each characteristic. In effect, the natural endowment together with knowledge of an individual's actual choices may provide sufficient information to disentangle a complex index number problem.[3] Moreover, with such a resolution, it is possible to value the attributes of recreational experiences in terms that can facilitate management decisions. Mendelsohn's paper illustrates how this can be accomplished for the case of deer hunting to determine the value Pennsylvania hunters place on deer density.

These four papers have identified some of the most important aspects of the research issues facing benefit estimation for environmental resources. They combine analytical insight with empirical results to help document what we do know and what we need to learn. As such, they provide good background for understanding the research needed in environmental benefit analysis.

NOTES

1. For a more detailed discussion of the background for and effects of Executive Order 12291, see Smith (1984).

2. The most prominent example of a prohibition of benefit-cost analysis would arise in the statutory mandates for the primary national ambient air quality standards for criteria pollutants. These standards are to be set to protect sensitive members of the population from health impacts with an adequate margin of safety.

3. It should be acknowledged that there are several theoretical issues associated with the hedonic travel cost framework that require further attention. For the most part they relate to the plausibility of the maintained assumption that the price function, relating travel costs to site attributes, exists. Among the most important of these are: (1) the definition of the relevant sites considered by individuals in each origin zone; and (2) the mechanism that assures a smooth locus relating implicit prices to site attributes.

The encouraging empirical findings with the method to date should provide further stimulus to the research needed to address these issues.

REFERENCES

Brookshire, David S., Ralph C. d'Arge, William D. Schulze and Mark A. Thayer, "Experiments in Valuing Public Goods." In V. K. Smith (ed.), *Advances in Applied Micro-Economics*, Vol. I. Greenwich, CT: JAI Press, 1981.

Brookshire, David S., Mark A. Thayer, William D. Schulze, and Ralph C. d'Arge, "Valuing Public Goods: A Comparison of Survey and Hedonic Approaches." *American Economic Review* 72(March 1982):165–177.

Brown, Gardner M. and Robert Mendelsohn, "The Hedonic Travel Cost Method." Seattle: Institute for Economic Research, University of Washington, 1980.

Desvousges, William H., V. Kerry Smith and Matthew P. McGivney, *A Comparison of Alternative Approaches for Estimating Recreation and Related Benefits of Water Qual-*

ity Improvement, Environmental Benefits Analysis Series. Washington, DC, U.S. Environmental Protection AGency, 1983.

Krutilla, John V., "Conservation Reconsidered." *American Economic Review* 57(September 1967):777–786.

Smith, V. Kerry (ed.), *Environmental Policy Under Reagan's Executive Order: The Role of Benefit-Cost Analysis*. Chapel Hill, NC: University of North Carolina Press, 1984.