

EXTERNAL BENEFITS OF NATURAL ENVIRONMENTS

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ABSTRACT. Existing methods of assessing economic benefits arising from certain physical environments left in a relatively natural condition do not include estimates of external benefits. Existence value is one such external benefit that accrues to individuals who have no intention of ever visiting the area in question. A partial measure of the existence value of National Parks has been found. Additional research in this area should yield information important to land-use decision making.

MY ASSIGNMENT for this Symposium is to discuss research progress in the identification and measurement of external benefits arising from land areas left in a relatively natural condition.

The concept of "externalities," the generic term for a variety of specific kinds of market failures, occupies an important position in modern welfare economics. If externalities are present, the equilibrium approached by the workings of a competitive market mechanism will not necessarily be a position of maximum efficiency or economic welfare. Social costs or benefits will not equal private costs or benefits. The market will produce either too small or too large an output of some goods and services.

Various kinds of externalities are often assumed to be associated with outdoor recreation, and this is partially the justification for providing certain recreational services in the public sector. But what are these external effects? Can they be measured in terms that permit comparison with other kinds of benefits and costs? The answers

to these questions are important to the rational formulation of public policy involving alternative uses of natural resources.

Externalities can be classified as: (1) external benefits, or economies, arising from production; (2) external benefits arising from consumption; (3) external costs, or diseconomies, arising from production; and (4) external costs arising from consumption. In my brief stay at the Cooperative Recreation Research Unit at Raleigh, I was interested in specific types of external recreation benefits within the first category—those arising from production.

Robert Dorfman (1964), in his book *The Price System*, offers a clear example of this type of external benefit. Dorfman points out that the Salton Sea, in southern California, is one of the country's most productive inland fisheries. A high nutrient level is maintained through the tremendous input of fertilizers from the many farms of the Imperial Valley. The farmers, in other words, pay for the fertilizer; and the fishermen enjoy part of the benefits without being made to contribute to the costs.

This situation leads to a misallocation of resources. If the farmers act as economic men, they will apply fertilizer until an additional dollar's worth will just produce an additional dollar's worth of crops. If other inputs are being used efficiently, this equating of marginal costs with marginal returns will maximize their net revenues. Obviously, the farmers would not want to spend an extra dollar for fertilizer if that application would add only 98 cents to the value of the crops. But suppose it increased the dollar value of fish yield by 5 cents? At the margin, the application would add more to output than to costs. Unless the application is made, an inefficient solution will result. Under a price system, the individual farmer will pay no attention to the impact of his activities on the fishermen.

A similar example could be drawn from recreation if a situation could be found in which the mere provision of a particular recreation area or facility provided benefits to non-users as well as to users. Wilderness is often thought to produce this kind of external benefit.

Outdoor recreational services are also often claimed to produce external benefits of the second type—those resulting from consumption of the services or participation in outdoor recreation activities. Ruth Mack and Sumner Myers (1965), for instance, argue that there are "benefits which result from the advantage to *all* people, whether or not users of outdoor recreation, of living in a country where more rather than fewer people are educated in the ways of the out-of-doors."

Suppose this hypothesis is correct. Then, if the individual is required to pay the full costs of outdoor recreation experiences, he will adjust his participation so that his perceived benefits per unit of cost for an additional hour of recreation just equals the benefits per unit of cost for additional units of other goods and services. But if benefits from the additional hour of recreation accrue not just to the individual but to all of society, an underallocation of time devoted to recreation will occur in the private market.

External diseconomies, or costs of production and consumption, are mentioned

here only to complete the discussion of externalities. This is not to minimize their importance, since almost all forms of pollution are examples of external costs. But my research—the topic of this paper—was concerned only with external benefits of production.

EXTERNALITIES IN ECONOMIC ANALYSES

Much government activity is directed toward correcting for various kinds of externalities so that a reasonably efficient allocation of resources is obtained within a particular distribution of income. Analysts of public policy alternatives are thus faced with the problem of identifying these external effects where possible. In some cases, actual measurements within a reasonable degree of accuracy can be obtained. In others, the externality can only be treated qualitatively. The reliance that can be placed on information provided by economic analysis increases as the proportion of total benefits and costs included in the analysis increases.

Outdoor recreation has long been recognized by economic analysts as a particularly intractable problem. For a variety of reasons, including the perceived existence of many kinds of external benefits, the public sector has traditionally played a dominant role in providing outdoor recreational opportunities. Prices, which for most goods indicate the relative willingness of consumers to pay, have not been generated. And willingness to pay for goods and services is generally considered to be an appropriate measure of economic benefits.

Because of the absence of reliable market signals, and faced with growing numbers of resource allocation questions involving outdoor recreation, economists have directed considerable attention to the development of ways to measure the *demand* for certain kinds of recreational opportunities. Estimates of willingness to pay can be derived from economic demand curves. None of the methods developed to date are both theoretically sound and readily adaptable to practical applications. Much more research is needed.

But suppose we could put our faith in

one of the existing methods. Would it actually reveal the full willingness to pay, or the total economic benefits, of a particular recreational opportunity? The answer is no, as long as external benefits are present. All the known methods of assessing demand are based on some kind of response of *actual users* to changes in real or simulated prices. External benefits are not included. Yet external benefits are components of total willingness to pay and should ideally be included in economic analyses when they exist.

Important research questions are: (1) What external effects do arise from the production and the consumption of outdoor recreation services?, and (2) how can they be measured? Many types of external benefits will undoubtedly always defy measurement. Those hypothesized by Mack and Myers provide an example. There seems to be no way to measure the economic benefits that accrue to society at large because the citizenry is generally informed about the out-of-doors. But some progress in identifying and measuring specific kinds of externalities is bound to help clarify thinking about gains and losses associated with alternative uses of natural environments.

EXISTENCE VALUE AND OPTION VALUE

My work at the Cooperative Research Unit at Raleigh was concerned with two particular external benefits arising from the "production", in a loose sense, of identifiable units of relatively natural environments. These two types of external benefits are: (1) existence value and (2) option value.

The concept of existence value has been recognized for some time, although the term has not yet been used in the literature. John Krutilla (1967) has used the term "bequest motive" to express roughly the same idea. I prefer existence value because it is less specific in its connotations about motivations; i.e., it does not imply a handing down to later generations. Whatever the term, I am talking about the external benefit of natural environments (or any

kind of good) that accrues to individuals having no intention of ever visiting the site or using the good in question. These people are willing to give up resources simply to know that the area, feature, or good exists in a particular condition. As mentioned earlier, this type of external benefit is frequently claimed to be associated with wilderness and outstanding natural features.

Option value was first described by Burton Weisbrod (1964). In principle, his arguments apply to all goods characterized by: (1) a demand that is infrequent and uncertain; (2) high costs of expanding production once output is curtailed; and (3) an absence of perceived close substitutes. Many National Parks, wildlife species, and cultural features fall into this category. An underallocation of resources to these goods might occur if a private producer attempted to maximize his profits, even if he could operate as a perfectly discriminating monopolist and thus capture the consumer surplus of each user.

Weisbrod's argument depends on the existence of persons who are unsure of their future demand for the goods. Some of these people may, in fact, never express a demand. In other words, an individual may have some expectation of visiting, say, a particular National Park sometime in the future, but in actuality may never get there. Yet if people with these expectations of future demand behave rationally, they will be willing to pay something to maintain the option of using the goods in the future if they so desire.

Weisbrod calls this willingness to pay for the standing services of many types of goods *option value*. He uses Sequoia National Park as an example of a "good" that meets his requisite characteristics in the extreme and for which option value may represent a substantial proportion of total benefits received. If this is the case, efforts to estimate the benefits of Sequoia based on willingness of actual users to pay would understate the total benefits of Sequoia in its existing condition.

Economists at Resources for the Future, Inc., have recently developed a more rigorous way to demonstrate the possibility of an option value in excess of consumer

surplus. To me, the deductive evidence in favor of option value for certain kinds of goods is quite convincing. I hasten to add, however, that some other economists who have considered the subject do not share this view.

EMPIRICAL WORK

My research on external benefits was directed to the question whether empirical support for option value and existence value could be generated. Ideally, monetary measures for both would be developed in order to assure comparability with other resource values. But markets do not usually exist for external benefits because, in a large group, it does not pay any one individual to reveal his true preferences for the good or service. The problem is that no one can be excluded from enjoying the benefits. Once a wilderness is preserved, the satisfaction of knowing that it exists accrues to everyone. If one individual were asked to pay for this benefit, he would likely refuse, since no one can keep him from enjoying it. But perhaps some approximations can be found.

It is my opinion that many conservation/preservation organizations serve as focal points for the voluntary expression of various kinds of external benefits arising from natural environments, wildlife, or other objects of the groups' attention. They can be viewed as quasi-markets for these services. Consider the National Parks and Conservation Association, for example. Its primary responsibility, as stated in its monthly publication, is to help protect the national parks and monuments of America. Many people willingly and voluntarily give up resources to help assure that this responsibility is met. Admittedly, contributors are seeking to get parks established and protected through the political process rather than through the market. In this way, they can avoid paying the full opportunity costs of the resources involved. Nevertheless, their contributions must be a partial reflection of the utility expected to be gained. It makes sense, then, to consider these voluntary payments as partial measures of benefits of National Parks to be compared with the true (opportunity) costs of estab-

lishing new parks or maintaining existing areas in a relatively natural state.

Members of the National Parks and Conservation Association provided the data for my research. The membership roles of the Association were systematically sampled to obtain information on the magnitude of individual contributions and on addresses of contributors. Other information, such as estimated probability of future use, was obtained from a questionnaire mailed to sampling units.

Four percent of the sample donated money to the National Parks and Conservation Association while having no intention of ever visiting a National Park. These contributions, it seems to me, can be interpreted as expressions of existence value. Whatever their motives, these people are willing to voluntarily give up resources to help assure the existence of an environmental feature that they will most likely never see. These people apparently benefit from knowing that National Parks exist, yet their benefits will never be registered in visitor counts or in entrance fees. Some degree of existence value is also likely reflected in the contributions of other members of the Association, but it could not be identified as such.

It may be argued that 4 percent is hardly worth bothering with. But it should be remembered that there are real incentives to not express preferences for external benefits at all. In light of the revelation of preference problem, it is surprising that any existence value as defined in this study could be identified. Contributions as a reflection of total willingness to pay are probably further reduced because the outcome of the efforts of the National Parks and Conservation Association are likely less than certain.

Option value is more difficult to assess and to isolate from other forms of willingness to pay, such as existence value and consumer surplus. As a first attempt, contributions were related to the expressed probability of future use of National Parks. The hypothesis, as suggested by Cicchetti and Freeman, was that the total value of contributions should exceed the total expected value of consumer surplus when

demand is uncertain. The difference would be option value. A positive difference was indeed found. But, because of a number of difficult definitional and conceptual problems, the results are still inconclusive.

The general conclusion that emerged from my research was that existence values associated with certain outstanding natural environments do exist. Economic analyses

of alternative uses of these land units are likely to exclude important social benefits if they are restricted to benefits measured in terms of economic responses of actual users. Additional research directed toward the assessment of specific external benefits of land units now in a relatively natural state and being considered for development would likely pay big dividends.

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