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COMMENT 1

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Alan Randall makes a case for using benefit-cost analysis (BCA) to support public policy decisions. Even though potential Pareto improvement (PPI) is not universally accepted as a decision rule, he argues that the PPI information in a BCA serves several useful public and private roles that may influence—but seldom determine—policy choice. With this background, along with that on the valuation problem itself provided by Anderson and Bishop, we can turn to some pragmatic questions about where resource economics stands in terms of using BCA now, and what needs to be done to make this tool more useful in the future.

BCA's Role in Resource Policy

There is considerable resistance to using BCA in making policy decisions. Randall covered three basic reasons for this: (1) society's political philosophy; (2) BCA's scientific basis; and (3) the sheer expense of conducting a

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complex BCA. While these reasons apply to any public policy choice, they tend to be more severe for decisions about natural resources. This is because resource policy effects on complex ecosystems are difficult to predict, and the categories of effects ordinarily are not traded in markets, so estimates of their values are not readily available.

Reduced flexibility

Resistance also comes from decision makers' reluctance to accept any framework that might restrict them from exercising their discretion, and from recognition of BCA's past abuses (particularly for projects under the Flood Control Act of 1936). Randall states that public and private interests ultimately are protected from such abuse by critical review of BCAs, which can occur except under the rational planning model. Simple availability of a BCA may be insufficient, however, if it is written in very technical terms (as is common), and if interested parties are so scattered that transaction costs prevent them from enlisting the aid of an expert who can interpret the document. Thus availability of a BCA for critical review might be defined to require that it be written so the layman can understand its contents.

Using the right baseline

Another reason for the reluctance to accept BCA in evaluating resource and environmental policy is disagreement about an appropriate reference point for individuals' initial endowments. This occurs because some property rights are not defined clearly. This is particularly important when the proposed policy involves a loss of entitlement because of persistent differences between empirical estimates of maximum willingness to pay (WTP) to prevent an adverse change, and minimum compensation (i.e., willingness to accept (WTA)) required to agree to the change.[1]

The economic theories behind BCA imply that so long as income effects are small, WTP and WTA should be approximately the same.[2] While this condition may not hold for some resource policy decisions, it does hold for most of the studies where substantial divergences have been estimated. Since there may be shortcomings in the WTA questions used in these studies, it has been recommended that the smaller WTP estimates be used in BCA.[3] Until this issue is resolved, it appears that property rights must be assigned carefully for a reliable BCA.

For example, the loss of benefits estimated for a development project that will eliminate some wilderness recreation (or hunting, fishing, etc.) opportunities will depend on how much of these opportunities people are assumed to have rights to without the project. Similarly, the benefits estimated for programs to reduce air or water pollution depend on how clean is the air or water to which they have property rights. If the status quo is better (or worse) than what is perceived as the appropriate initial endowment baseline, this should be accounted for in the BCA.

Legal limitations and requirements

Randall discusses the broad legal foundations that could support reliance upon a PPI criterion. However, another reason BCA is not used more widely as one basis for policy decisions is that several laws prohibit its use. For example, the Clean Air Act requires the U.S. Environmental Protection Agency (EPA) to set primary standards for national ambient air quality with adequate margins of safety for protecting public health, without considering the costs of achieving those standards.[4] (Of course, once a standard is set, EPA can examine the cost effectiveness of alternative ways of reaching it.) Similarly, Congress's recent reauthorization of the Resource Conservation and Recovery Act appears to preclude use of BCA in deciding whether to prohibit specific hazardous wastes from land disposal.[5] Instead, the legislation requires that each of a long list of hazardous wastes be banned from land disposal unless EPA can show that such disposal will not harm human health or the environment. This completely overlooks the possibility that alternative disposal methods might be both more dangerous and more costly to construct, operate, and eventually close.

Such legal restrictions apply to relatively few types of natural resource policy decisions, but their existence for some programs often seems to have spillover effects for others. For instance, an agency's legal staff seems more comfortable with consistent decision criteria across as many programs as possible. The lawyers sometimes argue that it will be difficult to defend a BCA criterion in one program when it is proscribed in another.[6] Such behavior by an agency's legal counsel can be viewed as consistent with Randall's conceptualization of the diffuse public policy process in which individuals and coalitions pursue their self-interests through a variety of market and governmental institutions. Unless the agency's lawyers have a strong preference for the outcome they expect to be indicated by a BCA, they may opt for keeping their work load smaller by encouraging consistency across the agency's programs.

On the other hand, Executive Order 12291 requires BCA as part of a regulatory impact analysis (RIA) for each major regulation, regardless of whether its results can be used in the decision process. When the law pre-

cludes the use of BCA in the decision, the RIA must include a statement to that effect. The Office of Management and Budget (OMB) issued guidance to amplify the executive order, indicating that the Reagan administration's intent was to have agencies identify laws that force inefficient regulations so that the legislation could be changed. I am not aware of any instances where the law has changed as a result of such a finding.

In the diffuse policy process he described, Randall interprets Executive Order 12291 as President Reagan's attempt to place constraints on other participants. The likelihood that proposed and existing regulations might not pass a PPI test means the executive order would move agencies toward the president's goal of less regulation. Conducting the required RIA undoubtedly has kept some inefficient regulations from being submitted to OMB. At the same time, it is interesting to note how many regulations have been proposed where the RIA shows positive net benefits. This may have come as a surprise to the administration, and may help explain why OMB takes so long to review an RIA.[7]

Potential for BCA In Upcoming Decisions

As Randall points out, BCA has not been, and perhaps should not be, the primary decision criterion in the public policy arena. Factors related to data availability and the technical implementation of a BCA, along with considerations aside from efficiency, support the need for flexibility in the decision process, rather than a rigid BCA rule.

In line with this flexible approach, it may be that a policy proposal will not require a full-fledged BCA in order to provide the efficiency information of interest to the decision maker. In some cases, cursory examination will show that a proposal's benefits clearly outweigh its cost to society, so that it can be justified on efficiency grounds.[8] In others, a quick look will reveal that benefits are few and relatively small compared with the costs of implementing the proposal. Such information suggests abandoning the proposal, given society's multiple needs and scarce resources. In these cases, more information is not worth gathering since it would be unlikely to lead to a different recommendation on PPI grounds.

The third possibility is that preliminary examination will show substantial benefits but will not make clear whether they exceed the costs of implementing the proposal. In this case, a more detailed BCA is required if the efficiency aspects of the policy are to be determined. However, the extent and detail of the BCA should depend on the potential magnitude of making the wrong decision from an efficiency perspective (i.e., the costs of being

wrong) and the potential to influence that decision. Thus, a proposal that might turn out to be mildly inefficient but expensive merits a less exhaustive BCA than another that might be inefficient and very costly. Since analytical resources are scarce, the efficient natural resource economist will conduct a "mini" BCA on how extensive his/her BCA should be for a particular policy proposal.

Differing precision in BCAs

Regardless of the degree of detail desired to match the magnitude of the decision, differences in data availability and in the sophistication of our valuation methodologies lead to four levels of BCA, with decreasing precision:

1. All benefits and costs can be identified, quantified, and monetized.
2. All benefits and costs can be identified and quantified, but some cannot be monetized satisfactorily (either because their inherent nature makes valuing them controversial—as with morbidity and mortality—or because our present valuation methodologies are limited—as for valuing ecosystem changes).
3. All benefits and costs can be identified, but some cannot be quantified and thus cannot be monetized. (For example, the analyst may be able to say that strip mining in an area will affect species X, Y, and Z, but shortcomings in measurement techniques may prevent him from saying how much each species is affected.) Others can be quantified, but not monetized, as in (2).
4. Some benefits or costs cannot be identified, perhaps because of limitations in our basic understanding about ecosystem structures and functions. For those that can be identified, (3) may apply.

The monetization of benefits and costs relies on prices for those commodities traded in markets, and on estimates of Hicksian compensating values for the remaining ones. These values may be estimated through direct methods (what Randall calls contingent valuation, broadly defined) or through indirect methods (his weak complementarity/implicit price approaches).

To accommodate the fact that the degree of precision will vary across different benefit-cost analyses, I have for some time recommended the following approach for the policy decision process. The first step is to consider the available benefit-cost information (keeping in mind that the extent of BCA should be keyed to the magnitude of the policy decision, and to the

likelihood that new information will affect the decision):

1′. If information is available for (1), is the net benefit estimate positive?
2′. If information is insufficient for (1) but adequate for (2), list and describe the nonmonetized benefits and costs. For plausible ranges for values of the nonmonetized benefits, is it likely that they are large enough to change the sign of the net benefit estimate?
3′. For a BCA in level (3), calculate the net benefits on the basis of available information. List and describe the measures of the quantified but nonmonetized benefits and costs; list and describe the unquantified benefits and costs. On balance, are the values and magnitudes of these categories likely to reverse the sign of the net benefits estimate?
4′. Conduct an analysis as close to (3′) as possible. Use any available information to describe potential but unidentified benefits and costs. Given the expected reliability of this information, is it likely to be important enough to reverse the recommendation based on the (3′) analysis?

This organization of benefit and cost information makes a complex, multidimensional decision more manageable by combining information into a smaller number of categories. It focuses attention on the nonmonetized and/or unquantified benefits and costs, so that explicit decisions must be made about their importance relative to the monetized benefits and costs. In each case, the decision maker should consider the uncertainties in the estimate, perhaps through the sensitivity and inverse sensitivity analyses suggested by Randall.[9]

Equity considerations

The information provided to this point in a BCA shows whether a particular policy proposal would lead to a PPI. By its very nature, the efficiency conditions of a PPI ignore equity aspects. Since society may be unwilling to support a policy that is viewed as particularly unfair, it may be worth recognizing that the BCA is only one component in the diffuse decision process. In particular, the PPI information may stand a better chance of being a real component of the decision process if it is accompanied by explicit statements about the proposal's expected equity effects. In a broadly defined benefit-cost *assessment*, the analyst provides information about the distribution of benefits and costs in addition to the PPI information.[10] This allows a more informed response to the question: Are the equity impacts important enough to either negate the recommendation based on the net benefit estimate or lead to a recommendation for some other mitigating action?

What next?

Examination of the steps in (1′) through (4′) emphasizes that BCA essentially relies on a damage-function approach—values are applied to changes in quantities of physical and biological measures. As Randall points out, the scientific measures of these changes often have substantially more uncertainty than the imprecise valuation methods economists use. This illustrates the most important needs for improving the applications of BCA: namely, a better understanding of underlying physical and biological processes, and more reliable data for predicting the outcome of a policy option.

When the data problem is particularly serious (i.e., when the BCA is closer to that in levels (3) and (4)), it may be desirable to consider valuing the policy action directly, rather than its expected outcomes. For example, it may be difficult to predict the precise ecological (and other) effects of a 50 percent reduction in sulfur dioxide (which is a contributor to acid rain). Similarly, it may be difficult to predict the ecological effects of energy development adjacent to a unique wilderness area, or the specific reduction in health risks from more stringent hazardous waste regulations. In such cases, a description of the policy proposal could be developed, along with explicit recognition of the uncertainties in identifying and measuring the types, quantities, and values of outcomes. Citizens, experts, and/or decision makers then would be asked to assign values to the policy action itself.[11] As more scientific information becomes available and narrows the uncertainties about the outcomes of a proposed policy, then the valuation of benefits and costs can be assigned to the outcomes rather than to the policy action itself.

Over time, current and future research will improve not only the methods we have for predicting the types and amounts of outcomes that will occur as a result of a policy decision, but also those for estimating the values for each type. Then some BCAs that today are in level (4) will move up to level (3), or even (2). Some of these prediction problems, such as measuring the impact on ecosystems and determining option and existence values, may be difficult to solve. At the same time, new problems will arise in the natural and environmental resources arena, so that there still will be some BCAs in the less-satisfactory levels (3) and (4). Unfortunately, not to decide is to decide. To make sure efficiency considerations are included in policy decisions that cannot wait for perfect information, natural resource economists have an incentive to provide the best BCA information possible while pointing out its strengths and weaknesses.

Notes

[1] Studies by Hammack and Brown [1974]; Sinclair [1976]; Brookshire and Randall [1978]; Bishop and Heberlein [1979]; Rowe, d'Arge, and Brookshire [1980]; Banford, Knetsch, and Mauser [1980]; and Knetsch [1984] found WTA to be 2.5 to 16 times as large as WTP.

[2] Willig [1976] showed this for price changes, while Randall and Stoll [1980] showed it for quantity changes.

[3] Cummings et al. [1984] make this recommendation. Others (e.g., Gregory, [1984]) are concerned that the divergences can be explained only by modifying the theories behind BCA. Tversky and Kahneman [1981] suggest that insights from psychology may explain why the payments people demand for giving up an entitlement seem to be larger than the maximum they would agree to pay to keep the same rights.

[4] Sections 109(a) and 109(b), 42 U.S.C. 7409.

[5] *Congressional Record*, October 3, 1984, H 11104-H 11144.

[6] This is made difficult when some of the agency's laws require an approach that is similar to BCA. For example, the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), Section 2(bb), 7 U.S.C. 136(bb), requires EPA to examine both the benefits of using a pesticide to increase agricultural and forestry yields and the risks associated with its use. FIFRA does not require monetization of the risks in order to get a net benefit number. Similarly, to receive EPA funding, states must show that combined-sewer-overflow projects will "substantially restore" impaired shellfishing and swimming, and a reasonable relationship between these benefits and the project's costs (Construction Grants Regulation §35.2024(b)).

[7] For the effect of the executive order on environmental policy, see Smith [1984].

[8] This ignores the possibility that a more refined BCA could point to the specific size of the policy proposal that would maximize net benefits, giving the largest PPI.

[9] As is typical of other authors, Randall emphasizes the need to focus on the uncertainties in valuing nonmarket natural and environmental resources. Usually, these are on the benefits side of the ledger. At the same time, the cost side should not be neglected. In many instances cost analyses have concentrated on their distributional impacts, rather than on the overall costs to society.

[10] See, for example, Desvousges and Smith [1983].

[11] In a pioneering attempt, Schulze et al. [1983] asked households to value a hazardous waste regulation directly. Smith and Desvousges (1985) asked households to value changes in risk from hypothetical hazardous waste regulations of varying stringency. A next step would be to tie their valuations to changes in risk actually expected from a proposed policy.

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