INTRODUCTION
TO COST-BENEFIT ANALYSIS

In the Affair of so much Importance to you, wherein you ask my Advice, I cannot
for want of sufficient Premises, advise you what to determine, but if you please I will tell
you how. When those difficult Cases occur, they are difficult, chiefly because while we
have them under Consideration, all the Reasons pro and con are not present to the Mind
at the same time; but sometimes one Set present themselves, and at other times another,
the first being out of Sight. Hence the various Purposes or Inclinations that alternately
prevail, and the Uncertainty that perplexes us.

To get over this, my Way is, to divide half a Sheet of Paper by a Line into two
Columns; writing over the one Pro, and over the other Con. Then during three or four
Days Consideration, I put down under the different Heads short Hints of the different
Motives, that at different Times occur to me, for or against the Measure. When I have
thus got them all together in one View, I endeavour to estimate their respective Weights;
and where I find two, one on each side, that seem equal, I strike them both out. If I find
a Reason pro equal to some two Reasons con, I strike out the three. If I judge some two
Reasons con, equal to some three Reasons pro, I strike out the five; and thus proceeding
I find at length where the Ballance lies; and if after a Day or two of farther consideration,
nothing new that is of Importance occurs on either side, I come to a Determination
accordingly. And, tho’ the Weight of Reasons cannot be taken with the Precision of
Algebraic Quantities, yet, when each is thus considered, separately and comparatively,
and the whole lies before me, I think I can judge better, and am less liable to make a rash
Step; and in fact I have found great Advantage from this kind of Equation, in what may
be called Moral or Prudential Algebra.

—B. Franklin, London, September 19, 1772
**INDIVIDUAL VERSUS SOCIAL COSTS AND BENEFITS**

Benjamin Franklin's advice about how to make a personal decision illustrates many of the features of cost-benefit analysis (CBA). These include a systematic categorization of impacts as benefits (pros) and costs (cons), valuing in dollars (assigning weights), and then determining the net benefits of the proposal relative to the status quo (net benefits equal benefits minus costs).

When we as individuals talk of costs and benefits, we naturally tend to consider only our own costs and benefits. To oversimplify, we choose between alternative courses of action according to which has the largest individual net benefits. Similarly, in evaluating various investment alternatives, firms tend to consider only those costs (expenditures) and benefits (revenues) that flow to them. In cost-benefit analysis we try to consider all of the costs and benefits to society as a whole. For this reason, some people refer to CBA as social cost-benefit analysis.

Stated at this level of abstraction, it is unlikely that many people would disagree with CBA. In practice, however, there are disagreements, which are of two types. First, social critics including philosophers, libertarians, some political economists, and socialists have disputed the fundamental utilitarian assumptions of CBA that the sum of individual utilities should be maximized and that it is possible to trade off utility gains for some against utility losses for others. These critics are not prepared to make trade-offs between one person’s benefits and another person’s costs. Second, participants in the public policy-making process (analysts, bureaucrats, and politicians) may disagree about such practical issues as whether certain given impacts are costs or benefits, what those impacts will be over time, how to monetize (attach a dollar value to them), and how to make trade-offs between the present and the future.

Our purpose in this chapter is to provide a nontechnical but reasonably comprehensive overview of CBA. Though we introduce a number of key concepts, we do so informally, returning to discuss them more thoroughly in subsequent chapters. Therefore, this chapter is best read without great concern about definitions and technical details.

**THE PURPOSE AND USES OF CBA**

The broad purpose of CBA is to help social decision making. More specifically, the objective is to facilitate the more efficient allocation of society’s resources. As we will see, where markets work well, individual self-interest will lead to an efficient allocation of resources. Consequently, government analysts and politicians bear the burden of providing a rationale for any governmental interference with private choice. Economists lump these rationales under the general heading of market failures. Where markets fail there is a prima facie rationale for government intervention. But it is no more than that. One must be able to demonstrate the superior efficiency of a particular intervention relative to the alternatives, including the status quo. For this purpose, we use CBA.
There are two major types of cost-benefit analysis that aid government resource allocation decisions in distinct ways. *Ex ante* CBA, which is just standard CBA as the term is commonly used, assists in the decision about whether scarce social resources should be allocated by government to a specific policy, whether program, project, or regulation. Thus, its contribution to public policy decision making is direct, immediate, and bureau specific. *Ex post* analysis is conducted at the end of a project. At the end, all of the costs are “sunk” in the sense that they measure how much has already been given up to do the project; also, there is less uncertainty about what the actual benefits and costs were (apart from measurement errors). The value of such analyses is broader and less immediate as they provide information not only about the particular intervention but also about the “class” of such interventions. In other words, such analyses contribute to “learning” by government managers, politicians, and academics about whether particular classes or types of projects are worthwhile. Eventually the weight of evidence may lead to a policy change. For example, a whole range of CBAs in the 1960s and 1970s of industry-specific economic regulation showed that the costs of regulation often exceeded the benefits, paving the way for deregulation initiatives in the 1980s.

In practice, many CBA studies are performed during the course of the life of a project, that is, *in medias res*. Some elements of such studies are similar to an *ex ante* analysis, while others are similar to an *ex post* analysis.

There is also a fourth class of CBA—one that compares *ex ante* predictions with *ex post* measurements or, more likely, with *in medias res* estimates for the same project. This comparative class of CBA is most useful to policymakers for learning about the efficacy of CBA as a decision-making and evaluative tool. Unfortunately, CBA comparisons appear to be almost nonexistent in the academic literature. In fact, we are unable to find any disinterested published *ex post* or *in medias res* analysis that is compared to an objective *ex ante* analysis of the same or very similar project. (In Chapter 15 we will provide an example of such a comparison.) The lack of comparison CBAs is not as surprising as it may appear because the constituencies for *ex ante* CBA are frequently different from those for *ex post* or *in medias res* CBA.

It is useful to elaborate on the values of the four different classes of CBA discussed previously: *ex ante*, *ex post*, *in medias res*, and *ex ante/ex post* or *ex ante/in medias res* comparisons. Table 1.1 summarizes the important ways in which different classes of analysis serve different purposes.

**Project-Specific Decision Making**

*Ex ante* analysis is most useful for deciding whether resources should be allocated to a particular project. For ongoing projects where it is feasible to shift resources to alternative uses, an *in medias res* analysis can also be used for decision-making purposes. It is rare that such analysis will lead to termination of a project nearing completion because costs tend to come before benefits in investment projects, and the subsequent benefits will usually exceed the subsequent costs. However, it can happen. Recently a Canadian Environmental Assessment Panel recommended the decommissioning of a
### TABLE 1.1 VALUE OF DIFFERENT CLASSES OF CBA

<table>
<thead>
<tr>
<th>Value</th>
<th><em>Ex Ante</em></th>
<th><em>In Medias Res</em></th>
<th><em>Ex Post</em></th>
<th><em>Ex Ante/Ex Post or Ex Ante/In Medias Res Comparison</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>Resource allocation decision for this project</td>
<td>Yes—helps to select best project or make “go” versus “no-go” decisions, if accurate</td>
<td>If low sunk costs, can still shift resources</td>
<td>Too late—the project is over</td>
<td>Same as in <em>medias res</em> or <em>ex post analysis</em></td>
</tr>
<tr>
<td>Learning about actual value of specific project</td>
<td>Poor estimate—high uncertainty about future benefits and costs</td>
<td>Better—reduced uncertainty</td>
<td>Excellent—although some errors may remain. May have to wait long for study</td>
<td>Same as in <em>medias res</em> or <em>ex post analysis</em></td>
</tr>
<tr>
<td>Contributing to learning about actual value of similar projects</td>
<td>Unlikely to add much</td>
<td>Good—contribution increases as performed later. Need to adjust for uniqueness</td>
<td>Very useful—although may be some errors and need to adjust for uniqueness. May have to wait long for project completion.</td>
<td>Same as in <em>medias res</em> or <em>ex post analysis</em></td>
</tr>
<tr>
<td>Learning about omission, forecasting, measurement and evaluation errors in CBA</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes, provides information about these errors and about the accuracy of CBA for similar projects</td>
</tr>
</tbody>
</table>


just completed dam on the basis of an *in medias res* analysis which showed that, with continuation, future environmental costs exceeded future benefits. Because *ex post* analysis is conducted at the end of the project, it is obviously too late to reverse resource allocation decisions with respect to that particular project.
Learning About the Value of the Specific Project

In the early stages of a project there is considerable uncertainty about the actual consequences and, consequently, about the true net benefits. As time goes by uncertainty decreases and more is known about the true value of the project. At the end, all impacts have occurred. In general, *ex post* studies are more accurate than *in medias res* studies, which are more accurate than *ex ante* studies.

Learning About the Potential Benefits of Similar Projects

*Ex post* analyses not only provide information about a particular policy intervention but, more importantly, about similar interventions as well. Thus, they provide information for analysts conducting *ex ante* analyses of similar policies. Furthermore, *ex post* analyses potentially contribute to learning by political and bureaucratic decision makers, as well as policy researchers, about whether particular kinds of projects are worthwhile. The U.S. federal government has explicitly induced learning by sponsoring and requiring evaluation of a variety of "pilot tests," "demonstration projects," and "social experiments" including, for example, various welfare reform demonstrations that were conducted by different states during the 1980s. Eventually the weight of evidence may lead to a policy change. *In medias res* analyses provide similar learning: Analyses of ongoing regulatory policies contributed to deregulation in the trucking, airline, and telecommunications industries.

The degree of societal learning from *in medias res* and *ex post* analyses depends on the representativeness of a particular project. This is crucial for realistic assessment of the usefulness of CBA. For example, CBAs of experiments involving new surgical procedures or pharmaceutical products are usually representative. Lessons from many projects, however, are not as generalizeable as they appear. For example, there may be scale-related effects for either benefits or costs (the proposed intervention is usually at least several orders of magnitude bigger than the experiment). Also the proposed program usually has a more extended time frame than the experiment, which may increase the incentives for behavioral changes that increase costs or reduce benefits.

Learning About the Efficacy of CBA

Comparisons of *ex ante* with either *in medias res* or *ex post* analyses are most useful for learning about the value of CBA itself. First, they help estimate the level of confidence one can place in subsequent CBAs. That is, they provide a measure of *ex ante* precision. This information is useful for decision-making purposes. Second, comparison studies help explain the divergence between expected and realized benefits and costs. In Chapter 15, we describe four important dimensions of accuracy: omission errors, forecasting errors, measurement errors, and valuation errors.

THE DEMAND FOR CBA

The demand for CBA is illustrated by Executive Order 12291, issued by President Reagan in early 1981. This requires that a regulatory impact analysis (RIA) accompany every major regulatory initiative (over $100 million in cost) from government agen-
cies. (An RIA is essentially a cost-benefit analysis that also identifies distributional and fairness considerations.) In the spring of 1995 the U.S. House of Representatives passed legislation that requires considerably more elaborate CBAs to be performed prior to regulations being promulgated. Moreover, before the regulations are issued, the CBAs could be challenged in the courts or by petition to the regulatory agency. This legislation was being debated by the Senate at the time this book was completed.

Nearly all other Western industrialized countries have similar protocols covering broad ranges of programs or specific program areas. For example, Canada's Federal-Provincial Fraser River Flood Control Agreement recognizes that before any dike construction can take place, projects have to be determined to be engineeringly sound and economically viable. Economic viability is determined by CBA.

The demand for ex post analysis tends not to be so explicit—there are no mandatory requirements that it be done. Nonetheless, resource allocation decisions often draw heavily on such analyses. For example, President Clinton's State of the Union Address on February 17, 1993, emphasized the relationship between ex post CBAs of specific Head Start programs (i.e., educational programs for low-income preschool children) and his intention to increase funding and expand the scope of such programs.

As public officials face citizen resistance to raising taxes, they are forced increasingly to ensure that government works more efficiently and effectively. In practice, this may provide an impetus toward the increased use of CBA and related methods to make more efficient resource allocation decisions. Such trends are contemporaneous with more concern for the environment, which calls for the valuation of all social costs and benefits, rather than just government expenditures. But, as we will see, there are enormous pressures working against the correct use of CBA including ignorance of correct methods, and bureaucratic and political incentives to distort it.

CLIENTS FOR THIS BOOK

We write this book first of all for people who want to know how to do CBA—current and future analysts. Second, it is for people who want to know how to interpret CBA—in other words, clients of CBAs. We think clients can be helped in two ways. In the narrow sense clients should be well enough informed to evaluate specific CBAs. They should be able to judge whether or not a CBA has been conducted well: Does it meet professional standards? In the broad sense, clients' primary need may be to understand the collection of CBAs in a given policy area. Here the purpose is to evaluate CBA studies well enough to have a sense of the conclusions of the literature in specific areas such as employment training or environmental regulation. In order to do this well, one has to understand the basic principles of CBA.

THE BASIC STEPS OF CBA ILLUSTRATED USING A HIGHWAY EXAMPLE

The best way to get a feel for what CBA involves is to walk through a relatively straightforward example. First, we go through the basic steps of CBA using an example to illustrate how they should be performed. Second, we retrace our steps pointing
Introduction to Cost-Benefit Analysis

out the realities and practical difficulties associated with actually doing each step. The conceptual and practical issues that we touch on drive most of the rest of this book. Do not worry if concepts are unfamiliar to you; this is a dry run. Subsequent chapters explain the concepts clearly.

CBA may look intimidating and complex. You may not know where to start. To help make CBA more manageable, we break it down into nine basic steps, as summarized in Table 1.2.

Imagine a cost-benefit analyst working for the State of Texas in 1986 has been asked to perform a CBA of a new highway between Amarillo and Austin (this is hypothetical!), called the AA Highway. This four-lane divided freeway would extend for 195 kilometers, significantly reducing travel time between the two cities. The analyst’s results are presented in Table 1.3. How did she get them? We will go through the nine steps, one at a time.

1. Decide whose benefits and costs count (standing). Following the steps in Table 1.2, the analyst must first decide who has standing, that is, whose benefits and costs should be counted. In this case, she was not in a position to decide this; her superiors were. They wanted the analysis done from the Texan perspective, but also asked her to take a global perspective. The global perspective counts all of the benefits and costs to everyone, irrespective of where they reside. Thus, it includes benefits (and costs) to Californians, Mexicans, and even tourists from the United Kingdom. The state perspective counts only the benefits and costs that accrue to Texas residents. These include costs and benefits that are borne by the Texas government. The two perspectives are shown in the table.

2. Select the portfolio of alternative projects. Step 2 requires the analyst to specify the set of alternative projects. In this simple example the highway department was interested in only two alternatives to the status quo: one with tolls and one without. The toll was set by the highway department; it ranged from $40 for large trucks to $8 for cars. Combining the with-toll and without-toll alternatives with the two different perspectives on standing gives us the four columns in Table 1.3, labeled A through D.

<table>
<thead>
<tr>
<th>TABLE 1.2 CONCEPTUALLY CBA IS SIMPLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Decide whose benefits and costs count (standing).</td>
</tr>
<tr>
<td>2. Select the portfolio of alternative projects.</td>
</tr>
<tr>
<td>3. Catalogue potential (physical) impacts and select measurement indicators.</td>
</tr>
<tr>
<td>4. Predict quantitative impacts over the life of the project.</td>
</tr>
<tr>
<td>5. Monetize (attach dollar values to) all impacts.</td>
</tr>
<tr>
<td>6. Discount for time to find present values.</td>
</tr>
<tr>
<td>7. Sum: Add up the benefits and costs.</td>
</tr>
<tr>
<td>8. Perform sensitivity analysis.</td>
</tr>
<tr>
<td>9. Recommend the alternative with the largest net social benefits.</td>
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</tbody>
</table>
TABLE 1.3 AMARILLO-AUSTIN HIGHWAY CBA (1986 $ MILLION)

<table>
<thead>
<tr>
<th></th>
<th>No Tolls</th>
<th>With Tolls</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A Global Perspective</td>
<td>B State Perspective</td>
</tr>
<tr>
<td>Time and Operating Cost Savings</td>
<td>389.8</td>
<td>292.3</td>
</tr>
<tr>
<td>Terminal Value of Highway</td>
<td>53.3</td>
<td>53.3</td>
</tr>
<tr>
<td>Safety Benefits (Lives)</td>
<td>36.0</td>
<td>27.0</td>
</tr>
<tr>
<td>Alternative Routes Benefits</td>
<td>14.6</td>
<td>10.9</td>
</tr>
<tr>
<td>Toll Revenues</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>New Users</td>
<td>0.8</td>
<td>0.6</td>
</tr>
<tr>
<td>Total Benefits</td>
<td>494.5</td>
<td>384.1</td>
</tr>
</tbody>
</table>

Net Social Benefits 148.8 38.4 24.2 -19.7

Source: Adapted from Anthony Boardman, Aidan Vining, and W.G. Waters, II, "Costs and Benefits through Bureaucratic Lenses: Example of a Highway Project," *Journal of Policy Analysis and Management*, 12, no. 3 (Summer 1993), 532-555, Table 1, p. 537.

3. Catalogue potential (physical) impacts and select measurement indicators. Step 3 requires the analyst to catalogue the physical impacts of the alternatives and to specify the impacts' units. We use the term *impacts* broadly to include both required resources and outputs of the projects. The anticipated beneficial impacts were time saved and reduced vehicle operating costs for travelers on the new highway ("Time and Operating Cost Savings" in Table 1.3); the residual value after the discounting period of 20 years ("Terminal Value of Highway"); accidents avoided (including lives saved) due to drivers switching to the shorter, safer new highway ("Safety Benefits"); reduced congestion on the existing alternative routes ("Alternative Routes Benefits"); revenues collected from tolls ("Toll Revenues"); and benefits accruing to newly generated traffic ("New Users"). The anticipated cost impacts were construction costs ("Construction"); additional maintenance and snow removal ("Maintenance"); toll collection ("Toll Collection"); and toll booth construction and maintenance ("Toll Booth Construction").

Specification of impact category indicators occurs simultaneously with specification of the impact categories. There are no particular difficulties in this study in specifying measurement indicators of each impact category that is used. For example, number of lives saved per year, person-hours of travel time saved, and dollar value of gasoline saved are reasonably straightforward.
Observe that to facilitate presentation, some impacts have been identified as being costs, while others have been labeled as benefits. For example, time saved is a benefit, while construction expenditure is a cost. Again, note that impacts refer to both inputs (which are typically costs) and outputs (which are typically benefits).

4. Predict quantitative impacts over the life of project. This project, like almost all projects, has impacts over extended periods of time. The fourth task is to predict for each alternative project the level of all impacts over the life of that project, and sometimes beyond it. We need to estimate how many people will use each highway under the with-tolls and no-tolls alternatives, and what proportion of these users are Texans. In this example, one must predict or calculate for different categories of drivers (trucks, passenger cars on business, passenger cars on vacation) and for all alternatives over time:

- The number of vehicle-trips on the new highway.
- The number of vehicle-trips on the old roads.
- The total amount of time users save.
- The total amount of vehicle operating costs and wear-and-tear that users save.

One must also predict:

- How many accidents are avoided and lives saved.
- The frequency and severity of rainstorms, tornadoes, and other factors that affect maintenance costs.

Each impact must be predicted over the life of the project. Here we present an example of how the analyst predicted how many lives the new highway would save each year:

Shorter distance:

\[
130 \text{ vkm} \times 0.027 \text{ lives lost per vkm} = 3.5 \text{ lives/year}
\]

Safer (4-lane versus 2-lane):

\[
313 \text{ vkm} \times 0.027 \text{ lives lost per vkm} \times 0.33 = 3.0 \text{ lives/year}
\]

Total lives saved\(^{13}\) = 6.5 lives/year

There are two components. First, the new highway is shorter than existing alternative routes. Hence, it is expected that drivers will avoid 130 million vehicle-kilometers (vkm) of driving and evidence provided by the state suggests that, on average, there are 0.027 deaths per million vehicle-kilometers. The shorter distance is expected, therefore, to save 3.5 lives per year. The new highway is also predicted to be safer per kilometer driven. It is expected that 313 million vehicle-kilometers will be driven each year on the new highway. Based on previous traffic engineering evidence, the analyst estimated that the new highway would lower the fatal accident rate by one-third. Consequently, the new highway is expected to save 3.0 lives per year due to being safer. Combining the two components, 6.5 lives are saved per year.
5. Monetize (attach dollar values to) all impacts. The analyst now has to monetize each of the impact units described previously. Monetization means value in dollars. Specifically, we need to monetize time saved, a statistical life saved, and accidents avoided. One would like to find such values in a "catalogue" that, for example, provides one with the monetary value of an hour of leisure saved, the value of an hour saved by a person on business, and the value of an hour saved by a truck driver. Ideally, each estimate should be location specific and time specific. Thus, in our example, it should pertain to Texas in 1986. Some examples of the dollar values per unit used in this CBA are:

- Leisure time saved per vehicle = 25 percent of gross wage x average number of passengers = $6.68 per vehicle-hour.
- Business time saved per vehicle = $12 per vehicle-hour.
- Truck drivers' time saved per vehicle = $14 per vehicle-hour.
- Value of a life saved = $500,000 per life.

These estimates were based on previously published estimates of the value of time and the value of life, topics that are discussed in depth in Chapter 12.

6. Discount for time to find present values. For any project that has either costs or benefits arising over extended periods (years), we need a method to aggregate the benefits and costs that occur at different times. Future benefits and costs are discounted relative to present benefits and costs in order to obtain their present values. The need to discount arises due to most people's preference to consume now rather than later. Discounting has nothing to do with inflation per se, although inflation must be taken into account. A cost or benefit accruing in year \( t \) is converted to its present value by dividing it by \( (1+d)^t \), where \( d \) is the social discount rate. As discussed in Chapter 5, the choice of the appropriate social discount rate is a contentious issue. In the highway example the analyst used a real (inflation-adjusted) social discount rate of 7.5 percent to calculate present values.

7. Sum: add up benefits and costs. The basic decision rule for a single alternative (relative to the status quo) is simple: Add up the present value of benefits \( (B) \), add up the present value of costs \( (C) \), and see which is larger. If benefits exceed costs, then proceed with the project. If not, stay with the status quo. In short, the analyst would recommend proceeding with the project if:

\[
\text{NPV} = B - C > 0.
\]

In other words, when there is only one potential project, proceed with that project if the net present value of social benefits \( (\text{NPV}) \) is positive.

When there is more than one alternative to the status quo, the rule is slightly more complicated: Select the project with the highest NPV.

The bottom line in our highway example is that projects A, B, and C have positive NPVs. The with-toll alternative from the Texas perspective (D) is the only one...
that does not. We should emphasize that these estimates are "expected" NPVs, based on our best predictions and valuations.

8. **Perform sensitivity analysis.** As discussed in Chapter 6, sensitivity analysis is an attempt to deal with uncertainty. One can perform sensitivity analysis with respect to both prediction of impacts and their valuation per unit of impact. For example, the analyst may be uncertain about the predicted number of lives saved and about the appropriate dollar value to place on a statistical life saved. One can also perform sensitivity analysis with respect to standing and the social discount rate. In this example, the analyst performed sensitivity analysis on the standing issue by comparing global against state NPVs.

9. **Recommend the alternative with the largest net social benefits.** In this case, three of the alternative projects have positive NPVs and one has a negative NPV. The latter indicates that from a Texan perspective it would be more efficient to "do nothing" (not build the proposed AA highway) at this time than to build it and charge tolls. Sometimes the status quo is the best alternative. Here, however, from a global perspective both the with-tolls and without-tolls alternatives are preferable to the status quo. Based on the preceding analysis, the analyst will recommend the selection of A above C or B above D, that is, the project with the largest NPV. In short, the no-toll alternatives are superior.

This result gives a flavor of the possibly counterintuitive recommendations that CBA can support. In this case, tolls lower the NPV because they deter people from using the highway, and so fewer people enjoy the benefits.14

Keep in mind that A is not directly comparable to B (and C is not directly comparable to D) because A and C represent different levels of standing from B and D. In this example, the global NPVs (A and C) are larger than the state NPVs (B and D) primarily because the benefits are higher while costs are the same. But this is beside the point. The issues of standing must be determined independently of which level of analysis obtains the highest NPV.

**THE REALITY OF CBA**

The highway example illustrates how to perform the basic steps of CBA. Yet, at each step, there are potential difficulties. We want to give you a taste for the practical difficulties of performing CBA. One factor that helps us to do this is the fact that the highway on which this example is based was actually built, with tolls, in 1987. But look for it in British Columbia, not in Texas!15

In this section, we focus on those difficulties inherent in doing CBA well; we recognize a whole host of other difficulties is created by political and behavioral biases and other factors. We deal with these later in this chapter.

We should stress right up front that it takes many resources (time, skill, and money) to do CBA well, especially where the alternative projects are large and complex, and have unique features. The costs involved may be very large. For example,
TABLE 1.4 THE REALITIES OF DOING CBA

1. Decide whose benefits and costs count.
   Contentious whether global, national, state, or local perspective is appropriate.
2. Select the portfolio of alternative projects.
   Potentially infinite, the analyst must select a reasonable subset.
3. Catalogue potential (physical) impacts and select measurement indicators.
   Difficult to identify specific impacts where unresearched scientific or biological processes are involved.
   True impacts may be unobservable.
4. Predict quantitative impacts over the life of the project.
   Prediction is difficult, especially over long periods for complex systems.
5. Monetize (attach dollar values to) all impacts.
   Where there are no appropriate market values, one needs "catalogues" that rarely exist. Often the most important benefits are the most difficult to measure.
6. Discount for time to find present values.
   Different theories suggest different social discount rates.
7. Sum: Add up the benefits and costs.
   Some argument about the appropriate decision criterion.
8. Perform sensitivity analysis.
   Potentially infinite—analyst has to choose a reasonable subset.
9. Recommend the alternative with the largest net social benefits.
   This is usually easy! It normally does not present any practical analytical difficulties, just political ones.
   The one exception is where sensitivity analysis shows that NPV estimates are very uncertain.

Thomas Hopkins reports that a recent analysis of the costs and benefits of reducing lead in gasoline cost the Environmental Protection Agency (EPA) roughly $1 million. On average, the EPA spends approximately $700,000 for a major CBA, that is, for the analysis of projects with compliance cost in excess of $100 million annually. Large-scale evaluations of training programs, of which CBA is one component, often run into millions of dollars.

To illustrate the realities of performing CBA well, we return to our nine steps, this time focusing on the difficulties. These are summarized in Table 1.4.

1. **Decide whose benefits and costs count.** It is sometimes contentious whether an analysis should be performed from the global, national, state, or local perspective. While the federal government usually performs analyses taking only national costs and benefits into account, critics argue that many issues should be analyzed from a global perspective. Recent environmental issues that fall into this category include ozone depletion, greenhouse gases, and acid rain. At the other extreme, local governments typically want to ignore costs and benefits that occur in the adjacent municipality or are borne by higher levels of government. Our highway example deals with this issue by analyzing costs and benefits from both a global perspective and a Texas perspective.

2. **Select the portfolio of alternative projects.** In our highway example, there were only two alternatives—with tolls and without tolls—relative to the status quo.
But the range of alternatives is potentially infinite, varying on a large number of dimensions. Some dimensions on which new alternatives could have differed include:

- Timing: The highway could have been delayed until a later date.
- Surface: The highway could have been surfaced in bitumen rather than concrete.
- Routing: The highway could have taken quite different routes.
- Size: The highway could have been two lanes or six lanes, rather than four lanes.
- Tolls: The toll could have been higher or lower.
- Wild Animal Friendliness: The highway could have been built with or without “Armadillo Crossings.”

Changing the highway on just one of these dimensions would generate a new alternative. Changing two or three simultaneously greatly increases the number of alternatives. In general, if there were $n$ dimensions, each with $k$ possible values, there would be $k^n$ alternatives. For example, if there were three dimensions, each with three possible values, there would be 27 mutually exclusive alternatives. With four dimensions, each with three possible values, there would be 81 alternatives! Neither decision makers nor analysts can cognitively handle comparisons among such a large number of alternatives.¹⁸

In practice, CBA analysts evaluate only one project at a time. In the preceding discussion all of the alternatives pertain to a specific highway between Austin and Amarillo. There is usually no attempt to compare the net social benefits of this project to alternative highway projects or, even more broadly, to health care, antipoverty, or national defense projects. As a practical matter, full optimization is impossible. In theory, CBA compares the net benefits of investing resources in a particular project with the net benefits of hypothetical projects that would be displaced if the project under evaluation were to proceed. If, however, a particular project would displace a specific alternative rather than hypothetical ones, it should be evaluated relative to the specific alternative. Thus, if government decided resources could be used only for the highway project or for a health-care project, then the highway project should be compared with the health-care project, not the status quo.

The limited nature of the comparisons sometimes frustrates politicians and decision makers who imagine that CBA is a *deus ex machina* that will rank all policy alternatives. On the other hand, as we discuss in subsequent chapters, the weight of CBA evidence can and does help in making broad social choices across policy areas.

Even if the analyst focuses on only one project (with few or many alternatives), there can be no guarantee that the analyst will select the optimal alternative. Even local optimization may not be possible. As we stated earlier, the analyst will recommend the project with the largest NPV among those evaluated. This point is illustrated in Figure 1.1.

Consider a project for which the alternatives vary along an output scale ($Q$). The benefits and costs associated with alternative scales are represented by the functions $B(Q)$ and $C(Q)$, respectively. The benefits increase as the scale increases, but at a decreasing rate. On the other hand, costs increase at an increasing rate. A small-scale
Moving from $Q_0$ toward $Q^*$ increases efficiency; that is: $\text{NPV}(Q^*) > \text{NPV}(Q_2) > \text{NPV}(Q_1) > \text{NPV}(Q_0)$

Moving beyond $Q^*$ reduces efficiency, but $Q_3$ is more efficient than $Q_0$: $\text{NPV}(Q^*) > \text{NPV}(Q_3) > \text{NPV}(Q_0)$

**Figure 1.1 CBA Seeks More Efficient Resource Allocation**
ject benefits and costs vary simultaneously on many dimensions, (2) the benefit and cost functions are discontinuous or complex (for example, with interaction terms), and (3) when there is uncertainty about the interactions or the functional forms. In practice, these cognitive limitations are always a factor to some extent. In the example depicted in Figure 1.1, this problem is unlikely to be of major importance because the NPVs depend only on scale, and the functional relationships $B(Q)$ and $C(Q)$ are assumed known and are relatively simple and smooth.

Another practical reason for not considering the optimum stems from budgetary or political constraints, which limit the choice set. In the example illustrated by Figure 1.1, projects in excess of size $Q_*$, including $Q^*$, may have been excluded because of budgetary or political considerations. We stress, however, that this should not be considered a weakness of CBA itself, but rather of the political process that selects projects.

In practice, it is useful initially to consider an expanded choice set. A brainstorming session can be very valuable at an early stage to expand the range of consideration.

3. Catalogue potential (physical) impacts and select measurement indicators. In the highway example, identifying impacts was relatively straightforward, although a critic might argue that some impacts were omitted. Some impact categories that the analyst did not include were: health impacts from automobile emissions, impacts on the population of armadillos and other animals, and changes in scenic beauty.

From a CBA perspective, we are only interested in the relationship between an impact and individual utility. In CBA, so-called impacts that do not have any value to human beings are not counted. (The big caveat is that this only applies where human beings have the relevant knowledge and information to make rational valuations.) In order to treat something as an impact, we have to know that there is a cause-and-effect relationship between some physical outcome of the project and human beings with standing. For some impacts, this relationship is so obvious that we do not think about it explicitly. For example, we do not question the existence of a causal relationship between motor vehicle usage and accidents that result in morbidity and mortality. Of course, this still requires us to estimate the exact functional form of the relationship, specifying the level (quantity) of morbidity and mortality under each alternative.

For other impacts, the causal relationships may not be so obvious. What about the impact of exhaust fumes from vehicle usage of the highway on drivers' blood pressure? Demonstrating such cause-and-effect relationships often involves extensive scientific research concerning the impact of airborne lead on blood pressure, whether exposure to secondary smoke raises lung cancer rates, or whether organochlorines harm game fish.

In many CBAs, what we suspect to be the most important impacts may depend upon unresearched, preliminary, or contradictory scientific or biological knowledge. A recent example that illustrates this problem is the controversy surrounding the effect of chlorinated organic compounds in bleached pulp mill effluent on wildlife. While an earlier Swedish study found such a link, a recent Canadian study found none.20

One current, highly publicized controversy that demonstrates how widely opinions can vary is provided by the northern spotted owl. While some experts feel the
costs of logging are relatively minor, Jonathan Rubin and his colleagues have argued the costs may be very large:

Biologically, the owl is an indicator for old-growth temperate ecosystems: the trees, associated plant communities, and wildlife species that find their optimal habitat in these forests. If the spotted owl cannot survive, its extinction could represent a lack of viability for old-growth habitat itself. Elimination of an ecosystem, itself a unique resource, clearly has greater costs for society than mere extinction of the owl.21

In some circumstances, the true impact is unobservable. For example, one may never know exactly how many crimes (or crimes avoided) can be attributed to an intervention. However, we usually have access to alternative indicators, such as changes in arrest rates or changes in conviction rates. In practice, the analyst will probably have to choose one of these surrogates (although one could instead take a weighted average of several). Choice of a specific indicator will usually depend on data availability: what is easy to measure and to monetize. Bear in mind that all indicators involve some slippage of information. Furthermore, remember that the valuation should be consistent with the chosen indicator. For example, the valuation of an arrest should be lower than the valuation of a conviction of the guilty party so that one would obtain similar estimates of crime impacts from using either indicator.

Watch out for impact categories where two different groups of people view what is apparently the same impact in opposite ways. Actually, this is mainly a question of valuation—some may view the impact as a benefit while others may view it as a cost. Consider, for example, “flooded land” as a potential impact category. Residents of the flood plain will generally view floods as a cost, while duck hunters will regard them as a benefit. In such circumstances, it is more useful to have two impact categories—one for damaged homes, another for recreation—even though in reality these are simply opposite valuations of the same impact. Sometimes such differences in valuations flag issues relevant to standing or the issue of weighting costs or benefits that accrue to particular individuals or groups. (Chapter 14 is devoted to distributional weighting.)

4. Predict quantitative impacts over the life of the project. One odd feature of the cost-benefit literature is that hardly anybody discusses the fact that prediction is both essential and very difficult! Most textbooks focus on theoretical issues, assuming that demand and supply curves are known. But they often are not. How good are analysts at predicting the impacts? Surprisingly, as we discussed earlier, there are almost no published examples in which a CBA has first been performed before a project was undertaken (ex ante) and then verified in terms of predictive accuracy at the end of the project (ex post). Consequently, the predictive capability of CBA and, therefore, its value as a practical tool are somewhat unproven.

This issue is so important that Chapter 15 is devoted largely to it and related issues. As discussed there, current evidence suggests that in the actual highway project on which our example is broadly based, usage levels and therefore benefits are considerably higher than predicted, but so were costs! Even this understates the problem. There were errors within benefit categories, which did not show up in the aggregate
dollar benefit as they offset each other. In general, prediction is especially difficult where projects have long time horizons or relationships among variables are complex.

Many of the realities associated with actually doing steps 3 and 4 are brilliantly summarized by Kenneth Boulding’s poem on dam building in the Third World, presented in Exhibit 1.1. Many of his points deal with omission of impact categories due to misunderstanding or ignorance of cause-and-effect relationships and to prediction errors. He also makes points about the distribution of costs and benefits, which we discuss later.

EXHIBIT 1.1  A BALLAD OF ECOLOGICAL AWARENESS

The cost of building dams is always underestimated,
There’s erosion of the delta that the river has created,
There’s fertile soil below the dam that’s likely to be looted,
And the tangled mat of forest that has got to be uprooted.

There’s the breaking up of cultures with old haunts’ and habitats’ loss,
There’s the education programme that just doesn’t come across,
And the wasted fruits of progress that are seldom much enjoyed
By expelled subsistence farmers who are urban unemployed.

There’s disappointing yield of fish, beyond the first explosion;
There’s silt ing up, and drawing down, and watershed erosion.
Above the dam the water’s lost by sheer evaporation;
Below, the river scours, and suffers dangerous alteration.

For engineers, however good, are likely to be guilty
Of quietly forgetting that a river can be silty,
While the irrigation people too are frequently forgetting
That water poured upon the land is likely to be wetting.

Then the water in the lake, and what the lake releases,
Is crawling with infected snails and water-borne diseases,
There’s a hideous locust breeding ground when water level’s low,
And a million ecologic facts we really do not know.

There are benefits, of course, which may be countable, but which
Have a tendency to fall into the pockets of the rich,
While the costs are apt to fall upon the shoulders of the poor.

So cost-benefit analysis is nearly always sure
To justify the building of a solid concrete fact,
While the Ecologic Truth is left behind in the Abstract.

—Kenneth E. Boulding

Reprinted with the kind permission of Mrs. Boulding.

5. Monetize (attach dollar values to) all impacts. Many of the most intuitively important impacts are intangible or are very difficult to value in monetary terms. The value of life is an obvious example. Environmental issues are also contentious. In CBA, value is measured in terms of “willingness-to-pay.” As we discuss in Chapter 3, where markets exist and work well (don’t “fail”) willingness-to-pay can be determined from the appropriate demand curve. Naturally, problems arise where
markets do not exist. In such cases, obtaining a value for just a few impact categories can be a life’s work. Scholars have spent many person-years trying to determine the appropriate value of a saved life. In practice, most CBA analysts do not reinvent these wheels but instead draw upon previous research. Ideally, analysts would like to have “catalogues” of appropriate values to attach to impacts where no market values exist. Unfortunately, such catalogues rarely exist, although, as we show in Chapter 12, considerable progress is being made in this regard.

In the highway example, a saved life was valued at $500,000 in 1986 dollars. Recently a consensus has begun to emerge that the appropriate value of life is considerably higher, closer to $2 million in 1986 dollars.²²

Some government agencies and critics of CBA are unwilling to attach a monetary value to life, which forces them to use an alternative method of analysis. Cost-effectiveness analysis and multigoal analysis, which we discuss in Chapters 2 and 13, are two possibilities.

6. **Discount for time to find present values.** The *social discount rate* is the rate at which analysts should discount the benefits and costs accruing at different times. Different theories suggest different values for the social discount rate. Many learned tomes have been written on this subject. We summarize this literature in Chapter 5. Unfortunately, for the practically oriented analyst, there is a lot of theoretical disagreement. The value of the social discount rate is thus a good candidate for sensitivity analysis. Sometimes the discount rate for use in a CBA is mandated by a government authority (e.g., the Office of Management and Budget, the General Accounting Office, Ministry of Finance or Treasury Board). Often, for example, the specified real (inflation-adjusted) discount rate is 10 percent. But many economists regard this rate as much too high and advocate a lower rate.

7. **Sum: Add up the benefits and costs.** There is some disagreement about the appropriateness of using the maximization of NPV of social benefits as a decision rule. Potential alternatives include the internal rate of return and the benefit-cost ratio. This is one area with more heat than light. The appropriate criterion to use is the NPV of social benefits, which requires only summation of the discounted benefits and costs. There is no disagreement on the merits of this method; it always gives the correct answer.

Arguments about whether it is appropriate to aggregate all of the impacts often turn out to reflect deeper disagreements concerning the choice of appropriate analysis methods. For example, if the analyst is not prepared to monetize the value of life, then she cannot sum all of the project’s impacts and will be forced to adopt an alternative method to CBA, such as cost-effectiveness analysis.

8. **Perform sensitivity analysis.** Potentially, every assumption in a CBA can be varied infinitely. In practice, one has to use judgment and focus on those assumptions that are potentially most important for the results. But this can mean that CBA is vulnerable to the judgment biases of the analyst. Nevertheless, carefully thought-out scenarios are usually more informative than a mindless varying of assumptions.
9. **Recommend the alternative with the largest net social benefits.** This one is easy! It does not present any practical difficulties. Note, however, that the analyst makes a recommendation, not a decision. CBA concerns how resources should be allocated; it is normative. It does not claim to be a positive (i.e., descriptive) theory of how resource allocation decisions are actually made. Such decisions are made in political and bureaucratic arenas. CBA is only one input to this political decision-making process—one that attempts to push it toward more efficient resource allocation.

**BUREAUCRATIC AND POLITICAL “LENSES”**

Thus far we have introduced CBA and discussed the prediction difficulties associated with performing CBA. But we have assumed implicitly that CBA is unconstrained by bureaucratic and political processes. This approach is reasonable given that CBA is based on normative principles: It proposes how resource allocation decisions should be made. Theoretically, its value cannot be countered by pointing out that real-world decisions are not always consistent with CBA; indeed, such arguments make the case for more explicit efforts to use CBA. In practice, however, if CBA never had an influence on real-world decisions, it obviously would lack a bit of oomph. CBA does have influence—as we discussed earlier, demand for it is growing. But CBA frequently gets distorted when bureaucrats and politicians get their hands on it. Certainly a positive theory of government, that is, analysis of how decisions are actually made, must take this reality very seriously. But some commentators have raised this to a normative theory, that is, analysis of how decisions “should” get made. We are not going to get into this debate here (except to the extent that our normative biases are clear). Rather, our purpose is to illustrate some of the perspectives of bureaucrats and politicians and how they distort CBA.

In a world that was perfect apart from market failures, governments would seek to produce perfect CBAs. But government analysts are also individuals who have a tendency to see “costs” and “benefits” from self-interested or agency-interested perspectives.

The major point of this section is that the bureaucratic role has a strong influence on what many government employees think CBA is, and should be, about. Bureaucratic perceptions of what constitutes “benefits” and “costs” appear to be based primarily on their bureaucratic role; specifically, whether they are “analysts,” “spenders,” or “guardians.” These labels are indicative of the perspective they bring to project evaluation in government. The analysts' perspective can be represented by standard CBA, which we have already presented in Table 1.3. Guardians and spenders have quite different lenses.

Most government employees have not taken, and will not take, formal courses in CBA analysis and, therefore, they will go on believing that what they think is CBA is, in fact, CBA. Even employees schooled in standard CBA may modify their orientation toward those of guardians or spenders as a consequence of the immediacy of their daily bureaucratic roles. The perceptions of guardians and spenders have important impacts on policy outcomes.
Guardians tend to be found in central budgetary agencies, such as the U.S. Office of Management and Budget, and in controllership or accounting functions within line agencies. They tend to have a bottom-line budgetary orientation. Their natural tendency is to equate benefits with revenue inflows to their agency or other governmental coffers and costs with revenue outflows from their spending agency or other governmental coffers. Thus, they engage in revenue-expenditure analysis. Guardians have a natural tendency to regard CBA as naive, impractical, and, worst of all in their eyes, a tool whereby spenders can justify whatever it is they want to spend.

For guardians within line agencies, the picture is more complex because they have dual allegiances. Many are prone to cognitive dissonance: They are most likely to describe themselves as being unsure of whether they are guardians, spenders, or both.

The conceptual lens of "pure" guardians can be illustrated by the way they tend to look at the costs and benefits of the AA Highway. Table 1.5 summarizes how a state-based guardian would evaluate the no-toll highway alternative (from column B of Table 1.3) and the corresponding with-toll alternative (from column D of Table 1.3). To guardians, all toll revenues are benefits, whether paid by state residents or by nonresidents. Construction costs are a cost, because they are an outlay by state government. Because guardians seek to minimize net budgetary expenditures, their preference, not surprisingly, is for the with-toll alternative. Indeed, their gut reaction is to consider raising tolls, irrespective of its effect on levels of use or its impact on social benefits.

How does the guardians' perspective differ from CBA? Most importantly, guardians ignore nonfinancial social benefits, in this case $384.1 million for the no-toll alternative and $297.3 million for the toll alternative. In general, they ignore important impacts valued by consumers and producers such as time saved and lives saved. When guardians control the post office, it is easy to understand why one has to wait so long to buy a stamp and post a letter. Neither your time nor my time figures into their calculations.

In this particular example, all social costs happen to represent governmental budgetary costs and so there is no difference between the CBA cost figures and those used by guardians. In other situations, however, there might be considerable differences between social costs and guardians' costs. This can be illustrated by their treatment of the cost of labor in job-creation programs. Guardians consider financial remuneration to labor as the cost, while CBA analysts would consider the loss of leisure time as the cost if the workers would otherwise be unemployed.

Another manifestation of this point concerns the treatment of resources, such as land or buildings, that are currently owned or leased very cheaply by the government. Ignoring their value in other uses, guardians tend to treat them as free to government itself because they do not require additional budgetary outlays.

Guardians ignore costs not borne by their level of government (e.g., costs borne by users or by local authorities), whether financial or nonfinancial. Thus, guardians ignore the loss suffered by Texans from paying tolls. In aggregate, guardians treat these toll revenues as a benefit, while in CBA they would be a transfer involving off-
### TABLE 1.5 AA HIGHWAY FROM A STATE GUARDIAN'S PERSPECTIVE (1986 $ MILLION)

<table>
<thead>
<tr>
<th></th>
<th>No Tolls</th>
<th>With Tolls</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Revenues (“Benefits”):</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Toll revenues from Texas residents</td>
<td>0</td>
<td>112.1</td>
</tr>
<tr>
<td>Toll revenues from non-Texas residents</td>
<td>0</td>
<td>37.4</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>149.5</td>
</tr>
<tr>
<td><strong>Expenditures (“Costs”):</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction</td>
<td>338.1</td>
<td>338.1</td>
</tr>
<tr>
<td>Maintenance</td>
<td>7.6</td>
<td>7.6</td>
</tr>
<tr>
<td>Toll collection</td>
<td>-</td>
<td>8.4</td>
</tr>
<tr>
<td>Toll booth construction</td>
<td>-</td>
<td>0.3</td>
</tr>
<tr>
<td></td>
<td>345.7</td>
<td>354.4</td>
</tr>
<tr>
<td><strong>Net Revenue-Expenditure “Benefits”</strong></td>
<td>-345.7</td>
<td>-204.9</td>
</tr>
</tbody>
</table>


Setting costs and benefits; that is, they would be treated as having no effect on net benefits. Furthermore, guardians would tend to ignore nonfinancial social costs, if there were any, in the same way that they ignore nonbudgetary social benefits. To them, congestion and pollution are not relevant costs.

Guardians treat subsidies from other governments (e.g., the federal government) as a benefit because these funds reduce what the state must expend. This ignores the fact that, in practice, the federal government may have earmarked a fixed transfer budget of funds for Texas: Funds used for one purpose may reduce the amount available for other purposes. If so, none of these federal funds should be treated as a benefit from the state perspective.

Finally, guardians generally want to use a high discount rate. One reason is that because of their financial background or the agency’s culture, they want to use a financial market discount rate, which is generally higher than the appropriate social discount rate. A second reason stems from their distrust of spenders who, in their view, overestimate benefits, underestimate costs, and generally use money less efficiently than the private sector. Guardians know that using a high discount rate will make it more difficult to justify projects advocated by spenders, because in most of these projects costs occur early and benefits occur late.

**Spenders**

Spenders tend to come from service or line departments. Some service departments, such as transportation, may be involved with large physical projects, while social service departments, such as health, welfare, or recreation, make large human capital invest-
ments. Some service departments, such as housing, make both types of expenditures. The views of spenders are somewhat more variegated than those of guardians because the constituencies of particular agencies are highly varied. Nevertheless, there are major commonalities. Most importantly, spenders have a natural tendency to regard expenditures on constituents as benefits rather than as costs. Thus, for example, they typically see expenditures on labor as benefits rather than costs. Spenders regard themselves as builders or professional deliverers of government-mandated services. As spenders focus on providing projects or services to particular groups in society, we characterize their behavior as constituency-support. Table 1.6 summarizes how spenders in the state highway department view the no-tolls versus the with-tolls alternatives.

Spenders view pecuniary and nonpecuniary benefits received by their constituents (residents of Texas in this example) as benefits. Most importantly, they treat money spent on construction workers who built the highway as a benefit. Thus, they think of both project benefits and project costs as benefits. With this method of accounting, both the with-tolls and no-tolls highway alternatives generate huge net constituency benefits. In general, spenders tend to support any alternative rather than the (no project) status quo. Thus, the mistrust of spenders by guardians is perfectly understandable. Guardians and spenders almost always oppose one another.

Spenders view monetary outlays paid by Texan highway users (also their constituents) as costs; for example, they treat tolls paid by Texan highway users as costs. Table 1.6 shows that spenders tend to favor the nontoll road primarily because a toll is a cost for some of their constituents. Indeed, spenders normally do not favor “user pay” fees, unless the agency keeps the toll revenue within its own budget or the payers are nonconstituents.

If spenders could keep the tolls, then they would face a dilemma: Tolls would reduce constituency benefits, but they would increase the agency’s budget. Generally, spenders behave as if they are budget-maximizing bureaucrats. When part of an agency’s budget flows from clients (i.e., user fees), it faces a trade-off between budget maximization and constituency-support maximization.

### TABLE 1.6

<table>
<thead>
<tr>
<th></th>
<th>No Tolls</th>
<th>With Tolls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constituency “Benefits”:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Project Costs (from CBA)</td>
<td>345.7</td>
<td>354.4</td>
</tr>
<tr>
<td>Project Benefits (from CBA)</td>
<td>384.1</td>
<td>334.7</td>
</tr>
<tr>
<td></td>
<td>729.8</td>
<td>689.1</td>
</tr>
<tr>
<td>Constituency “Costs”:</td>
<td>729.8</td>
<td>577.0</td>
</tr>
<tr>
<td>Toll Revenues from Texas Residents</td>
<td></td>
<td>112.1</td>
</tr>
<tr>
<td>Net Constituency “Benefits”</td>
<td>729.8</td>
<td>577.0</td>
</tr>
</tbody>
</table>

In general, as Robert Haveman and others have pointed out, politicians prefer projects that concentrate benefits on particular interest groups and camouflage costs or diffuse them widely over the population. In practice, politicians and spenders weight each impact category by the strength of the connection that constituents are expected to make between an impact and the particular spending department. If the spending agency perceives that it will receive no credit for expenditure on particular benefits, it will tend to ignore them. Because people almost always notice expenditures on themselves, such "benefits" are invariably treated as important and are heavily weighted. Thus, for example, construction jobs are heavily weighted. The net result is that for many projects expenditure benefits are weighted more strongly than social benefits.

Spenders treat some inputs as neither benefits nor costs. In particular, assets that are currently owned by the state government are simply ignored. In support of the Tellico Dam, for example, the Tennessee Valley Authority (TVA) argued that "since the farm land behind the dam had already been purchased, the value of this land should be considered a sunk cost, even though the land has yet to be flooded and could be resold as farm land if the project was not completed." In the AA highway example, spenders would tend not to include any cost for the land on which the highway was built if it were already owned by the state government.

Spenders treat (relatively recent) past expenditures on an ongoing project as investments that provided (and may continue to provide) constituency benefits. For the same reason, spenders believe completion of the project is worthwhile, even in the presence of negative information about real economic costs.

Another set of reasons for completion is indirect, stemming from the "pull-through" effect from the political sponsors. There may be strong political support for continuation of a venture even though it may not be justifiable on efficiency grounds. Politicians do not treat sunk costs as sunk because the political net benefits of completion are generally positive. For example, even though the Tellico Dam in Tennessee was 90 percent complete, the incremental costs still exceeded the benefits. Nonetheless, Congress decided to complete the project. Why? Politicians may believe that the project is beneficial to them in the sense that it is an investment that continues to buy ongoing support. Furthermore, as an added impetus for completion, Jerry Ross and Barry Staw note that "[n]ot only may those directly involved with a project work to maintain it, but other units interdependent or politically aligned with a threatened project can be expected to provide support." Spenders also tend to favor projects that involve large, irreversible, capital-intensive investments. For example, spenders tend to favor urban rail systems over buses. Once in place these assets cannot be easily redeployed to other uses or markets so the system will almost certainly remain in operation and constituents are guaranteed to receive some benefits. At the same time, the lower operating costs normally associated with such projects allow for lower prices. In turn, this may foster relatively high usage levels, which spenders think may contribute to political support.

The perspective of spenders concerning market efficiency has a bearing on the way they view many aspects in CBA. To spenders, markets are almost always inefficient. They act as if they believe unemployment is high and most project expenditures
on labor will go to the unemployed. If one could demonstrate to spenders that a person who will be employed by the project is currently employed elsewhere, then they would tend to argue that this worker's vacated job will be filled by an unemployed worker. Thus, even if the money did not go directly to an unemployed worker, there would eventually be a job "created" for an unemployed worker. Spenders implicitly do not accept that project resources are diverted from other potentially productive uses that also involve jobs.

Spenders regard project expenditures as inherently beneficial to the community: Creating jobs stimulates the economy directly and indirectly through multiplier (secondary) effects. In the extreme it gives rise to a "Midas touch" of project evaluation: First declare the expenditures (costs) to be a "benefit," and then multiply these expenditures by a multiplier, and any government project can be self-evidently justified as producing "benefits" greater than "costs."

Spenders generally favor using a low social discount rate. They prefer a low discount rate because, typically, most benefits occur later while most costs are up-front. While a lower discount rate does not tremendously affect near-term benefits, it raises the present value of benefits that are further off in time and, therefore, raises the total NPV.

With guardians looking over spenders' shoulders, how can spenders generate political support for the projects they favor? One way is to overestimate usage levels and therefore benefits. In addition to straight overestimation, spenders tend to use aforementioned multipliers to boost benefits. The other obvious way spenders generate political support is to underestimate expenditures (costs). All of these efforts are attempts to reduce guardian opposition and increase political feasibility.

**CONCLUSION**

In this initial chapter, we have provided a broad overview of many of the most important issues in CBA. We deal with these issues in more detail in subsequent chapters. At this point, do not worry if you can only see CBA "through the glass, darkly." Do not worry if you cannot entirely follow the AA highway analysis. Our desire was to give you a taste for the practical reality. We think that it is important to provide the reader with a sense of the reality of CBA before dealing with the technical issues.

CBA is often taught in a way that is completely divorced from political reality. We wish to avoid this mistake. CBA is a normative tool, not a description of how political and bureaucratic decision makers actually make decisions. Yet, because CBA disregards the demands of politicians, spenders, guardians, and interest groups, it is not surprising that there are tremendous pressures to ignore it or, alternatively, to adapt it to the desires of various constituencies or interest groups. Thus, correct CBA is no more than a "voice" for rational decision making.
EXERCISES FOR CHAPTER 1

1. Imagine that you live in a city that currently does not require bicycle riders to wear helmets. Furthermore, imagine that you enjoy riding your bicycle without wearing a helmet.
   a. From your perspective, what are the major costs and benefits of a proposed city ordinance that would require all bicycle riders to wear helmets?
   b. What are the categories of costs and benefits from society's perspective?

2. The effects of a tariff on imported kumquats can be divided into the following categories: tariff revenues received by the treasury ($8 million); increased use of resources to produce more kumquats domestically ($6 million); the value of reduced consumption by domestic consumers ($4 million); and increased profits received by domestic kumquat growers ($5 million). A CBA from the national perspective would find costs of the tariff equal to $10 million—the sum of the costs of increased domestic production and forgone domestic consumption ($6 million + $4 million = $10 million). The increased profits received by domestic kumquat growers and the tariff revenues received by the treasury simply reflect higher prices paid by domestic consumers on the kumquats that they continue to consume and, hence, count as neither benefits nor costs. Thus, the net benefits of the tariff are negative (-$10 million). Consequently, the CBA would recommend against adoption of the tariff.
   a. Assuming the agriculture department views kumquat growers as its primary constituency, how would it calculate net benefits if it behaves as if it is a spender?
   b. Assuming the treasury department behaves as if it is a guardian, how would it calculate net benefits if it believes that domestic growers pay profit taxes at an average rate of 20 percent?

NOTES

1“Letter to Joseph Priestley,” in Benjamin Franklin: Representative Selections, with Introduction, Bibliography and Notes, Frank Luther Mott and Chester E. Jorgenson (New York: American Book Company, 1936), pp. 348-349. We would like to thank our colleague, Ken MacCrimmon, for bringing this quote to our attention; see Kenneth R. MacCrimmon, “An Overview of Multiple Objective Decision Making,” in Multiple Criteria Decision Making, James L. Cochrane and Milan Zeleny eds. (Columbia: University of South Carolina Press, 1973), pp. 18-44 at p. 27.


3We often use the term project generically. Our discussion applies more generally to policies, programs, regulations, demonstrations, and other government interventions.


5Thus, we do not include CBAs by the World Bank of its own projects. In fact, evidence suggests that the World Bank does not actually use CBA much; see Nathaniel H. Leff, “The Use of Policy-Science Tools in Public-Sector Decision Making: Social Benefit-Cost Analysis in the World Bank,” Kyklos, 38, no. 1 (1985), 60-76.


9See, for example, Hahn and Hird, “The Costs and Benefits of Regulation: Review and Synthesis.”

10Of course, other criteria may determine whether evaluative research actually gets used; see the preceding paragraph. For a review of evaluative research utilization in policy analysis, see David H. Greenberg and Marvin B. Mandell, “Research Utilization in Policy Making: A Tale of Two Series of Social Experiments,” Journal of Policy Analysis and Management, 10, no. 4 (Fall 1991), 633–656.


13Of course, some additional deaths will occur as a result of more people traveling by road between the two cities. This additional cost is netted out against the generated traffic benefits.

14As we will discuss in Chapter 3, on congested highways positive tolls may in fact increase the net social benefits.


19For the seminal writing on this topic, see Herbert A. Simon, Models of Man (New York: Wiley, 1957).


24This terminology was introduced by Sanford Borins and David A. Good, “Spenders, Guardians and Policy Analysts: A Game of Budgeting Under the Policy and Expenditure Management System,” Toronto, Case Program in Canadian Administration, Institute of Public Administration of Canada, 1987 (revised 1989).

25See, for example, William A. Niskanen, “Bureaucrats and Politicians,” Journal of Law and Economics, 18, no. 3 (December 1975), 617–643, and André Blais and Stéphane Dion, eds., The Budget-Maximizing Bureaucrat: Appraisals and Evidence (Pittsburgh, PA: University of Pittsburgh Press, 1991). For various reasons, senior spenders may be more interested in the discretionary budget or “budget-shaping” than in budget maximizing; see Patrick Dunleavy, Democracy, Bureaucracy and Public Choice.
They may, therefore, be willing to support projects that involve considerable "contracting out" and other activities that may not be budget maximizing per se.


31One reason why some spenders attach so much importance to multipliers is because they have a basic grounding in input-output analysis, but they do not clearly understand the fundamental distinction between economic and social impact analyses, and evaluation studies; see W.G. Waters, II, "Impact Studies and the Evaluation of Public Projects," Annals of Regional Science, 10, no. 1 (March 1976), 98–103.