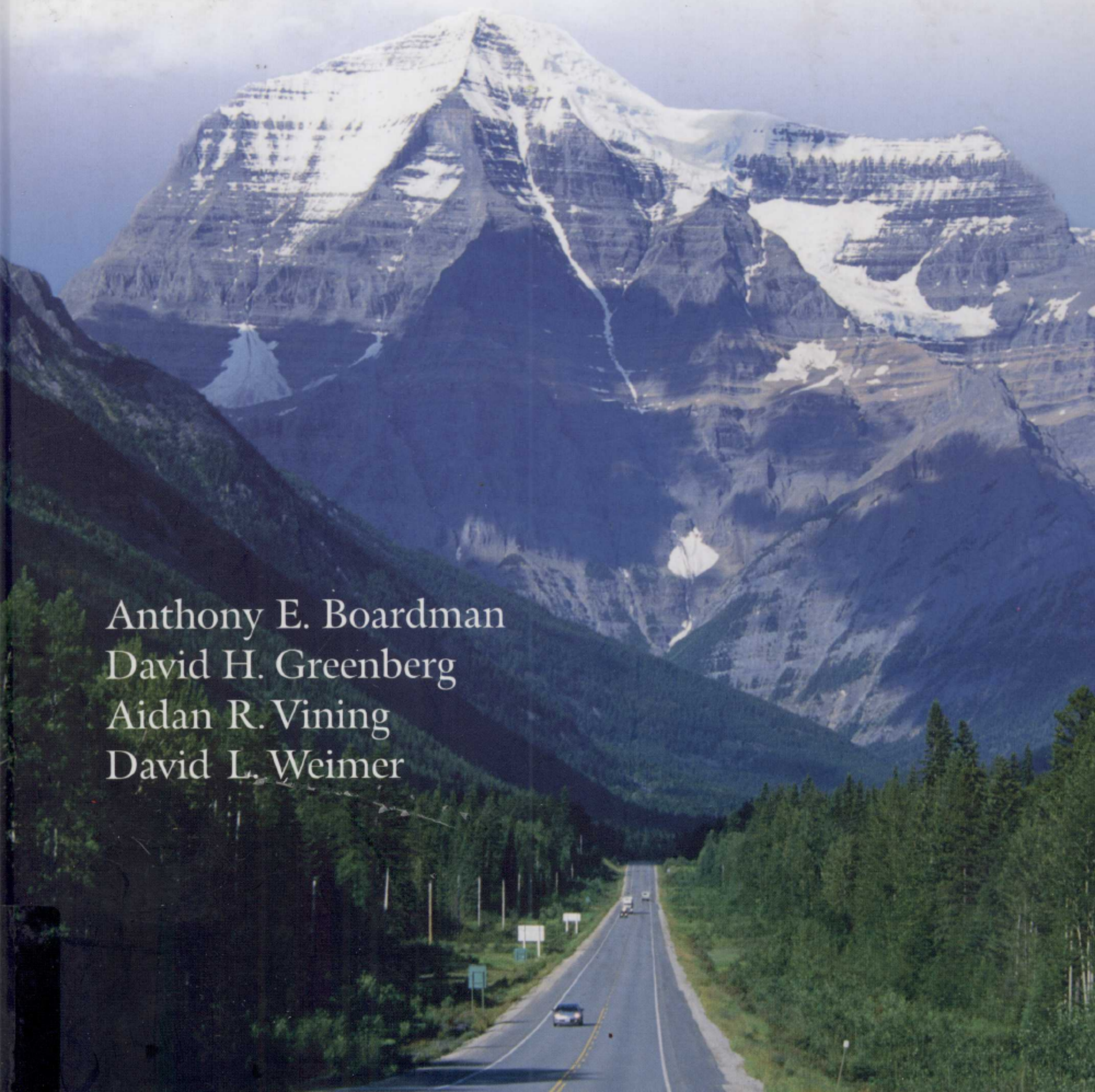


Cost-Benefit Analysis

Concepts and Practice

Third Edition

Anthony E. Boardman
David H. Greenberg
Aidan R. Vining
David L. Weimer



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This is the must-have resource for anyone looking to conduct, interpret, or evaluate a cost-benefit analysis... both students and practicing policy makers.

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THIRD EDITION

COST-BENEFIT ANALYSIS

Concepts and Practice

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Preface

Collaborative academic projects often take longer than originally anticipated, not just because of the normal delays of coordinating the efforts of busy people, but also because initially modest goals can become more ambitious as participants delve into their subject. We confess to both these sins with respect to preparing the first edition of this text. Our original plans made in 1990 were very modest. We intended to use an expanded version of the chapter on benefit-cost analysis in the text *Policy Analysis: Concepts and Practice* by David Weimer and Aidan Vining as the conceptual foundation for a collection of cases. Our goal was to produce a book that would be conceptually sound, practically oriented, and easily accessible to both students and practitioners. Although our final product was far different in form and content than we initially planned, we believe that our first edition was such a book.

Our plans evolved for a number of reasons. Perhaps most importantly, through our teaching of undergraduate and graduate students as well as our experiences in training government employees, we realized that many topics demanded extended treatment if the essential basics were to be conveyed effectively and if solid foundations were to be laid for further learning of advanced topics. We also decided that fully integrating illustrations and examples with concepts and methods is pedagogically superior to presenting independent cases. The result was a series of chapters that develops conceptual foundations, methods of application, and extensions of cost-benefit analysis through numerous practical examples and illustrations.

Our own use of the book in teaching, as well as comments from other teachers and students, helped us identify several areas for improvement in the second and third editions. In addition to adding new material to each edition, we revised and reorganized a number of chapters to make the presentation clearer and more effective. For example, in preparing the third edition, we essentially rewrote the chapters on the social discount rate and cost-effectiveness analysis and added considerable new material on using shadow prices from secondary sources. We also added a number of exercises based on spreadsheets that are available to instructors.

These improvements were made with our three intended audiences in mind. First, we intend this book for use in courses on public-sector decision-making offered in graduate programs in public policy analysis, public-sector management, urban planning, public administration, business, economics, public health, and environmental studies. Second, we envision it being used at the undergraduate level either as a primary text for a course on cost-benefit analysis or as a supplementary text for economics courses in public finance, public-sector economics, and policy analysis. Third, we intend it to be useful to policy analysts and public managers as a general introduction and practical guide to cost-benefit

analysis, as well as a starting point for exploring advanced topics. In order to be appropriate for these diverse audiences, the third edition continues to emphasize clear discussion over formal mathematics, and application over abstract theory. Nevertheless, we think that we cover important, if difficult, conceptual issues in adequate detail both as a framework for thoughtful application and as a basis for further study.

The process of preparing the new edition has been a rewarding one for us. As during preparation of the first two editions, we were forced to think more deeply about some topics that we thought we had already mastered and to develop others with which none of us was very familiar. We did this enjoyably together through numerous exchanges of drafts and during an intensive work session at the University of British Columbia.

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FEEDBACK

The authors and product team would appreciate hearing from you! Let us know what you think about this textbook by writing to college_economics@prenhall.com. Please include "Feedback about Boardman 3e" in the subject line.

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Brief Contents

Preface xiii

PART I: OVERVIEW 1

- Chapter 1 Introduction to Cost-Benefit Analysis 1
Chapter 2 Conceptual Foundations of Cost-Benefit Analysis 26

PART II: FUNDAMENTALS OF CBA 51

- Chapter 3 Basic Microeconomic Foundations
 of Cost-Benefit Analysis 51
Chapter 4 Valuing Benefits and Costs in Primary Markets 73
Chapter 5 Valuing Benefits and Costs in Secondary Markets 112
Chapter 6 Discounting Benefits and Costs in Future Time Periods 131
Chapter 7 Dealing with Uncertainty: Expected Values, Sensitivity Analysis,
 and the Value of Information 165
Chapter 8 Option Price and Option Value 200
Chapter 9 Existence Value 222
Chapter 10 The Social Discount Rate 236

PART III: VALUATION OF IMPACTS 279

- Chapter 11 Valuing Impacts from Observed Behavior:
 Demonstrations 279
Chapter 12 Valuing Impacts from Observed Behavior: Direct Estimation
 of Demand Curves 314
Chapter 13 Valuing Impacts from Observed Behavior: Indirect
 Market Methods 337
Chapter 14 Contingent Valuation: Using Surveys to Elicit Information
 About Costs and Benefits 369
Chapter 15 Shadow Prices from Secondary Sources 403
Chapter 16 Shadow Prices: Applications to Developing Countries 441

PART IV: RELATED METHODS AND ACCURACY	463
Chapter 17 Cost-Effectiveness Analysis	463
Chapter 18 Distributionally Weighted Cost-Benefit Analysis	488
Chapter 19 How Accurate Is CBA?	507
Bibliography	523
Name Index	545
Subject Index	550

Contents

Preface xiii

PART I: OVERVIEW 1

CHAPTER 1 Introduction to Cost-Benefit Analysis 1

Individual Versus Social Costs and Benefits	1
The Purpose and Uses of CBA	2
The Demand for CBA	5
The Cost of CBA	6
Readers of This Book	6
The Basic Steps of CBA: Coquihalla Highway Example	7
Bureaucratic and Political “Lenses”	18

CHAPTER 2 Conceptual Foundations of Cost-Benefit Analysis 26

CBA as a Framework for Measuring Efficiency	26
Using CBA for Decision Making	30
Fundamental Issues Related to Willingness-to-Pay	33
Concerns About the Role of CBA in the Political Process	39
Limitations of CBA: Other Analytical Approaches	41

PART II: FUNDAMENTALS OF CBA 51

CHAPTER 3 Basic Microeconomic Foundations of Cost-Benefit Analysis 51

Demand Schedules	51
Supply Schedules	56
Social Surplus and Allocative Efficiency	59
Alternative Ways to Calculate Net Social Benefits	62
Appendix 3A: Consumer Surplus and Willingness-to-Pay	64

CHAPTER 4	Valuing Benefits and Costs in Primary Markets	73
	Practical Versus Conceptually Correct Measures of Benefits and Costs	74
	Valuing Outcomes: Willingness-to-Pay	76
	Valuing Inputs: Opportunity Costs	93
	Project Effects on Government Revenues and Taxes	103
CHAPTER 5	Valuing Benefits and Costs in Secondary Markets	112
	Valuing Benefits and Costs in Efficient Secondary Markets	112
	Valuing Benefits and Costs in Distorted Secondary Markets	120
	Indirect Effects of Infrastructure Projects	123
	Secondary Market Effects from the Perspective of Local Communities	124
CHAPTER 6	Discounting Benefits and Costs in Future Time Periods	131
	The Basics of Discounting	131
	Compounding and Discounting Over Multiple Years	134
	Timing of Benefits and Costs	140
	Long-Lived Projects and Horizon Values	141
	Comparing Projects with Different Time Frames	145
	Inflation and Real Versus Nominal Dollars	146
	Relative Price Changes	152
	Sensitivity Analysis in Discounting	153
	Appendix 6A: Shortcut Methods for Calculating the Present Value of Annuities and Perpetuities	156
CHAPTER 7	Dealing with Uncertainty: Expected Values, Sensitivity Analysis, and the Value of Information	165
	Expected Value Analysis	165
	Sensitivity Analysis	175
	Information and Quasi-Option Value	184
	Appendix 7A: Doing Monte Carlo Sensitivity Analysis with a Simple Spreadsheet	194
CHAPTER 8	Option Price and Option Value	200
	<i>Ex Ante</i> Willingness-to-Pay: Option Price	201
	Determining the Bias in Expected Surplus: Signing Option Value	211
	Rationales for Expected Surplus as a Practical Benefit Measure	213
	Appendix 8A: Signing Option Value	217

CHAPTER 9 Existence Value 222

- Active and Passive Use Value 222
- The Measurement of Existence Value 226
- Appendix 9A: Expenditure Functions
and the Partitioning of Benefits 230

CHAPTER 10 The Social Discount Rate 236

- Does the Choice of Discount Rate Matter? 238
- The Theory Behind the Appropriate Social Discount Rate 239
- Deriving the Social Discount Rate from the Market:
Four Alternatives 247
- The Shadow Price of Capital 253
- Using the Optimal Growth Rate Approach to Discounting 258
- Intergenerational Discounting 261
- Recommended Social Discount Rates 264
- The Social Discount Rate in Actual Practice 268

PART III: VALUATION OF IMPACTS 279**CHAPTER 11 Valuing Impacts from Observed Behavior: Demonstrations 279**

- Why Conduct Demonstration Projects? 280
- Alternative Evaluation Designs 281
- CBAs of Demonstration Projects 285
- CBAs of Employment and Training Demonstrations:
An Introduction 286
- The CBA Framework in the Education and Training Context 287
- Conceptual Issues in Conducting CBAs of Education
and Training Demonstrations 289
- Choosing Prediction Parameters 300
- A Case Study: CBAs of Work/Welfare Demonstrations 302

**CHAPTER 12 Valuing Impacts from Observed Behavior: Direct Estimation
of Demand Curves 314**

- Project Revenues as the Measure of (Gross)
Consumer Benefits 315
- Estimation Knowing One Point on the Demand Curve
and Its Slope or Elasticity 315
- Extrapolating from a Few Observations 322
- Econometric Estimation with Many Observations 323
- Appendix 12A: An Introduction to Multiple Regression Analysis 330

CHAPTER 13	Valuing Impacts from Observed Behavior: Indirect Market Methods	337
	Market Analogy Method	338
	The Trade-Off Method	340
	Intermediate Good Method	346
	Asset Valuation Method	346
	Problems with Simple Valuation Methods	348
	Hedonic Pricing Method	349
	Travel Cost Method	354
	Defensive Expenditures Method	361
CHAPTER 14	Contingent Valuation: Using Surveys to Elicit Information About Costs and Benefits	369
	Overview of Contingent Valuation Methods	370
	Payment Vehicle	374
	Generic Survey Issues	374
	Contingent Valuation Problems and Issues	379
	How Accurate Is Contingent Valuation?	391
	Heuristics for the Design and Use of CV Surveys	393
CHAPTER 15	Shadow Prices from Secondary Sources	403
	The Value of a Statistical Life	405
	The Value of a Life-Year	408
	The Cost of Crashes and the Cost of Injuries	409
	The Cost of Crime	413
	The Value of Time	415
	The Value of Recreation	417
	The Value of Nature (Specific Species or Habitats)	419
	The Value of Water and Water Quality	419
	The Cost of Noise	423
	The Cost of Air Pollution	425
	The Cost of Taxation: Marginal Excess Tax Burden	428
	Transferring and Adjusting Plug-In Values	429
CHAPTER 16	Shadow Prices: Applications to Developing Countries	441
	The LMST Methodology	442
	Illustrations of the LMST Method in Practice	443
	Shadow Pricing When Goods Are in Fixed Supply	449

The Shadow Price of Labor	450
Additional Topics	455
Is the LMST Method Actually Used for Project Evaluation?	459

PART IV: RELATED METHODS AND ACCURACY 463

CHAPTER 17 Cost-Effectiveness Analysis 463

Cost-Effectiveness Ratios and Policy Choice	464
Omitted Costs and Benefits	473
Cost-Utility Analysis	474
The Use of League Tables	482

CHAPTER 18 Distributionally Weighted Cost-Benefit Analysis 488

Distributional Justifications for Income Transfer Programs	490
The Case for Treating Low- and High-Income Groups Differently in CBA	492
Distributional Weights	494
Determining Distributional Weights	495
Politically Determined Weights	497
A Pragmatic Approach to Weighting	498

CHAPTER 19 How Accurate Is CBA? 507

Sources of Errors in CBA Studies	508
The Distribution of Net Benefits Over Time	511
Summary of the CBAs of the Coquihalla Highway	512
Analysis of the Differences Among the CBAs	514
Conclusions Arising from the Comparisons	519

Bibliography 523

Name Index 545

Subject Index 550

CHAPTER I

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 endeavor 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 Balance 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, 1772¹

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 cataloguing 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, generally choosing among alternative courses of action according to whichever has the largest individual net benefits. Similarly, in evaluating various investment alternatives, a firm tends to consider only those costs (expenditures) and benefits (revenues) that accrue to it. In CBA we try to consider *all of the costs and benefits to society as a whole*, that is, the *social costs* and the *social benefits*. For this reason, some people refer to CBA as *social* cost-benefit analysis.

CBA is a policy assessment method that quantifies in monetary terms the value of all consequences of a policy to all members of society. Throughout this book we use the terms *policy* and *project* interchangeably. More generally, CBA applies to policies, programs, projects, regulations, demonstrations, and other government interventions. The aggregate value of a policy is measured by its net social benefits, sometimes simply referred to as the net benefits. The *net social benefits*, *NSB*, equal the social benefits, *B*, minus the social costs, *C*:

$$NSB = B - C \quad (1.1)$$

Stated at this level of abstraction, it is unlikely that many people would disagree with doing CBA. In practice, however, there are two types of disagreements. First, social critics, including some political economists, philosophers, libertarians, 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 what impacts will actually occur over time, how to monetize (attach a dollar value to them), and how to make trade-offs between the present and the future.

In this chapter we provide a nontechnical but reasonably comprehensive overview of CBA. Although we introduce a number of key concepts, we do so informally, returning to discuss them 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 more efficient allocation of society's resources. As we will see in Chapter 3, where markets work well, individual self-interest leads 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. However, and this is important to emphasize, 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, analysts use CBA.

There are two major types of cost-benefit analysis. *Ex ante* CBA, which is just standard CBA as the term is commonly used, is conducted while a project or policy is under consideration, before it is started or implemented. *Ex ante* CBA assists in the decision about whether scarce resources should be allocated by government to a specific project or policy. Thus, its contribution to public policy decision making is direct, immediate, and bureau specific. *Ex post* CBA is conducted at the end of a project. At this time, all of the costs are “sunk” in the sense that they have already been given up to do the project. The value of *ex post* analyses is broader but less immediate as they provide information not only about the particular intervention but also about the “class” of such interventions. In other words, they contribute to “learning” by government managers, politicians, and academics about whether particular classes of projects are worthwhile.

Some 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. Like *ex ante* analyses, *in medias res* analyses have the potential of directly influencing a decision, the continuation of the project. Like *ex post* analyses, they can be based on observation rather than prediction of some costs and benefits. They also provide information that can be used to predict costs and benefits in future *ex ante* analyses.

There is also a fourth type of CBA—one that compares an *ex ante* CBA with an *ex post* (or *in medias res*) CBA of the same project. This comparative type of CBA is most useful to policy makers for learning about the efficacy of CBA as a decision-making and evaluative tool. Unfortunately, there are almost no disinterested published examples of this type of CBA.² (In Chapter 19 we provide an example of such a comparison.) The paucity of this type of CBA 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 uses of these four types of CBAs. Table 1-1 summarizes the important ways that these four types of cost-benefit analyses aid government decision making.

Project-Specific Decision Making

Ex ante analysis is most useful for deciding whether resources should be allocated to a particular project or program that is under consideration. An *in medias res* analysis of an ongoing project can also be used for decision-making purposes where it is potentially feasible to shift resources to alternative uses. Although such an analysis may lead to discontinuation of service-orientated programs (e.g., government-funded training programs), it will rarely lead to termination of a physical investment project nearing completion, such as a dam or bridge, because a large share of the costs will likely have been incurred, and benefits subsequent to the analysis will usually exceed the remaining costs. However, it can happen. For example, a Canadian Environmental Assessment Panel recommended the decommissioning of a just-completed dam on the basis of an *in medias res* analysis which showed that, with use, future environmental costs would exceed future benefits.³ Because *ex post* analysis is conducted at the end of