



# Applied Cost–Benefit Analysis

Second Edition

Robert J. Brent

**APPLIED COST–BENEFIT ANALYSIS,  
SECOND EDITION**

*To Elizabeth, Adam and Matthew, Nancy and Carisa, and Austin*

# Applied Cost–Benefit Analysis, Second Edition

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**Edward Elgar**

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# Abbreviations

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<i>AFDC</i>	Aid to Families with Dependent Children
<i>AF</i>	annuity factor
<i>AC</i>	average cost
<i>AR</i>	average revenue or accounting ratio
<i>B</i>	benefit(s)
<i>C</i>	cost(s)
<i>CBA</i>	cost–benefit analysis
<i>CE</i>	cost effectiveness
<i>CEA</i>	cost-effectiveness analysis
<i>CM</i>	cost minimization
<i>CRI</i>	consumption rate of interest
<i>CV</i>	compensating variation
<i>CS</i>	consumer surplus
<i>CV</i>	contingent valuation
<i>CUA</i>	cost-utility analysis
<i>EPA</i>	Environmental Protection Agency
<i>EU</i>	expected utility
<i>EV</i>	equivalent variation or expected value
<i>GDP</i>	gross domestic product
<i>HIV/AIDS</i>	human immuno deficiency virus/acquired immune deficiency syndrome
<i>I</i>	indifference curve
<i>IRR</i>	internal rate of return
<i>L</i>	financial loss
<i>LDC</i>	less developed country
<i>LEDR</i>	life expectancy discount rate
<i>LRMC</i>	long-run marginal cost
<i>MB</i>	marginal benefit
<i>MCS</i>	marginal consumer surplus
<i>MC</i>	marginal cost
<i>MCF</i>	marginal cost of public funds
<i>MED</i>	marginal environmental damage
<i>MEB</i>	marginal excess burden
<i>MP</i>	marginal price
<i>MPC</i>	marginal private cost
<i>MR</i>	marginal revenue

<i>MRS</i>	marginal rate of substitution
<i>MRT</i>	marginal rate of transformation
<i>MSB</i>	marginal social benefit
<i>MSC</i>	marginal social cost
<i>MU</i>	marginal utility
<i>N</i>	number of people
<i>NPV</i>	net present value
<i>Q</i>	quantity
<i>QALY</i>	quality adjusted life year
<i>R</i>	repayments or revenues
<i>RBRVS</i>	resource-based relative value system
<i>SDR</i>	social discount rate
<i>SOCR</i>	social opportunity cost rate
<i>STPR</i>	social time preference rate
<i>U</i>	utility
<i>V</i>	maximum value function
<i>VSL</i>	value of a statistical life
<i>W</i>	social welfare
<i>WTA</i>	willingness to accept
<i>WTP</i>	willingness to pay
<i>Y</i>	income

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## Preface to the first edition

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The title of the book *Applied Cost–Benefit Analysis* was chosen to highlight a major limitation in the existing literature on cost–benefit analysis (CBA), namely the gap between theory and applications in this field. Many texts cover theory and applications. But there is very little correspondence between what the theory specifies and what the applications cover. In part, this is a reflection of the fact that often the practice of CBA does depart from the theory. But it does not have to be that way. CBA was developed as a subject in order to be a practical guide to social decision-making. If the usefulness of the theory were made apparent, there would be a greater chance that the theory and practice of CBA would coincide.

My conception of applied economics generally, and applied CBA in particular, is this. One starts with the theory, one applies it, and on the basis of the results, one goes back to modify the theory to include the important aspects that practice deems relevant, but theory originally neglected. There is this constant to and fro from the theory and the practice until, hopefully, there is (for a while) a strong correspondence between the two. The world is constantly changing and our framework for thinking about these changes must be expanded at the same time.

This book does not pretend to be a ‘hands-on’, step-by-step guide how to do a CBA. At this stage of the art of CBA, it is more important that practitioners get acquainted with the basic principles of CBA than follow some alleged ‘masterplan’. If one knows what one should be doing, one can (perhaps) find a way of implementing those principles. In any case, it is clear that there is no one, single way of proceeding. Certain components must be present. But the manner in which they are assembled can vary. The availability of reliable and relevant data will, into the foreseeable future, continue to be one of the main factors that determine how a CBA will actually be undertaken.

What the book does attempt is a unified statement of the principles of CBA. I have adopted the benchmark that ‘less is more’. Unlike some encyclopaedic texts that cover everything that could possibly be applied, I have focused only on those parts of theory that are fundamental and have been usefully incorporated into actual applications. The discussion of the applications is to show the relevance of the theory. Note that by ‘an application’ I do not simply mean that I have made up some numbers to illustrate a particular model. The case studies I have chosen all deal with



an important and concrete public policy issue analysed using real data. The intention is that the book provides a unified course in the principles of CBA rather than a set of disconnected topics. On this basis the reader should be able to appreciate the main strengths and weaknesses of actual studies in the field.

The book is geared to upper-level undergraduate or beginning graduate students. The applied nature of the course should make this of interest not only to traditional economics students, but also to those in professional programmes, especially those connected with studies in transport, the environment and health care. Students in Eastern Europe would find the subject matter especially relevant.

I would like to thank a decade or more of graduate students at Fordham University who participated in the public policy courses on which this text was based. They taught me the need to provide applications in this area. I am grateful also to Fordham University for giving me a semester off to write the book, and Columbia University who arranged for me to visit the economics department while I wrote and taught some of the chapter material. I would also like to thank Professor Robert Millward who taught me my first course in public expenditure economics, Professor Peter Hammond who introduced me to the modern theory of public sector economics, and to Professor Edwin West for getting me started and supporting me over the years.

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## Preface to the second edition

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There was little in the principles and practice of CBA that were outlined in the first edition that has become out of date and in need of replacing. Rather, the motivation for the second edition is in the recognition that many of the principles have been extended and applications introduced to cover new and interesting policy issues and so these need to be added to the existing material. The design of each chapter is the same, with roughly half the space devoted to theory and half to applications. Each chapter has a new application and in line with the continued attempt to link theory and practice, there is analysis added to the theory sections to lay the foundations for the extra applications. When some new ideas are added to the theory section separate from the added applications they are always presented in an applied setting and so are self-contained contributions in their own right.

This new second edition continues to view cost–benefit analysis as applied welfare economics and to feature the revealed preference approach for estimating value and other parameters. It builds on the earlier framework by extending the theory sections to cover in an accessible manner such concepts as dynamic game theory, hyperbolic discounting and uncertainty with irreversibility, and proceeding to provide a wider range of applications, including privatization in mental health, condom social marketing programmes, female primary education, user fees and the poor, and using inequality measures to determine income distribution weights. New problems have been added to every chapter. As with the first edition, the purpose of the problems is to either reinforce or extend the theory presented earlier in each chapter.

In 2003 I was given a Fulbright research award to carry out CBA of HIV/AIDS intervention programmes in Tanzania. Inevitably, my experience of the HIV/AIDS pandemic has had some influence on my selection of applications for this second edition. For those interested in a CBA text devoted exclusively to health applications, see my *Cost–Benefit Analysis and Health Care Evaluations* (2003a) and for those who specialize in Development, see my *Cost–Benefit Analysis for Developing Countries* (1998a).

I would like to continue to thank all those who have supported my cost–benefit work over the years, in particular, editors of journals, Fordham University, William Cartwright and Paul Solano, and of course, Edward Elgar.



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