

# Cost-Benefit Analysis

## Concepts and Practice

FOURTH EDITION

## Chapter Two

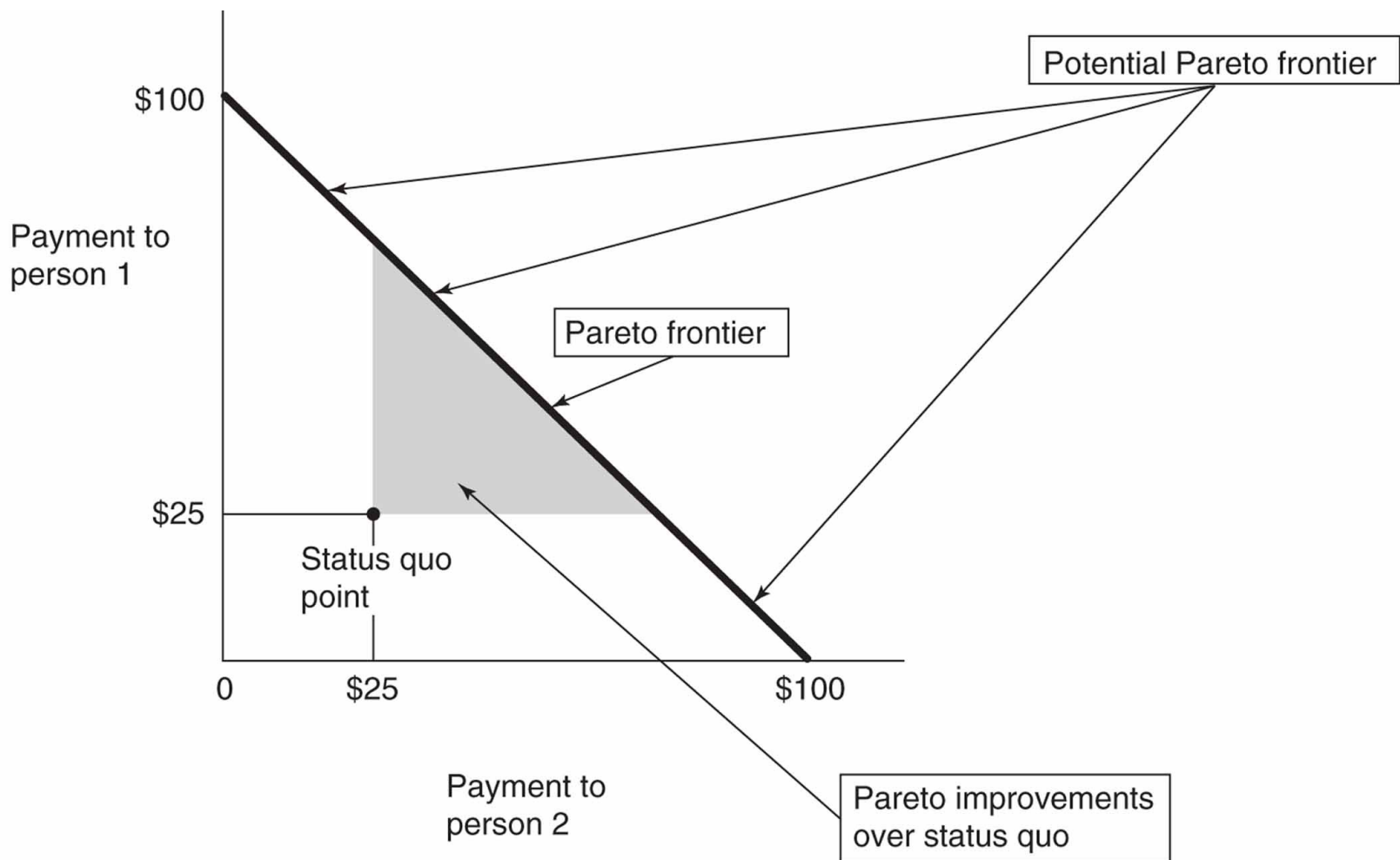
## Conceptual Foundations of Cost-Benefit Analysis

PEARSON

*Cost-Benefit Analysis: Concepts and Practice*, Fourth Edition  
Boardman • Greenberg • Vining • Weimer

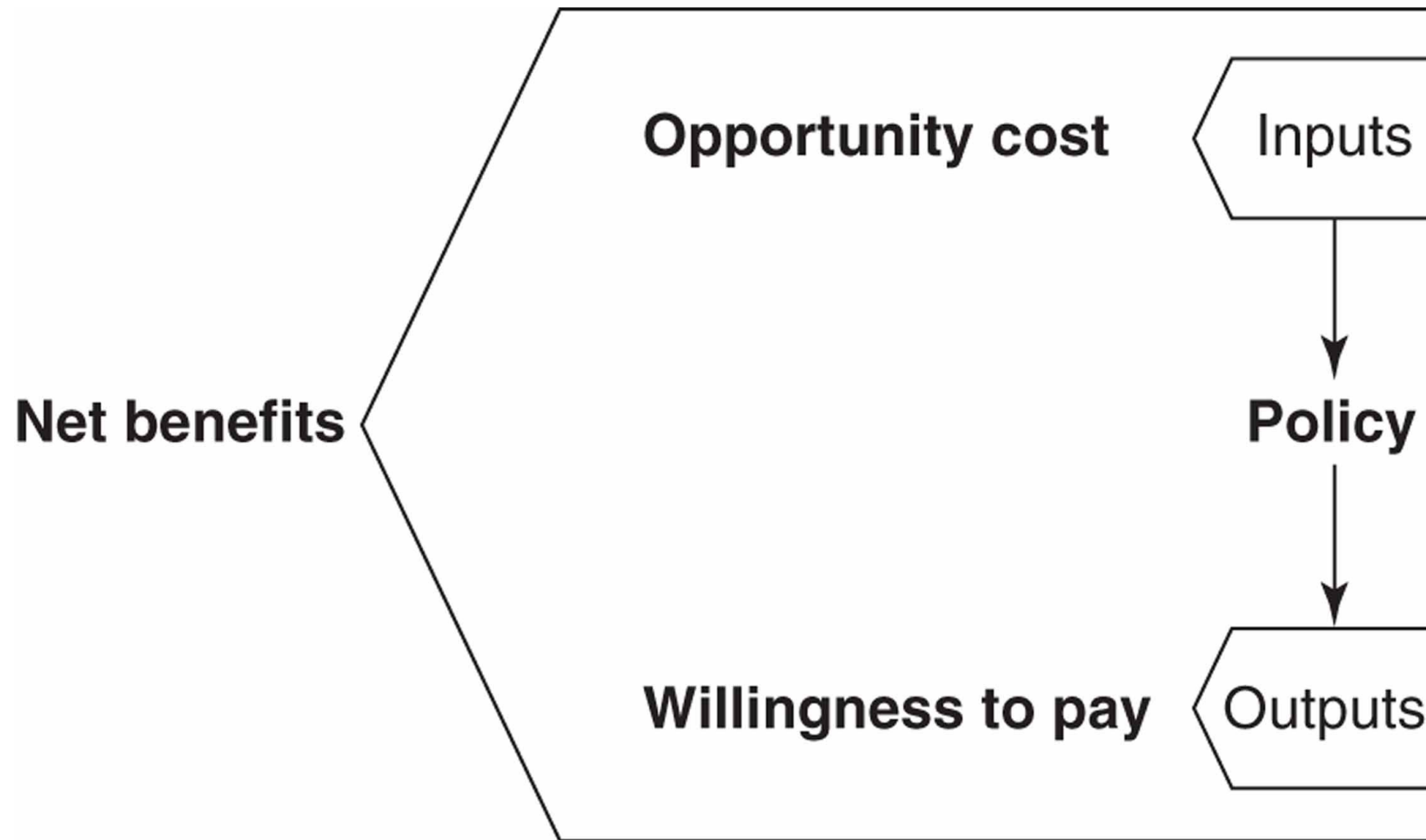
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Figure 2-1 Pareto Efficiency



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**Figure 2-2** Categorization of Net Benefits of Projects



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**TABLE 2-1** Choosing Efficient Projects and the Use of Net Benefits versus Benefit-Cost Ratios

	<i>Costs (millions of dollars)</i>	<i>Benefits (millions of dollars)</i>	<i>Net Benefits (millions of dollars)</i>	<i>Benefits/Costs</i>
No project	0	0	0	—
Project A	1	10	9	10
Project B	10	30	20	3
Project C	4	8	4	2
Project D	3	5	2	1.7
Projects C and D	7	21	14	3
Project E	10	8	-2	0.8

(1) *No constraints: Choose A, B, and combination C and D (net benefits equal \$43 million).*

(2) *All projects mutually exclusive: Choose B (net benefits equal \$20 million).*

(3) *Total costs cannot exceed \$10 million: Choose A and combination C and D (net benefits equal \$23 million).*

*Source: Adapted from David L. Weimer and Aidan R. Vining, Policy Analysis: Concepts and Practice, 5th ed. (Upper Saddle River, NJ: Pearson Prentice Hall, 2011), Figure 16.2.*

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**TABLE 2-2** Cyclical Social Preferences under Pairwise Majority Rule Voting

<i>Preference Ordering</i>	<i>Voter 1</i>	<i>Voter 2</i>	<i>Voter 3</i>
First Choice	<i>X</i>	<i>Z</i>	<i>Y</i>
Second Choice	<i>Y</i>	<i>X</i>	<i>Z</i>
Third Choice	<i>Z</i>	<i>Y</i>	<i>X</i>

*(1) Pairwise Voting Outcomes: X versus Y, X wins; Y versus Z, Y wins; X versus Z, Z wins.*

*(2) Implied Social Ordering: X is preferred to Y, Y is preferred to Z, but Z is preferred to X!*

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## EXHIBIT 2-1

Does wealth produce happiness? Surveys conducted within countries consistently find that rich people (say those in the top quarter of the income distribution) on average report being happier than poorer people (say those in the bottom quarter of the income distribution). Yet, if one looks at either of these groups over time, one discovers that its absolute level of happiness is roughly constant despite the fact that economic growth has made it richer. Similarly, comparing the happiness of the rich (or poor) across countries generally shows similar levels of happiness despite substantial differences in the overall levels of wealth between the countries. What explains this puzzle? Richard Layard suggests two psychological effects that move up the norm to which people

compare their own circumstances as societies become wealthier: habituation and rivalry. Habituation involves getting used to things we have—an initial feeling of happiness from acquisition tends to evaporate as we get used to having the good. Rivalry involves comparing one's situation to those in a reference group—happiness depends on relative position.

These phenomena raise concerns about interpreting changes in social surplus as changes in aggregate happiness. A policy that increased everyone's income would certainly pass the net benefits test. Yet extreme habituation might quickly return everyone to their initial levels of utility, or extreme rivalry would result in no utility gains at all because no one's relative position changes!

*Source:* Adapted from Richard Layard, "Happiness: Has Social Science a Clue?" Lionel Robbins Memorial Lectures, London School of Economics, Lecture 1: Income and Happiness: Rethinking Economic Policy, March 3, 4, and 5, 2003.

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**TABLE 2-3** Evaluation Matrix Worksheet for Alternative Family Aid Policies

<i>Goals</i>	<i>Impact Categories</i>	<i>Policy Alternatives</i>		
		<i>Policy A (status quo)</i>	<i>Policy B</i>	<i>Policy C</i>
Efficiency	Labor earnings Investment in human capital Administrative costs			
Quality of life of poorest families	Number of fami- lies below poverty line Number of one-parent families Educational achievement of family members			
Political feasibility	Probability of adoption of required legislation			

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## EXHIBIT 2-2

A study by the Congressional Budget Office to assess three alternatives for reducing U.S. consumption of gasoline listed the following criteria:

This study weighs the relative merits of tightening CAFE standards, raising the federal gasoline tax, and creating a cap-and-trade program against several major criteria:

*Cost-Effectiveness.* Reducing gasoline consumption would impose costs (both monetary and nonmonetary) on various producers and consumers. A cost-effective policy would keep those costs to a minimum.

*Predictability of Gasoline Savings.* How reliably would the policy bring about the desired reduction in gasoline consumption?

*Effects on Safety.* How would the policy alter the number and severity of traffic accidents?

*Effects on Other External Costs Related to Driving.* Reducing gasoline consumption would affect not only the United States' energy security and carbon emissions but other driving-related

external costs (ones whose full weight is borne by society at large rather than by an individual). Those external costs include traffic congestion, the need for highway construction and maintenance, and emissions of air pollutants besides carbon dioxide.

In addition to those factors, the three policy options would have other implications that policymakers may care about—such as their effects on people at different income levels and in different parts of the country and their impact on the amount of revenue collected by the federal government. (Summary, p.1)

One could imagine turning the analysis into a CBA by monetizing the effects on safety and the effects on other external costs related to driving and treating predictability of gasoline savings through sensitivity analysis. As monetizing the distributional concerns would be difficult, a multigoal analysis with the CBA assessing efficiency and a separate treatment of distributional impacts could be useful.

*Source:* Adapted from Congressional Budget Office, *Reducing Gasoline Consumption: Three Policy Options*, November 2002 ([www.cbo.gov/ftpdocs/39xx/doc3991/11-21-GasolineStudy.pdf](http://www.cbo.gov/ftpdocs/39xx/doc3991/11-21-GasolineStudy.pdf)).

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