Chapter 6

Cost-Benefit Analysis and Government Investments

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Economic Analysis for the Budget Process:

Achieving the Least-Cost Means of Accomplishing an Authorized Objective

- A Program is a combination of government activities producing a distinguishable output.

- Program Budgeting is the system of managing government expenditures attempting to compare the program proposals of all government agencies authorized to achieve similar objectives.

- Cost-Effectiveness Analysis is a technique for determining the minimum-cost combination of government programs to achieve a given objective

Figure 6.1 Cost-Effectiveness Analysis

Lives Saved = 5,000

Cost-Benefit Analysis

- Enumerate all costs and benefits of a proposed project

- Evaluate all costs and benefits in dollar terms

- Discount future net benefits

Enumerating Benefits and Costs

- Direct Costs and Direct Benefits are those attributable to the purpose of the project.

- Indirect Costs and Indirect Benefits are those attributable to the project that were not part of the intended purpose of the project.

Evaluating Costs and Benefits in Dollar Terms

- Though some costs and benefits are easily quantifiable others, such as the value of a human life saved or lost because of a project, are not as easy.

Discounting Future Net Benefits

- Present Value

  - It is an interest-adjusted value of costs or benefits that will occur in the future

  - The *PV* of X dollars received in *n* years at an interest rate *r* is

$$PV = (X/(1+r))$$

Discounting Payment Streams

$$PV = \sum_{i=1}^{n} \frac{X_i}{(1 + r)^i}$$

$$PV = \frac{X_1}{(1 + r)^1} + \frac{X_2}{(1 + r)^2}$$

Illustrating the Effect of Interest Rate Changes on Present Value

- Project 1 yields $90 in net benefits immediately.
- Project 2 yields $100 two years from now.
- Results
  - At 0% interest $100 two years from now is worth $100 so project 2 is better than project 1.
  - At 5% interest $100 two years from now is worth $90.7 so project 2 is better than project 1.
  - At 10% interest $100 two years from now is worth $82.6 so project 1 is better than project 2.

Choosing the Social Rate of Discount

- If the private sector interest rate is r then the social rate of discount must be at least that because of the distortions in the market caused by government taxation.

- The rate must also account for the taxation on investment returns.

Figure 6.2 A Tax on Investment Income and the Social Opportunity Cost of Capital

Funds Invested and Saved per Year

Return (Percent) (y-axis)

$20 = r_G$

16

S

E

D = Gross Return

$I = 10 = r_N$

E'

D' = Net Return After Taxes
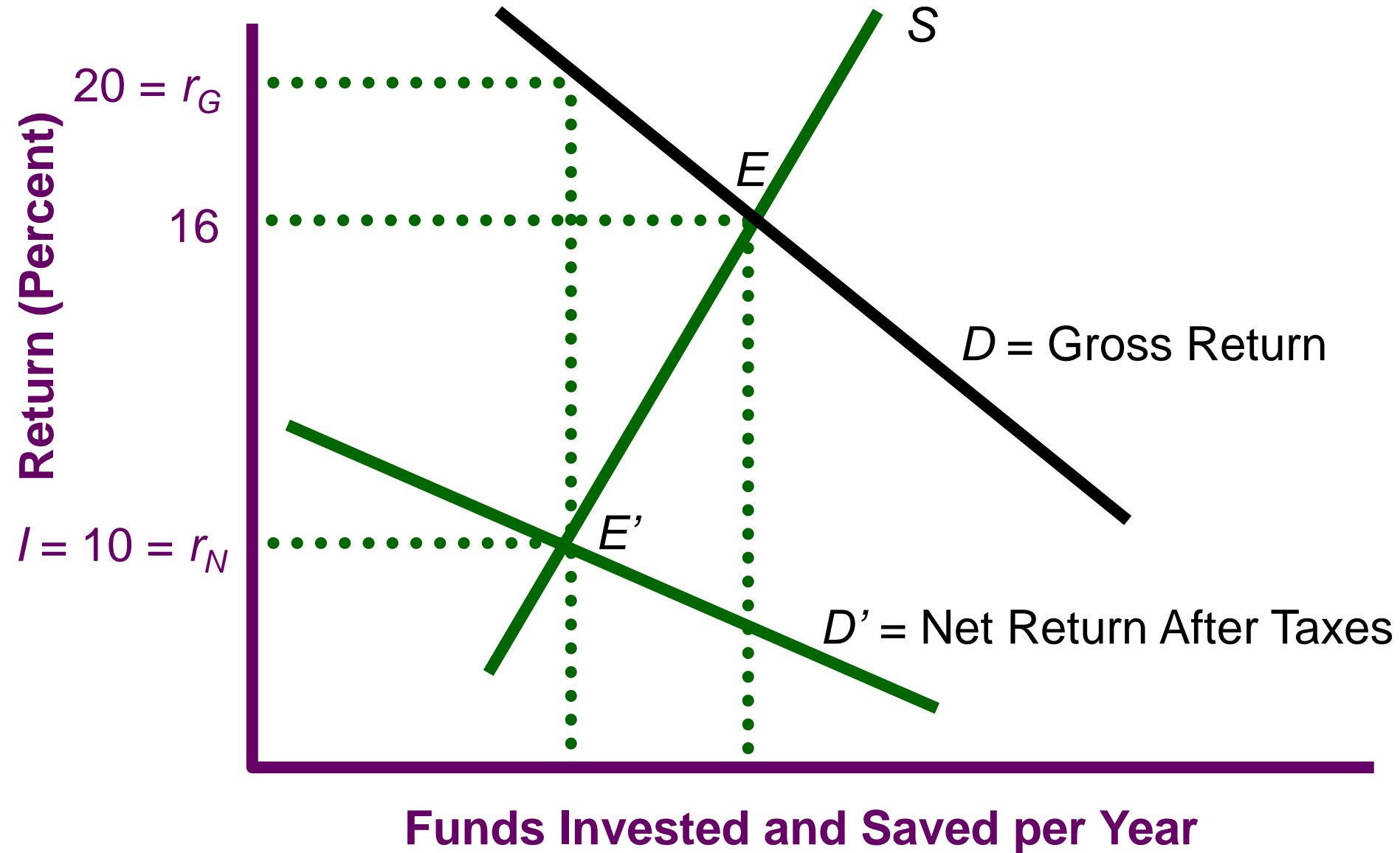
Weighting Net Benefits

- It also matters who gets the benefits and who pays the costs. Benefits accruing to certain people may be viewed as more or less important than costs that accrue to others.

Treatment of Inflation

- If all dollar figures are nominal then interest rates must be nominal and account for inflation. Alternatively, all accounting can be done with real dollars and real interest rates.
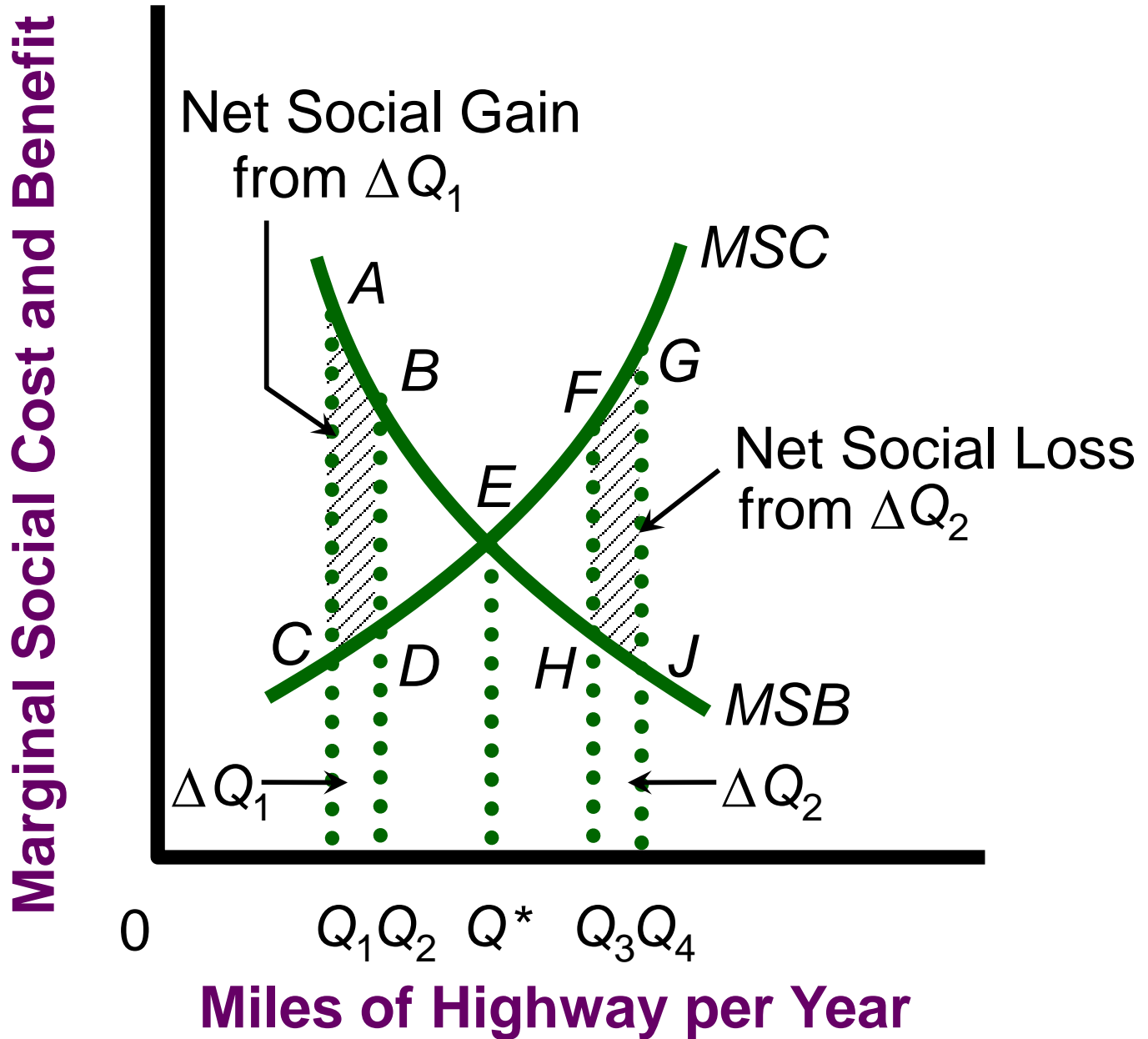
Ranking Projects

- Net Benefit Criterion: Rank according to the highest net benefits

$$\sum_{i=1}^{n} (B_i - C_i)/(1 + r)^i$$

- Benefit-Cost Ratio Criterion: Rank according to the highest ratio

$$\frac{\sum_{i=1}^{n} B_i /(1 + r)^i}{\sum_{i=1}^{n} C_i /(1 + r)^i}$$

Figure 6.3 Cost-Benefit Analysis and Efficiency

Net Social Gain
from ΔQ_1

Net Social Loss
from ΔQ_2

MSC

MSB

A

B

E

F

G

C

D

H

J

ΔQ_1

ΔQ_2

Marginal Social Cost and Benefit

0    $Q_1 Q_2$ Q^* $Q_3 Q_4$

Miles of Highway per Year

Cost-Benefit Analysis in Practice

Infrastructure Analysis

- Roads
- Bridges
- Dams
- Levies

Government Infrastructure Investment in LDC's

- LDC's have invested considerable sums in agricultural infrastructure because of a 17% estimated project rate of return.

- Projects (such as the creation of large water reservoirs) typically displace locals and these costs must also be accounted for.

- Projects have been shown to help the poor by adding substantially to their ability to produce crops for sale.

Cost-Benefit Analysis of a Hypothetical Irrigation Project

	Year							
Costs	1	2	3	4	5	6	...	N
Engineering and Planning	E							
Building and Construction	F_1	F_2	F_3	F_4	F_5			
Maintenance						M_6	...	M_N
Loss in Agriculture	A_1	A_2	A_3	A_4	A_5	A_6	...	A_N
Loss in Recreation	R_1	R_2	R_3	R_4	R_5	R_6	...	R_N
Total Costs	C_1	C_2	C_3	C_4	C_5	C_6	...	C_N
Benefits								
Increased Agriculture						A_6	...	A_N
Increased Recreation						R_6	...	R_N
Total Benefits						B_6	...	B_N

Figure 6.4 The Benefits of Widening a Highway

Number of Trips per Year

Average Cost per Trip

C

C'

B

D

A

D_T

T

T'

0
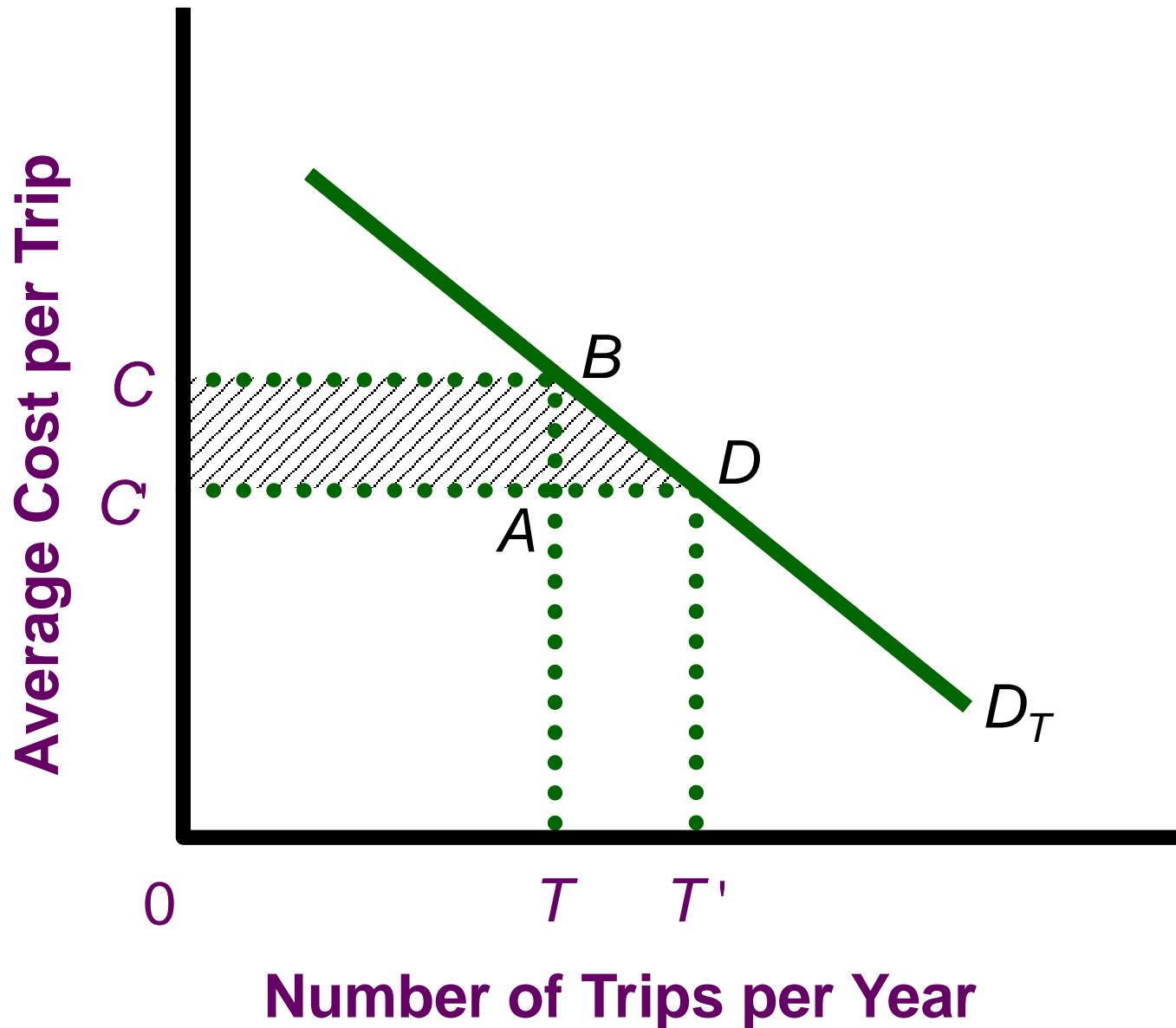
Cost-Benefits Analysis of Job Corps Program

- Costs per Participant
  - Operating the Program ($8,380)
  - Forgone Output of Participants ($1760)
- Benefits Per Participant
  - PV of Increased output ($8,080)
  - PV of reduced crime ($5,840)
  - Reductions in costs of other programs ($880)
- Net PV of Benefits ($4,460)

The Role of Cost-Benefit Analysis in Budgeting

- Useful tool to policy makers attempting to quantify decision making.

- Some social benefits are difficult to quantify.

- The distribution of benefits plays a role in the political output of which programs are funded.