

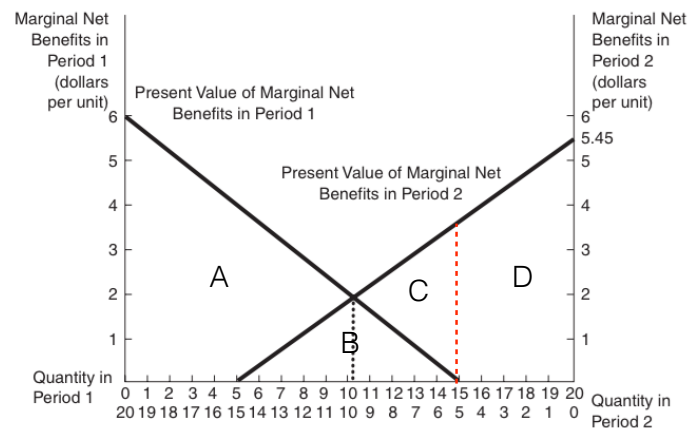
Evaluating Trade-offs: Benefit-Cost Analysis and Other Decision-Making Metrics

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by
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Outline

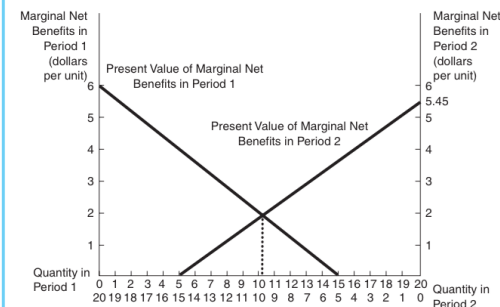
- Some thoughts from last class
- Normative Criteria for Decision Making
 - Evaluating options: Benefit-cost analysis
 - Optimal Outcomes
- Treatment of Risk

FIGURE 5.2 The Dynamically Efficient Allocation



Are Efficient Allocations Fair?

FIGURE 5.2 The Dynamically Efficient Allocation



- Is this example of efficient allocations fair?
- In practice, what can we do to make the efficient allocation fair?
- Is it weak or strong sustainability?

Normative Criteria for Decision Making

- Normative choices can arise in two different contexts
- Choose among options that have been predefined -> Benefit-Cost Analysis
- Find optimal choice among all the possible choices -> Optimal Outcome

Evaluating predefined options: Benefit-Cost Analysis

If $B > C$, support the action

If $B/C > 1$, support the action ;

As long as B and C are positive

Do you still remember the types of values from natural resource?

Evaluating predefined options: Benefit-Cost Analysis

- In economics the measurement system is anthropocentric.
- All benefits and costs are valued in terms of their effects (broadly defined) on humanity.
- Not only direct effect on human is concerned.
- Considering demand and supply curves, which areas are total benefits and total costs?

Evaluating predefined options: Benefit-Cost Analysis

- Do the **environmental services** have **costs** even though they are produced without any human input?

Example: Preservation of a River

White-water Canoeing

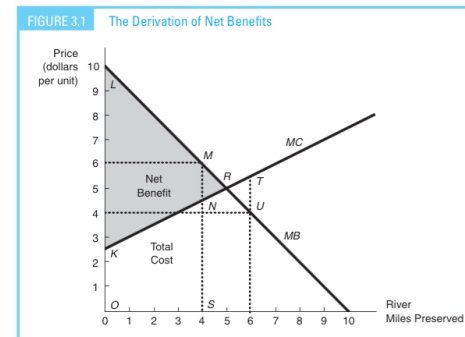


Generate Electric power

Evaluating predefined options: Benefit-Cost Analysis

- What is opportunity cost?
- Opportunity Cost* for using resources in a new or an alternative way
 - The net benefit lost when specific environmental services are foregone in the conversion to the new use.
- Marginal opportunity cost curve -
 - The additional cost of producing another unit of alternative use of environmental service resulting from the associated incremental loss of net benefits due to reduced opportunities for the other environmental service.
- Net benefit - Excess of benefits over costs

Evaluating predefined options: Benefit-Cost Analysis



- Is preserving a 4-mile stretch of the river worth doing?

Finding Optimal Outcomes

- General steps in Normative analysis
 1. Identify an optimal outcome
 2. Attempt to understand the extent to which our institutions produce optimal outcomes and, where divergences occur between actual and optimal outcomes —> Identifying the behavioral sources of problems
 3. Design appropriate policy solutions

Finding Optimal Outcomes

- Example: Fishery resource
 1. Defining the optimal stock of fish and the optimal rate of harvest of the fishery
 2. Compare the optimal levels with the actual stock and harvest level
 3. Design appropriate policies



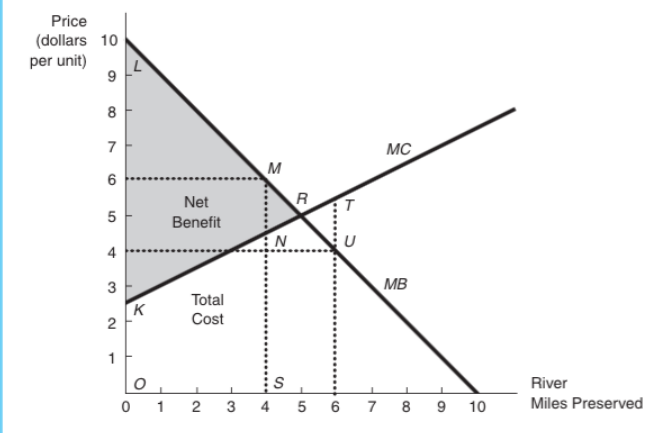
Relating Optimality to Efficiency

- The net benefits area to be maximized in an “optimal outcome” for public policy is identical to the “economic surplus” that is maximized in an efficient allocation.
- Hence efficient outcomes are also optimal outcomes.

Relating Optimality to Efficiency

- In the case of the preservation of the river
 - What is the optimal (or efficient) number of miles to be preserved?
 - Is preserving the 4 miles of the river the optimal outcome? Why or why not?
 - Is preserving the 6 miles of the river the optimal outcome? Why or why not?

FIGURE 3.1 The Derivation of Net Benefits



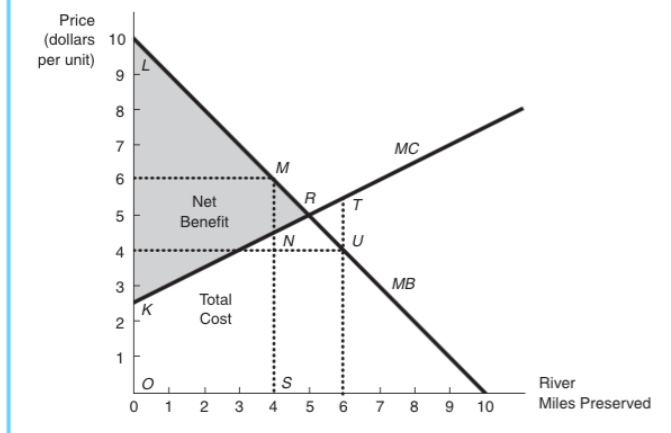
Relating Optimality to Efficiency

- *First Equimarginal Principle (the Efficiency Equimarginal Principle):*
- Social net benefits are maximized when the social marginal benefits from an allocation equal the social marginal costs.
- This criterion helps to minimize wasted resources.
- Is it fair?

Relating Optimality to Efficiency

- Pareto Optimality:
 - Allocations are said to be Pareto optimal if no other feasible allocation could benefit at least one person without any deleterious effects on some other person.
- Suboptimal allocations can always be rearranged so that some people can gain net benefits without causing anyone else to lose net benefits.
- Are efficient allocations Pareto optimal?

FIGURE 3.1 The Derivation of Net Benefits



Issues in Benefit Estimation

- Primary versus Secondary Effects
- Accounting Stance
- With and without principle
- Tangible versus Intangible Benefits

Approaches to Cost Estimation

- **The survey approach** : Ask those who bear the costs directly.
 - Problem?: Strong incentive not to be truthful.
- **The Engineering approach** : Bypass those who bear the costs and use engineering information.
 - Problem? : Unique circumstances of some firms may cause the costs to be higher or lower than estimated.

Treatment of Risk

- Future is uncertain. --> Risk
- Two major dimensions of the treatment of risk in the policy process
 - Identifying and quantifying the risks (scientific and descriptive)
 - Deciding how much risk is acceptable (evaluative/normative)

Treatment of Risk

- A range of policy options: A , B , C , and D
- A range of possible outcomes: E , F , and G (depend on how the economy evolves over the future)
- With 4 policies, total possible outcomes are 12.
- Choosing policy that is best if outcome E prevails may be disastrous if G results instead.

Treatment of Risk

- **Dominant Policy:** The policy that will have higher benefits for every outcomes. (Exceptional circumstance)
- In normal circumstances, we choose the policy that gives the highest *expected present value of net benefits*.

Treatment of Risk

$$EPVNB_j = \sum_{i=0}^I P_i PVNB_{ij}, \quad j = 1, \dots, J,$$

- $EPVNB_j$ = expected present value of net benefit for policy j
- P_i = probability of the i th outcome occurring
- $PVNB_{ij}$ = present value of net benefits for policy j if outcome i prevails
- J = number of policies being considered
- I = number of outcomes being considered

Treatment of Risk

- Specific assumption: Risk-neutrality
- Is it an appropriate assumption?
- Arrow and Lind (1970): "*when the risks of a public investment are publicly borne, the total cost of risk-bearing is insignificant and, therefore, the government should ignore uncertainty in evaluating public investments.*"