

Environmental Economics and Policy: Memo 8

1. Cost Benefit Analysis in Environmental Policy

Market failure, public goods, nonexcludable and nonrivalrous, jointness in supply

Policy (program and project) evaluation criteria and policy selection criteria

$$B/C = \sum (B_n / (1+r)^{n-1}) / \sum (C_n / (1+r)^{n-1})$$

$$NPV = \sum (B_n / (1+r)^{n-1}) - \sum (C_n / (1+r)^{n-1})$$

Net benefit criterion: Kaldor-Hicks criterion: Those who will gain could fully compensate those who will lose.

Efficiency: Pareto Optimum or Pareto Efficiency

“An allocation of goods is Pareto efficient if no alternative allocation can make at least one person better off without making anyone else worse off.”

Ex ante CBA and ex post CBA

Social Cost vs. Social Benefit

Social Benefit: WTP: willingness to pay (vs. WTA)

Social Cost: Opportunity cost: The opportunity cost of using an input to implement a policy is its value in its best alternative use.

Social characteristics of CBA: Supporting technology for policy (selection) decision making from a viewpoint of efficient social resource allocation

Lifetime: Benefit stream and Cost stream

SDR: Social Discount Rate: Social time preference and Marginal return of capital

5 main steps:

- ① List of alternatives (counterfactual)
- ② Items of cost and items of benefit (Time framework and Impact)
- ③ Technical measurements of cost items and benefit items
- ④ Monetary assessments of technical cost and benefit items
- ⑤ Comparison CB ratio (B/C) or NPB (Net Present Benefit)

2. Cost benefit analysis of the sulfur dioxide emissions control policy in Japan

$$\text{Benefit} = \sum_{t=0}^e \text{BM}_t / (1+r)^t + \sum_{t=0}^l \text{BL}_t / (1+r)^t \quad (1)$$

$$\left[\begin{array}{lll} \text{BM}_t : \text{social medical expense} & e : \text{remaining lifetime} & r : \text{SDR} \\ \text{BL}_t : \text{social labor loss} & l : \text{remaining working life-years} & \end{array} \right]$$

$$\text{Cost} = \sum_{t=0}^e C_t / (1+r)^t \quad (2)$$

$\left(\begin{array}{l} C_t : \text{social cost} \\ e : \text{remaining lifetime} \\ r : \text{SDR} \end{array} \right)$

SDR=0% (Unit : 1 billion yen, 1993 price)

| | | 1968~1973 | 1974~1983 | 1984~1993 |
|---------|-----------------|-----------|-----------|-----------|
| Cost | | 9215 | 27233 | 16248 |
| Benefit | Medical Expense | 20759 | 12687 | 2639 |
| | Labor loss | 2071 | 1742 | 343 |
| | COI Total | 22830 | 14428 | 2982 |
| | WTP | 45660 | 28856 | 5964 |
| B/C | | 4.96 | 1.06 | 0.37 |

SDR=2.5%

| | | 1968~1973 | 1974~1983 | 1984~1993 |
|---------|-----------------|-----------|-----------|-----------|
| Cost | | 5576 | 15991 | 9354 |
| Benefit | Medical Expense | 13626 | 8228 | 1695 |
| | Labor loss | 1404 | 1181 | 233 |
| | COI Total | 15029 | 9409 | 1927 |
| | WTP | 30058 | 18818 | 3854 |
| B/C | | 5.39 | 1.18 | 0.41 |

SDR=9%

| | | 1968~1973 | 1974~1983 | 1984~1993 |
|---------|-----------------|-----------|-----------|-----------|
| Cost | | 2387 | 6632 | 3811 |
| Benefit | Medical Expense | 6809 | 4078 | 829 |
| | Labor loss | 682 | 573 | 133 |
| | COI Total | 7490 | 4652 | 942 |
| | WTP | 14980 | 9304 | 1884 |
| B/C | | 6.29 | 1.40 | 0.49 |

Source: Kochi, I., S. Matsuoka, M. A. Memon, and H. Shirakawa (2001), "Cost benefit analysis of the sulfur dioxide emissions control policy in Japan", *Environmental Economics and Policy Studies*, 4(4), pp.219-233

References

- * Kochi, I., S. Matsuoka, M. A. Memon, and H. Shirakawa (2001), "Cost benefit analysis of the sulfur dioxide emissions control policy in Japan", *Environmental Economics and Policy Studies*, 4(4), pp.219-233
- * Boardman, A.E., D. H. Greenberg, A. R. Vining, and D. L. Weimer (2006), *Cost-Benefit Analysis: Concept and Practice (3rd ed.)*, Person Prentice Hall.

Schedule

1. Introduction 9/26

Part I : Theory of Environmental Economics and Environmental Policies

2-6. CAC and MBIs and the comparison of their efficiency 10/6, 10/13, 10/27, 11/10, 11/17

7. Voluntary Approaches, Water Pollution Policy, Climate Change Policy 11/17, 11/24

Part II : Economic Evaluation on Environmental policy and Policy Analysis

8.9. Cost Benefit analysis in Environmental Policy 12/1, 12/8

10.11. Economic Valuation on Environmental Policy-COI, SP and RP 12/15, 12/22

12.13. Contingent Valuation Method (CVM) and Travel Cost Method 1/12, 1/19 (close)

14. The Design of Environmental Policy 1/26

15. Concluding remarks 2/2 (supplements)