COURSE OVERVIEW & INTRODUCTION TO PROJECT EVALUATION

EE465/EE463 Project Evaluation

Semester 2/2015

About the Instructor

- Name: Phatta Kirdruang
- Research Interests
  - Health economics
  - Development economics
  - Population studies
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- Office: Room 15, 60-year anniversary annex.
- Office hours: Tues & Thurs, 2-3pm, and by appointment

Students' Background?

- Please introduce yourself:
  - Name & Nickname
  - Which year of the program are you at?
  - What makes you interested in cost-benefit analysis (or project evaluation in general)?
  - What do you expect from this class?
  - Others?

Course Contents

First-half of the course:

- Introduction to cost-benefit analysis
- Conceptual foundations of cost-benefit analysis
- Microeconomics of cost-benefit analysis
- Valuing benefits and costs in primary markets
- Valuing benefits and costs in secondary markets
- Discounting benefits and costs in future time periods
- Social discount rate
- Dealing with uncertainty

Course Contents (cont'd)

Second-half of the course:

- Valuing impacts from observed behavior: Indirect market methods
- Nonmarket valuation using stated preferences: Contingent Valuation Method
- Case studies:
  - Transportation
  - Environment
  - Health
- Cost-effectiveness analysis
- Shadow prices: applications to developing countries
- Term projects

Readings

- Required Textbooks (on the reserve in Puey Library)
  - Boardman, A., Greenberg, D., Vining, A., & Weimer, D. (2010). *Cost-Benefit Analysis: Concepts and Practice.* Fourth Edition. Prentice Hall.
- Required journal articles – as indicated in the course outline.
  - Please check moodle regularly for updates (enrollment key: 2547) .
- Supplemental Textbooks:
  - Mishan, E. J., & Quah, E. (2007). *Cost-Benefit Analysis*. Routledge.
  - Campbell, H. F. (2003*). Benefit-Cost Analysis: Financial and Economic Appraisal Using Spreadsheets*. Cambridge University Press.

Course Organization

- Meet every Tuesday and Thursday, 9:30 – 11 am
- Lectures based style + class participation
  - Students are required to read assigned readings before class.
- Assessment:
  - Class participation 5 %
  - Quizzes 10 %
  - Term Report 20%
  - Midterm exam 30 % (March 10, 9.30 – 11.00 hrs)
  - Final exam 35 % (May 16, 13.30 – 16.30 hrs)

Quizzes

- There are 5 quizzes in total. Each of them will given on the date specified on the course outline.
- For each quiz, there are two questions: one is based on the materials from the previous lecture; another is based on the assigned readings for the current lecture.
- You will be given 15 minutes at the beginning of the class to complete the quiz. No quiz will be accepted after the first 15 minutes of the class.
- The best 4 (out of 5) quizzes will be counted toward your final quiz grade.

Term Report

- Each group of 2-3 students is required to write a term report based on their cost-benefit analysis of suggested projects. The report contains the following components.
  - Measurement of the benefits and costs of the projects
  - How the relevant impacts are quantified and monetized
  - NPVs of different alternatives of the project
  - Any relevant sensitivity analysis
  - Recommendation and policy implications, if any.
- The report should not exceed 5 pages, excluding the reference (Time New Roman Font 12, with 1.5 space and 1-inch margin for A4-size paper). The reference must be in APA style.

Suggested Topics for Term Projects

- An underground car parking below the soccer field in Thammasat University (Ta Prachan Campus)
- A free vaccination (flu vaccine) program provided to Thammasat students and staffs
- A waste management program at Thammasat University (Rangsit Campus)
- An insecticide program to prevent dengue fever in a community

INTRODUCTION TO COST-BENEFIT ANALYSIS

What Is Cost-Benefit Analysis (CBA)?

- CBA is a process of identifying, measuring, and comparing the social costs and benefits of an investment project or program.
  - CBA can be public or private projects – based on a social viewpoint
    - Can you think of any social cost of a private project?
  - CBA can be in terms of investment in physical infrastructure, or in forms of investment in human capital
- CBA involves a calculation of net social benefits (NSB) of each policy/project alternatives.

$$NSB = B - C$$

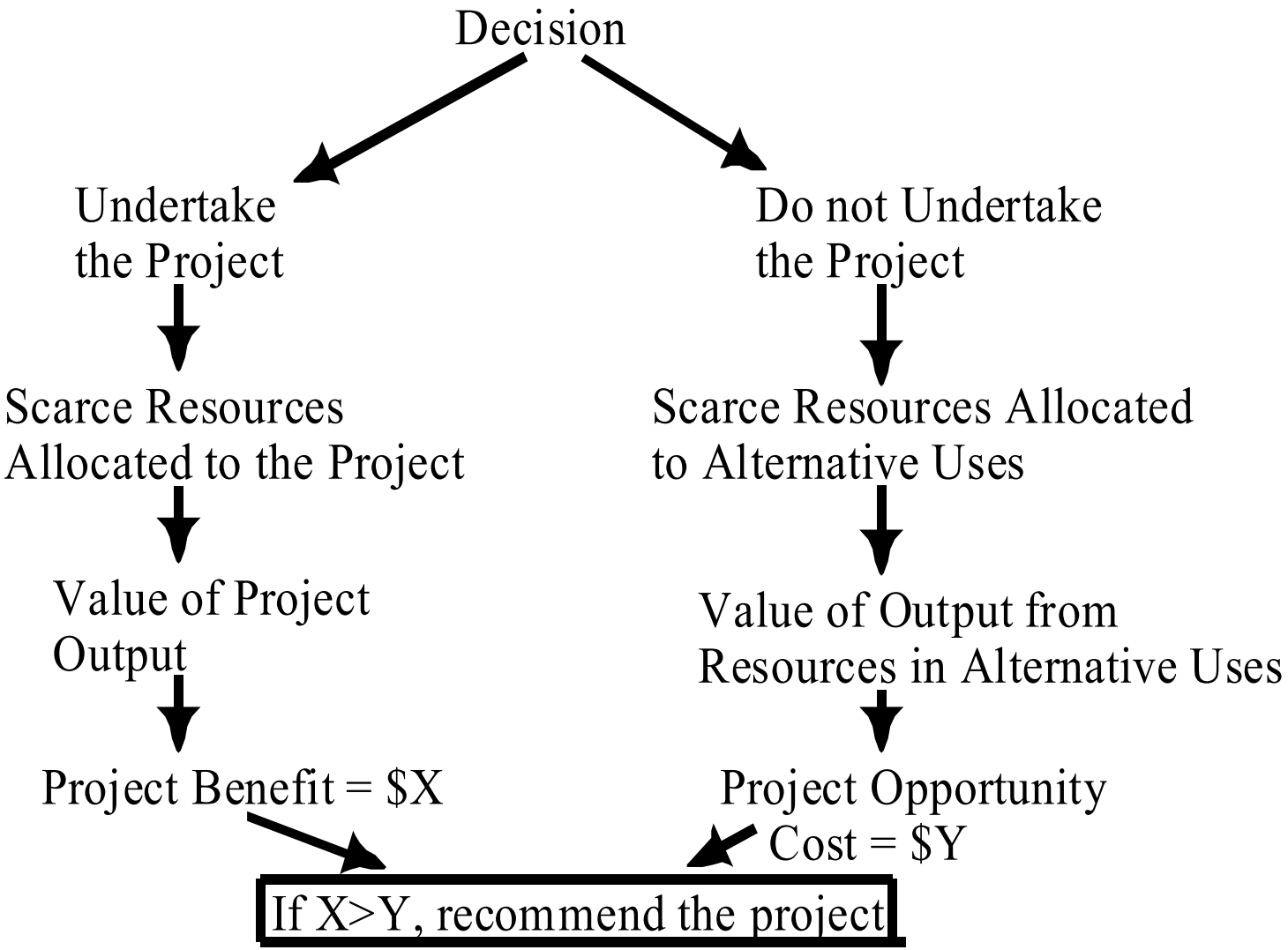
Where B = social benefits and C = social costs (opportunity costs)

Example: What are social costs and benefits of a toll way?

Why Do We Need CBA?

- The basic rationale for government intervention is *market failure*.
  - CBA is used to clarify which of potential alternative programs, policies or projects is the most efficient.
- More specifically, CBA is used to inform the decision maker - those who will appraise or evaluate the project
  - "Appraise" – process of actually deciding whether the resources are to be allocated to the project or not
  - "Evaluate" – process of reviewing the performance of a project or program

With and Without Approach to CBA



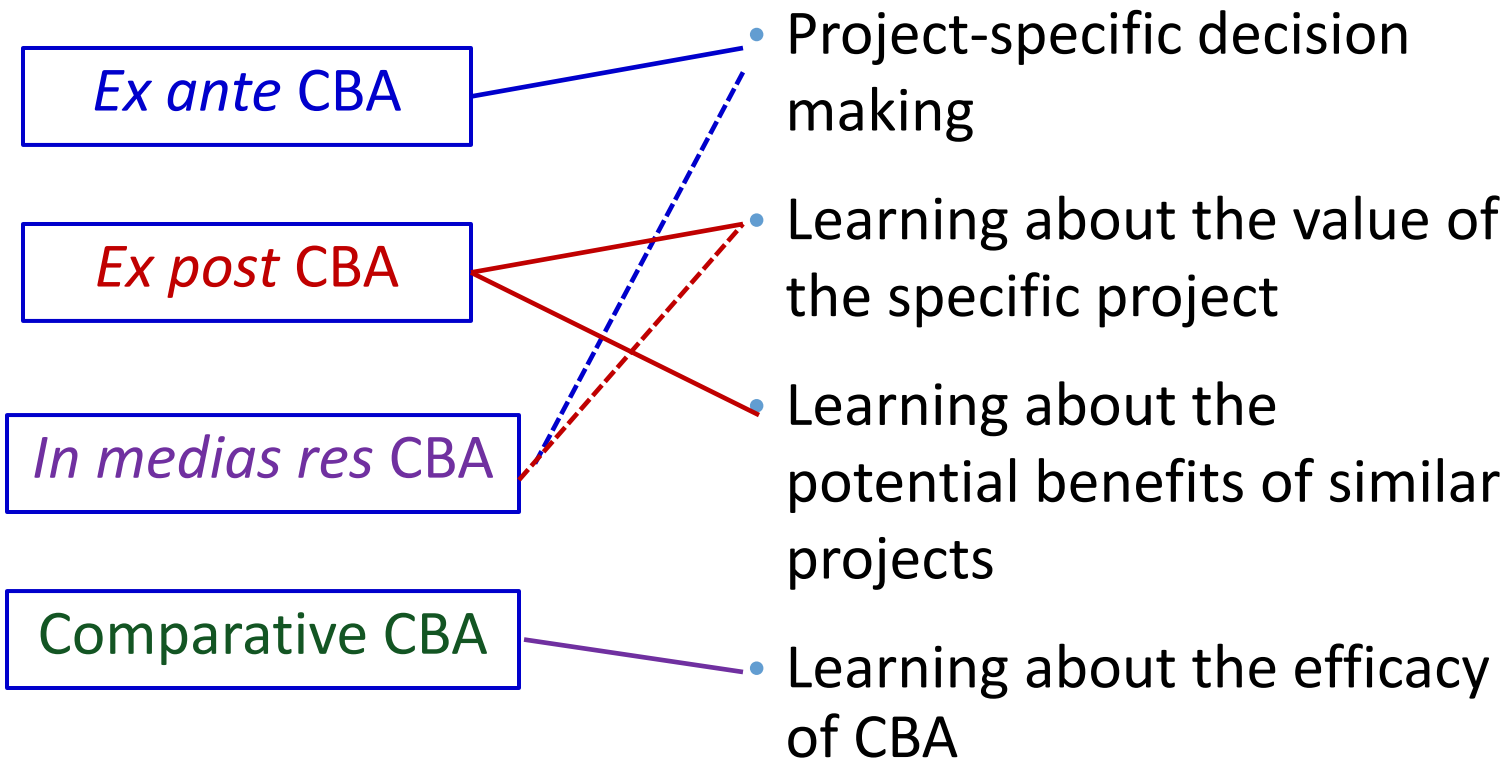
Types of CBA

There are four main types of CBA:

- *Ex ante* CBA – conducted prior to the intervention
  - shows whether resources should be used on a program or project
- *Ex post* CBA – conducted at the end of the intervention
  - provides information about the particular class of intervention
- *In medias res* CBA – conducted during the intervention
  - assesses the project as the time goes by
- Comparative CBA – compares the ex ante predictions to ex post results for the same project

Different Types of CBA and Their Uses

Which type(s) of CBA matches with the purposes on the right hand side?



The Basic Steps of CBA

1. Specify the set of alternative projects.
2. Decide whose benefits and costs count (standing).
3. Identify the impact categories, catalogue them, and select measurement indicators.
4. Predict the impacts quantitatively over the life of the project.
5. Monetize all impacts.
6. Discount benefits and costs to obtain present values.
7. Compute the net present value of each alternative.
8. Perform sensitivity analysis.
9. Make a recommendation.

Example: Basic Steps of CBA

TABLE 1-3 Coquihalla Highway CBA (1986 $ Million)

	No Tolls		*With Tolls*	
	A ***Global Perspective***	***B*** ***Provincial Perspective***	***C*** ***Global Perspective***	***D*** ***Provincial Perspective***
Project Benefits: Time and Operating Cost Savings	389.8	292.3	290.4	217.8
Horizon Value of Highway	53.3	53.3	53.3	53.3
Safety Benefits (Lives)	36.0	27.0	25.2	18.9
Alternative Routes Benefits	14.6	10.9	9.4	7.1
Toll Revenues	—	—	—	37.4
New Users	0.8	0.6	0.3	0.2
Total Benefits	494.5	384.1	378.6	334.7
Project Costs: Construction	338.1	338.1	338.1	338.1
Maintenance	7.6	7.6	7.6	7.6
Toll Collection	—	—	8.4	8.4
Toll Booth Construction	—	—	0.3	0.3
Total Costs	345.7	345.7	354.4	354.4
Net Social Benefits	148.8	38.4	24.2	–19.7

Source: Adapted from Anthony Boardman, Aidan Vining, and W. G. Waters II, "Costs and Benefits through Bureaucratic Lenses: Example of a Highway Project," *Journal of Policy Analysis and Management,* 12(3) 1993, 532–555, Table 1, p. 537.

Illustration of CBA Basic Steps (1)

Step 1: Specify the set of alternative projects.

- 2 alternative 4-lane highways: Tolls or no tolls
- Other dimensions:
  - Road surface – bitumen or concrete
  - Routing – different routes
  - Size – 2, 3, 4, or 6 lanes
  - Wild animal friendliness – with or without "elk tunnel"

Step 2: Decide whose benefits and costs count (standing).

- Residents in British Columbia → provincial perspective
- Everyone, regardless of where they reside → global perspective

Illustration of CBA Basic Steps (2)

Step 3: Identify the impact categories, catalogue them, and select measurement indicators.

- Anticipated beneficial impacts:
  - Time saved and reduced vehicle operating costs
  - Accidents avoided due to shorter and safer highway
  - Residual value of highway after discounting period
  - Benefits from new users
  - Revenues from toll collection
- Anticipated cost impacts:
  - Construction costs
  - Maintenance cost
  - Toll collection
  - Toll booth construction and maintenance

Illustration of CBA Basic Steps (3)

Step 4: Predict the impacts quantitatively.

- Predict the number of vehicle-trips, the number of accidents are avoided and lives saved, the factors affecting maintenance costs.
- Example:

  Shorter distance: 130 vkm x 0.027 lives lost per vkm = 3.5 lives/year

  Safer road: 313 vkm x 0.027 lives lost per vkm x 0.33 = 3.0 lives/year

  ➔ **Total lives saved = 6.5 lives/year**

Step 5: Monetize all the impacts.

- Monetize time saved, a statistical lives saved, and accidents avoided.
- Need to know: value of time saved per vehicle (e.g. $12 per vehicle-hour), value of a live saved (e.g. $500,000 per life)

Illustration of CBA Basic Steps (4)

Step 6: Discount benefits and costs to obtain present values.

$$PV(B) = \sum_{t=0}^{n} \frac{B_t}{(1+s)^t} \quad \text{and} \quad PV(C) = \sum_{t=0}^{n} \frac{C_t}{(1+s)^t}$$

Step 7: Compute the net present value of each alternative.

- NPV = PV(B) – PV(C) ➔ adopt the project if NPV > 0

Step 8: Perform sensitivity analysis.

- Adjust the prediction of impacts (e.g. the predicted number of lives saved), or the valuation per unit of impact (e.g. value of a statistical live saved)

Step 9: Make a *recommendation*

- Choose the alternative with the largest net social benefits.