Day 9
Distribution
Example: Windmills
Accuracy/value of CBA
Irish guidelines. [Will send document when I find it]. Proposed working rules for Cost-Benefit Analysis

DISTRIBUTIONAL EFFECTS
So far: we just added up gains and losses, irrespective of to whom they accrue.
Problem: $1 more for a rich person is not as valuable as $1 more for a poor person.

Possible solution: Use distributional weights.
Net benefit would be the weighted average of benefits and costs, with higher weights on costs or benefits for poor people.
\[
\text{Net benefit} = \sum_{i=1}^{n} w_i (B_i - C_i).
\]
If we don’t use weights, \(w_i = 1\).

Justifications for using distributional weights.
1. Diminishing marginal utility. “Utility” is “wellbeing”.
   \(\frac{dU}{dY}\) (poor person) \(>\) \(\frac{dU}{dY}\) (rich person)
   Take $1 from rich person, give to a poor person, society will be better off. But …
2. Social welfare function.
   Too much inequality leads to social disorder.
   Need to help poor. So at least put a higher weight on helping poor vs. non-poor.

Problem 1. What weights to use?
a. Infer from marginal income tax rates.
   e.g. Income tax. 0% on low incomes. (weight of 1)
      10% on middle incomes. (weight of 0.9)
      30% on high incomes. (weight of 0.7). \(+\$100, \$30\) in tax, keep \$70.
   In most poorer countries, personal income tax is not important.
b. Pragmatism.
   a. Show the results of the cost-benefit analysis without weights
   b. Apply distributional weights, and show implications. May not matter.
   c. Harberger: Limit weights to the maximum implicit in efficient transfer programs.
      We want to help poor: lots of ways to do so. Projects may not be the best way to serve
      poor, if there are good alternatives. So don’t skew projects too much by using
      distributional weights.

Example. We have a transfer program that collects taxes and transfers to poor people. For every $100
transferred to poor person, the cost to non-poor is $120.

- Administrative cost
- Deadweight loss of taxation

\[ \Delta Y_{\text{nonpoor}} \]

No consensus.

Problem 2.

Often, very hard to assign the benefits and costs of a project to different groups in society.

e.g. Hire more police officers. Who gains?
\[ -120 \quad \Delta Y_{np} \}
+ 100 \quad \Delta Y_p \}

\text{Weight on non-poor } = 1
\text{Poor } = 1.2

\[ B_k - C_k : +100 - 120 = -20 = NPV < 0 \]

\[ \sum W_i (B_i - C_i) : (1.2)100 - (1)120 = 0 = NPV = 0 \]

\text{OK
Implicitly we are using a poor weight of 1.2 \(= w_p \) in existing programs.}

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\text{Min. wage}
\text{Should be up?}

\text{Worry about unemployment.}

1987

\text{What if } W_{min} \rightarrow \$4.35?

\text{Workers: gain } A-E = \$21.1 \text{ billion}

\text{Consumers: lose } A+B = -\$24.1

\text{Prices up net } -\$3.0
In US: 1987:
27% of those at/near min wage were poor.

Poor to poor: 27% of \( \frac{4}{9} \) 21.1 bn = 5.6 bn
Poor to non-poor: 15.5 - 24.1 = -8.6 bn

Implicit poverty weight = \( W_P = \frac{-8.6}{5.4} = 1.54 \)

Conclusion:
some projects hinge on use of weights.
How accurate is cost-benefit analysis?

Why do we undertake cost-benefit analyses?

Reduces uncertainty, so we acquire better information.

Little and Mirrlees. 1990.

Suppose we have two projects with true NPV of \( x > y \). We should choose project \( x \) over project \( y \).

We don’t know the true values. Lack information, inaccurate measurement, etc.

After doing a cost-benefit analysis, we observe: \( x + A \) and \( y + B \)

A and B are the errors that remain. If we don’t do a cost-benefit analysis, we observe \( x + A + C \)

And \( y + B + D \).

Cost-benefit analysis removes the errors C and D.

Without CBA, choose larger of \( x+A+C \) and \( y+B+D \)

We make the wrong choice if \( A+C - (B+D) > y - x \)

Given \( M = (A-B) \)

And \( N = C-D \)

\[ M + N < y-x \]

With CBA, assume \( N = 0 \).

Now make wrong choice if \( M < y-x \)

But this is far less likely.

The benefit of CBA is that it makes it less likely that we make the wrong choice.

Rule of thumb: CBA. Typically worth paying equivalent of about 2% of value of the project, to do a good CBA.

1990. Typical World Bank project was worth about $30 million. 2% of this is $600,000.

Does CBA help reduce uncertainty/provide useful information?
**Case study.** Coquihalla Highway, east of Vancouver, Canada. Three cost-benefit analyses of same project by different teams at different times. Cost was about $1 billion.

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<thead>
<tr>
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<th>Ex ante (before)</th>
<th>In media res (during)</th>
<th>Ex post (after)</th>
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<tbody>
<tr>
<td>Net Present Value</td>
<td>$40 million</td>
<td>-$128 million</td>
<td>$394 million</td>
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All in 1984 Canadian dollars. Interest rate of 7.5%. 20-year life.

Disturbing. Suggests that CBA is very imprecise.

Why the differences?

  - Construction costs. More than expected.
  - Traffic projections.

Some similarities

  - Maintenance costs
  - Safety effects

Be humble!

Example of cost-benefit analysis

Cape Cod (Massachusetts) windmills offshore.