
Workshop

# Introduction to Cost-Benefit Analysis

**Speakers**

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# Understanding Benefit-Cost Analysis

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Scioto Analysis
Economics | Public Policy


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# 01

# DIRECT COSTS

# DIRECT COSTS

Cost-benefit analysis measures the *opportunity costs* of a policy

What is an "opportunity cost?"

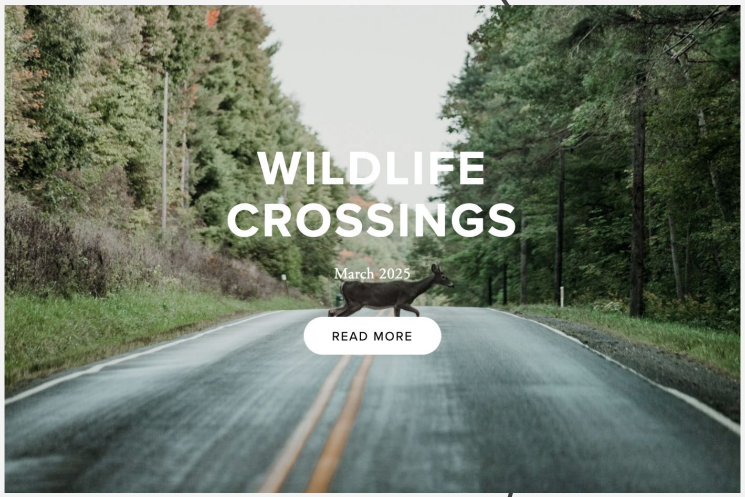
Why are opportunity costs preferable to accounting costs?

# DIRECT COSTS

Direct costs are costs associated with the administration of a policy

Example: Wildlife Crossings BCA

- Construction
- Maintenance



# DIRECT COSTS

When does opportunity cost depart from accounting cost?

What is a transfer?

What is the marginal excess burden of taxation?

# DIRECT COSTS

Table 3.2 *Estimates of the Marginal Excess Tax Burden*

| Study | Country | METB | Mid-point of METB estimate |
|---|---|---|---|
| Dahlby (1994) | Canada | 0.09–0.38 | 0.235 |
| Stuart (1984) | USA | 0.43 | 0.430 |
| Fullerton and Henderson (1989) | USA | 0.06–0.17 | 0.115 |
| Ballard et al. (1985) | USA | 0.12–0.23 | 0.185 |
| Campbell and Bond (1997) | Australia | 0.19 | 0.190 |
| Ahmad and Croushore (1994) | USA | 0.121–0.167 | 0.144 |
| Gruber and Saez (2002) | USA | 0.285 | 0.285 |
| Kleven and Kreiner (2006) | UK | 0.26 | 0.260 |
| Ruggeri (1999) | Canada | 0.18 | 0.180 |

# DIRECT COSTS

Can you think of examples of transfers in the Wildlife Crossings BCA?

- Costs of Construction: Labor, Materials, etc.
- "Benefits" of Construction: Salaries, Revenue, Local Economy

# DIRECT COSTS

Questions?

# 02

# INDIRECT COSTS

# INDIRECT COSTS

A good cost-benefit analysis goes beyond the measure of direct costs to measure indirect costs.

Indirect costs are often not even market costs and not experienced directly in dollar values.

# INDIRECT COSTS

Key concept: **Willingness to Pay**

What is “willingness to pay”?

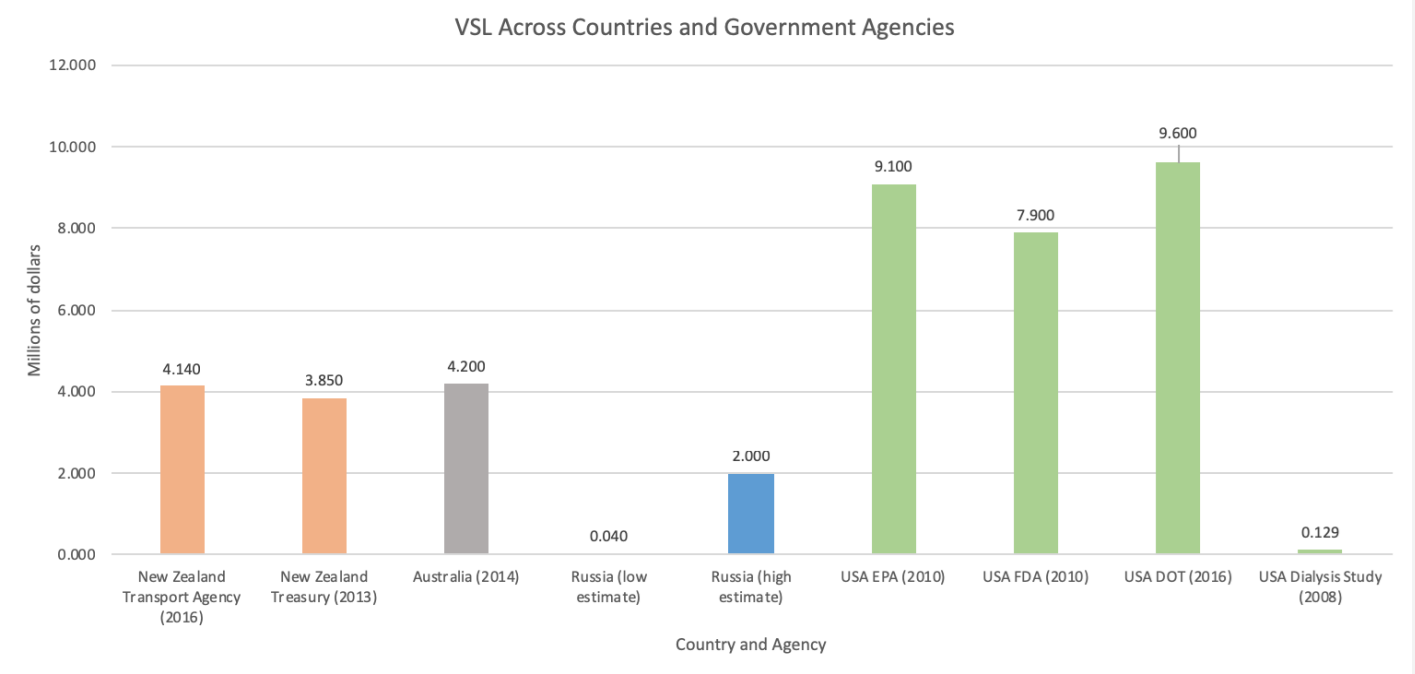
Have you heard of “willingness to accept?”

# INDIRECT COSTS

"Value of a statistical life" is a way of monetizing the costs associated with policies that increase the risk of death.

"Mortality risk valuation" (EPA) is a better descriptor.

# INDIRECT COSTS

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# INDIRECT COSTS

"Contingent valuation" is a survey method used to estimate the willingness to pay for a nontraded good.

Can be used to estimate the value of nonmarket goods.

# INDIRECT COSTS

Contingent valuation is a common tool used in environmental cost-benefit analyses.

E.g. Wildlife Crossings BCA

Can help determine **non-use value** of wilderness, for example.

# INDIRECT COSTS

Questions?

# 03

# TANGIBLE BENEFITS

# Tangible Benefits

The distinction between direct and indirect costs and tangible and intangible benefits can be more art than science.

A good CBA is comprehensive

# Tangible Benefits

Often, market prices are used to estimate the tangible benefits of a policy.

E.g. Wildlife Crossings BCA

- Vehicle Damage

# Tangible Benefits

Cash transfers are benefits, but on net are cancelled out by the revenue used to pay for them.

A bad cost-benefit analysis will focus on cash transferred, ignoring the *economic* benefit of the policy.

# Tangible Benefits

Cost-benefit analysis is often best when it guided by the concept of **market failures.**

What is a market failure?

# Tangible Benefits

Market failure is a strong guide for cost-benefit analysis because it provides a conceptual framework for how government can grow or shrink the economy.

# Tangible Benefits

Examples of market failure are...

- Externalities
- Market power (monopoly, monopsony, oligopoly)
- Public Goods
- Information Asymmetry

# Tangible Benefits

Examples of Tangible Benefits:
Wildlife Crossings BCA...

- Passenger Fatalities
- Injuries
- Crash & Disposal Costs

# Tangible Benefits

Questions?

# 04

# INTANGIBLE BENEFITS

# Intangible Benefits

OMB circular A-4 describes “intangible benefits” as “non-monetized and non-quantified effects.”

This differs from Pew, clearly, because Pew calls for the monetization of intangible benefits.

# Intangible Benefits

One way to think of tangible vs intangible benefits is that tangible benefits usually occur within clear markets.

Distinction isn't too important, though—the point is that a good CBA is comprehensive about benefits.

# Intangible Benefits

Some examples of intangible benefits are psychological benefits of health and satisfaction with life.

These can be hard to monetize, but economists have tried to figure out ways to do it.

# Intangible Benefits

Example: Wildlife Crossings BCA...

Ecosystem Services

- Aesthetic information
- Existence, bequest values
- Inspiration for culture, art, and design

# Intangible Benefits

Questions?

# 05

# BASELINE

# Baseline

No public policy exists in a vacuum.

A good cost-benefit analysis will measure the policy against a status quo of not adopting the policy.

# Baseline

Current trends need to be considered to understand the true impact of a policy.

Example: Wildlife Crossings...

- Current migration patterns

# Baseline

What to look for: baselines that are drawn from credible sources.

What would be some credible sources for the Wildlife Crossings BCA?

- Stage Legislatures
- Department of Transportation
- Academic Literature

# Baseline

Randomized controlled trials are considered the “gold standard” in social science research.

Randomized treatment has been key in understanding the impacts of early childhood education.

# Baseline

What would a baseline look like for the Wildlife Crossings CBA?

- Status Quo

# Baseline

Questions?

# 06

# DISCOUNTING

# Discounting

$1 today ~= $1 tomorrow

$1 invested today can grow into more money down the road

We know we have $1 today while uncertainty means it could be less in the future

# Discounting

$$\frac{1}{(1 + THE\ DISCOUNT\ RATE)^t}$$

# Discounting

Considerable disagreement exists as to what the *right* discount rate is.

This disagreement has an impact on the perceived effectiveness of a policy.

Has bled into federal politics.

# Discounting

Low-end for the public sector (often accepted) is 3%. This puts it below market rates of return and reflects higher present value of money.

# Discounting

More conservative estimates of present bias fall in the 7% range. 7% is closer to the market rate of return so comes closer to capturing what alternative use of funds in the private sector could provide.

# Discounting

Some calculate discount rates in the double-digit percentage range (around 11%). This can be appropriate for the developing world where institutions are less stable and future gains less certain.

# Discounting

Sensitivity analysis can be a good tool for adjudicating the lack of consensus on discount rates.

Look for studies that use multiple discount rates.

# Discounting

## Example: Wildlife Crossings BCA

| Description | Discount Rate | Net Present Value |
|---|---|---|
| Investment Rate | 7% | $5.2 million |
| Developing Country Rate | 11% | $2.3 million |
| No Discounting | 0% | $38 million |
| Highest to Break Even | 21% | $19,000 |

# Discounting

Higher discount rate = more present bias

Lower discount rate = more future bias

# Discounting

Questions?

# 07

# ASSUMPTIONS

# Assumptions

Cost-benefit analysis is applied microeconomic analysis.

Any type of microeconomic analysis relies heavily on assumptions.

# Assumptions

A good cost-benefit analysis will disclose key assumptions used in its calculations

# Assumptions

Assumptions that are based on empirical evidence are stronger than those drawn from “thin air.”

Looking to similar policies or public data can be a good guide for assumptions.

# Assumptions

Assumptions are a good place to conduct sensitivity analysis.

If we don't know what a certain input "should" be, we can test our model using different inputs to see what happens to it.

# Assumptions

A good cost-benefit analysis will subject assumptions to sensitivity analysis in order to see how much these assumptions impact the projections of the analysis.

# Assumptions

Example: Wildlife Crossings BCA

Default Assumptions: 90% deer, 5% elk, and 5% moose

| Wildlife Proportion | Net Present Value |
|---|---|
| 100% Deer | $13 million |
| 100% Elk | $17 million |
| 100% Moose | $22 million |

# Assumptions

Example: Wildlife Crossings BCA– what other assumptions do you think we made?

- 90% Collision Reduction Rate
- 22 Collision per Year Area
- 0.001 Mortality Rate

# Assumptions

Questions?

# 08

# SENSITIVITY ANALYSIS

# Sensitivity Analysis

**Sensitivity analysis** is the tool cost-benefit analysts use to test the robustness of their analysis.

Sensitivity analysis can provide a range of possible outcomes for policymakers to consider.

# Sensitivity Analysis

Partial sensitivity analysis

Worst- and best-case analysis

Break-even analysis

Monte Carlo simulation

# Sensitivity Analysis

A partial sensitivity analysis takes one input and varies it, seeing how it impacts the outcome.

Example: Trying different values of a statistical life and seeing how that impacted the outcome.

# Sensitivity Analysis

Worst- and best-case analysis means changing all the assumptions to “break” the model.

Example: Assuming low uptake and low per-person benefits from a food security program.

# Sensitivity Analysis

Break-even analysis changes assumptions until benefits equal costs.

This can be useful for gauging how much an input has to change for a certain outcome to happen.

# Sensitivity Analysis

Monte Carlo simulation is the “gold standard” of sensitivity analysis.

Monte Carlo simulation randomly varies inputs and repeats this 10,000 times to ascertain a range of outcomes.

# Sensitivity Analysis

Example: Wildlife Crossings BCA– what kind of assumptions can we adjust?

| Impact | 5th Percentile | Median | 95th Percentile |
|---|---|---|---|
| Net Present Value | $11 million | $49 million | $147 million |
| Total Costs | $1.8 million | $5.8 million | $13 million |
| Total Benefits | $18.6 million | $56 million | $159 million |

# Sensitivity Analysis

Questions?

# Additional Resources

Review Scioto Analysis CBAs

Talk with us!

# Other Questions?

Health Policy Institute of Ohio

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# We value your opinion

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