

OHIO HANDBOOK OF COST-BENEFIT ANALYSIS



SCIOTO
ANALYSIS

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INTRODUCTION

Cost-benefit analysis is a fundamental tool for today's policy analyst. By laying bare the economic costs and benefits of a given policy option, a policy analyst can help policymakers to better understand the impacts of their decisions and the tradeoffs inherent in these decisions.

This handbook is a guide to cost-benefit analysis for analysts in Ohio's state and local governments. The goal of this document is not to be an exhaustive explanation of all the best practices of cost-benefit analysis, but rather an introduction for analysts new to cost-benefit analysis and a guide to quick and easy cost-benefit analysis hitting the essential concepts of costs, benefits, discounting, and sensitivity analysis.

Before beginning to analyze costs and benefits, an analyst must be aware of four foundational considerations of cost-benefit analysis.

COST-BENEFIT ANALYSIS IS AN ECONOMIC TOOL.

This means that cost-benefit analysis is focused on measuring quantifiable economic costs and benefits of policies, as measured by individuals' willingness to pay (WTP) in dollar amounts for these outcomes. This also means that cost-benefit analysis is a good tool for projecting the economic impacts of a given policy, but is not a tool intended to help a policymaker analyze other policy criteria such as fairness, legality, and political feasibility.

COST-BENEFIT ANALYSIS IS A TOOL, NOT A DECISION RULE.

Just because a policy has net economic benefits does not mean a policymaker *should* support it. Other considerations such as equity can make a policy desirable regardless of its total balance of economic costs and benefits. That being said, cost-benefit analysis is a valuable tool in helping policymakers conceptualize these tradeoffs.

COST-BENEFIT ANALYSIS IS ABOUT SOCIAL WELFARE, NOT A PARTICULAR FIRM'S WELFARE.

A policymaker needs information on outcomes for all of society, not just one stakeholder. While private cost-benefit analysis can be carried out by firms, public-sector cost-benefit analysis takes society as the unit of interest. This means analysts need to be aware of the *scope* of their study (local, state, national) and should be focused on *social* costs and benefits, not just how they move money around.

COST-BENEFIT ANALYSIS COMPARES ALTERNATIVES AGAINST A BASELINE.

Cost-benefit analysis requires an understanding of what will happen if a policy is *not* adopted in order to project as well as possible what will happen if the policy is adopted.

Knowing what will happen if a policy is put in place is not enough for a cost-benefit analysis, the analyst must also determine how that outcome would differ from a situation where the new policy is not implemented. This scenario might differ from the status quo if, for example, existing trends would change outcomes even in the absence of the policy under consideration. This also means that outcomes should be projected using the best available evidence of how similar policies have impacted similar populations in the past.

With these four considerations in place, let us now talk about costs.

COSTS

The measure of costs in a cost-benefit analysis is *not* simply measuring the costs to the government for a policy, but rather measuring the costs to society of a given policy option. This means that cost in a cost-benefit analysis is not how much shows up on a government's balance sheet, but rather the "opportunity costs" of a given policy to society, or the foregone next-best use of those funds.

The general approach of an analyst in determining the costs of a policy is to (1) identify and quantify direct costs and (2) identify and quantify indirect costs.

DIRECT COSTS

Direct costs are costs associated with the administration of the policy. This includes costs to pay staff for carrying out the policy, material inputs, and anything else necessary for the policy to function. For instance, if you are analyzing an early childhood education program, you should estimate the costs of materials, facilities, and staff necessary to run the program. Once you have an estimate for these direct costs, though, you must next translate these costs into *social* costs.

Dollars governments spend on salaries, materials, and other inputs do not disappear: they represent a *transfer* of dollars from taxpayers to government employees, suppliers, and contractors. This transfer, however, does not come without a cost. Taxes on income, savings, and purchases reduce economic activity by discouraging them. For instance, when income is taxed, people work less, when goods are taxed, people buy less of them, etc. Economists call this the "excess tax burden." This is the economic cost of government spending: the distortions caused by the taxes needed to finance the spending.

Boardman's *Cost-Benefit Analysis: Concepts and Practice* suggests that the excess burden of taxation is estimated as 23% of the total revenue raised for programs funded via income tax and 17% of the total revenue raised for programs funded via property tax. Other taxes, such as sales, fees, etc, have different levels of economic distortion. This means that a program that costs \$1,000 per participant in government spending will actually generate a social cost of \$230 per participant if funded via income taxes and \$170 if funded via property taxes. An analyst should do her best to identify the source of funds for the program and, using

available estimates for marginal excess tax burdens, should calculate the social cost of government spending on the program.

INDIRECT COSTS

Analysts doing cost-benefit analysis should do everything they can to determine other costs a policy may levy on society. This means doing research to see what similar policies have done in similar contexts then calculating what the probable impacts would be of the policy. If a policy will require private sector workers to spend time filling out documentation, that time should be valued at their market rate. If a policy change will increase the chance of injury or death for citizens, those changes should be valued at people's willingness to pay to avoid these maladies, all estimates that have been made by economic studies already. Judgment must be made by the analyst to determine how applicable these studies are. For instance, a study conducted in Indiana might be more applicable in an Ohio context than a study conducted in Tibet.

BENEFITS

In cost-benefit analysis, benefits are the advantages of a policy expressed in monetary terms. Because cost-benefit analysis considers society to be the unit of analysis, a transfer from one person to another should not count as a benefit since such a transfer is just moving value around, not creation of a new benefit. Thus, benefits are best identified by considering how a policy creates or prevents **externalities** (external costs created by market activities), equalize **market power** (such as monopolistic practices), or correct **information asymmetries** (where buyers and sellers might have different levels of information, thus causing people to make purchases they wouldn't if they knew more). Strategies for estimating the monetary benefits of policies are listed below.

- **MARKET VALUATION** - If a good provided by the policy is traded in a market already, the analyst can simply find comparable market prices and calculate the benefits of a policy. For instance, if a safety regulation for automobiles will reduce car crashes, the analyst can easily find estimates of the average cost associated with repairs or replacement of crashed cars. It should be noted that this might be a lower-bound estimate for value since consumers are often willing to pay higher than the market rate.
- **SURVEYS** - A well-designed study of the willingness to pay amongst taxpayers for policy outcomes can be a strong guide for the value of a policy change by your client. This strategy often used in analysis of environmental programs that protect goods that are not traded in traditional markets.
- **SHADOW PRICING** - Using existing markets to approximate the value of a given benefit can help determine how a policy will create new benefits. If people are already buying goods that include your policy's benefits, their value can be approximated using market information already available. A

common example is goods that are “purchased” through home-buying. By studying similar houses in neighborhoods with varying levels of crime, for instance, economists have estimated a willingness to pay for lower crime levels in a neighborhood.

A distinction is sometimes made between “direct benefits” and “indirect benefits” to separate benefits depending on whether they accrue to program participants or other members of society. In this case, analysts must be careful not to “double count” benefits.

DISCOUNTING

Ohio’s economy is likely to grow in the future. This means that cost and benefits realized tomorrow will have less of a relative impact than costs and benefits realized today. This is because as individuals become wealthier, the value of an additional dollar is less than when they are relatively less wealthy: Bill Gates will be a lot less thrilled about finding a \$20 bill on the ground than someone living at the poverty line. Also, individuals and governments prefer current gains to future gains as revealed by spending decisions. Lastly, resources used in a public program could be used for other purposes, such as investment in private markets. For these reasons, it is best practice to “discount” future cost and benefits to the “net present value” of the policy’s total cost and benefits

The formula for discounting, as presented by the federal Office of Management and Budget, is

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

where “t” measures the number of years in the future that benefits or costs are expected to occur. Discount rate calculators are also available online.

While discounting is a standard practice of cost-benefit analysis, the discount rate to use is a subject of some controversy. Discount practice favored by the federal Office of Management and Budget is to provide net present value estimates with a 3% and 7% discount rate to reflect different approaches to the discount rate and to show how these assumptions impact the final results. Other discount rates can also be applied to test the impact on results, though discount rates outside the 1.5%-11% range are generally unrealistic.

SENSITIVITY ANALYSIS

Throughout the process of carrying out a cost-benefit analysis, the analyst will necessarily make assumptions. Almost all of these assumptions are going to have some sort of uncertainty about them. How does the analyst communicate this uncertainty to policymakers? That’s where sensitivity analysis comes in.

Sensitivity Analysis is the process of estimating how assumptions included in an analysis impact the uncertainty around the findings of the analysis. Below are some strategies for performing sensitivity analysis.

- **PARTIAL SENSITIVITY ANALYSIS** is the process of taking one key input and varying it to see how they impact the results of the study. By showing how one factor impacts the outcome of a study, a policymaker can understand the risks involved in relation to a key factor. So in a study that includes an important input with varying valuations like the value of a statistical life (the value used to quantify the benefit of avoiding a fatality), showing the net present value of the program under different assumptions for the value of a statistical life gives an insight into the variability of the results.
- **WORST- AND BEST-CASE ANALYSIS** takes all the inputs and sets them to the most optimistic or pessimistic reasonable assumptions. This allows you to communicate to a policymaker what the policy's outcomes would look like if everything went right and what they would look like if everything went wrong. This process also allows you to test your assumptions and see if changing them impacts the ultimate findings of the analysis, determining if it has net costs or benefits under all circumstances or if it ends up above or below water depending on assumptions.
- **BREAKEVEN ANALYSIS** is the process of varying assumptions to see where costs would equal benefits. This gives policymakers an understanding of how much the assumptions need to vary from their expectation for the policy's benefits to exceed costs.
- **MONTE CARLO SIMULATION** is a more complex sensitivity analysis technique that requires data analysis software. The essence of a Monte Carlo simulation is to generate a large number of possible outcomes by varying all the assumptions in the analysis. Using these outcomes, confidence intervals for cost-benefit outcomes can be estimated. Advanced Microsoft Excel users can execute a Monte Carlo simulation with a little bit of help from Google.

BRINGING IT TOGETHER

In the end, a cost-benefit analysis is about giving better information to a policymaker. Presentation of the cost-benefit analysis should be focused on this one goal. While the cost-benefit ratio or the net benefits of an intervention are the most-focused-on aspects of a cost-benefit analysis, the policymakers the analyst advises may be more interested in what the outcomes will be, costs, or the distributional aspects of you cost-benefit analysis. The analyst should communicate this information in the manner that will be most valuable for the policymaker she is working for.

That being said, cost-benefit analysis is often presented with tables for estimated costs, direct and indirect, estimated benefits, and the per-year costs and benefits over time if they vary. Standard practice is to present costs and benefits in an “impact table” format that shows costs and benefits by how they impact different groups in society. Tables make costs and benefits scan able for policymakers and allow decision makers to pick out information they are especially interested in. Use of bar charts is also common in cost-benefit analysis.

And there you have it: you’ve done a cost-benefit analysis! By carrying this out, you have given a policymaker information about how a proposed policy will impact the economy versus the status quo or other policy alternatives. You have probably also given the policymaker a better idea of what will happen when that policy lever is pulled. At the very least, you have helped the policymaking process become a little bit more evidence-based and helped policymakers consider the efficiency and effectiveness dimensions of crafting public policy.

CHECKLIST

Below are eight key elements of a cost-benefit analysis as determined by the Pew Charitable Trusts Results First Initiative.¹ Use this list when designing cost-benefit analyses to ensure all the key elements of a cost-benefit analysis are included.

- The study comprehensively measures direct costs.
- The study comprehensively measures indirect costs.
- Tangible benefits are monetized to the extent possible.
- Intangible benefits are monetized to the extent possible.
- Program costs and benefits are measured against alternatives or a baseline.
- Future costs and benefits are discounted to current year values (net present value).
- Key assumptions used in calculations are disclosed.
- Sensitivity analysis is conducted to test how the results would vary if key assumptions were changed.

¹ Pew Charitable Trusts, “States’ Use of Cost-Benefit Analysis: Improving Results for Taxpayers,” July 2013, p. 42.

FURTHER INFORMATION

This handbook is a cursory guide to cost-benefit analysis. For more information, consult the federal Office of Management and Budget’s Circular A-4, available online. This is a 40-page document for federal agencies conducting cost-benefit analysis on federal regulations and provides more detail than this handbook. For those interested in taking a deep dive into cost-benefit analysis, pick up *Cost-Benefit Analysis: Concepts and Practice*, now in its 5th edition. This is the definitive textbook on cost-benefit analysis.

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