Lecture # 23 -- Cost-Benefit Analysis

I. Introduction to Cost-Benefit Analysis (CBA)

- Public officials often use cost-benefit analysis to decide whether a project is worthwhile.
- Cost-benefit analysis can be used to guide several decisions:
  - Is a project worth doing?
  - Do the benefits outweigh the costs?
  - Given alternative projects that could achieve the same goal, which project should be undertaken?
  - What is the appropriate scale of the projects to be undertaken?
- Logic of CBA analysis:
  - Calculate the economic benefits and economic costs of each alternative.
  - These costs and benefits are discounted over time to reflect opportunity values.
  - Choose projects with the highest net benefit.
    - Note: works for a discrete set of choices, not a continuum.
    - For continuous choices, use marginal analysis.
- The ultimate goal of CBA is to ensure that society's resources are put to their most highly valued uses.
  - That is, scarcity is a concern even for government officials. We want to make the best use of the resources available to us.
- CBA is often criticized as being the "final word" and for putting too much emphasis on monetary values. However, it does have a role to play in guiding policy decisions.
  - If thought of as a guide to the final decision, rather than a means of providing definitive answers, CBA can be a useful policy analysis tool.
- CBA required by federal law for evaluating regulations.
  - In 1981, President Reagan required CBA for all proposed rules before published in the Federal Register.
    - "Regulatory action should not be undertaken unless the potential benefits to society of the regulation outweigh the potential costs of the regulation."
  - In 1993, President Clinton modified this requirement to refer to only to "significant regulatory action"
- In the upcoming lectures, we will discuss:
  - The steps to performing CBA
  - The role that CBA should play in policy analysis

II. Steps to Cost-Benefit Analysis

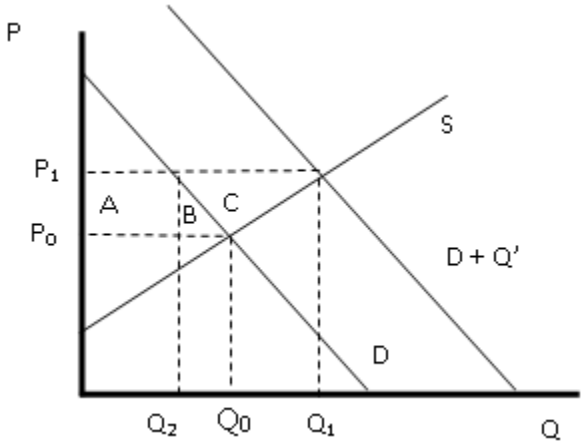
1. Define the Situation

- To begin, a community has a set of "resources", such as money, property, labor, environmental amenities, and government services.
- After a program is complete, the set of resources will change.
    - CBA looks at how these resources change.
    - A good analysis considers alternatives
        - At a minimum, one alternative is the status quo -- doing nothing.
        - However, considering projects of multiple sizes helps us assess which size provides the most benefit.
            - E.g. we could build a 4, 6, or 8 lane highway. Comparing benefits in each provides information on the marginal benefits of adding more lanes.
- Thus, we need to consider what community's resources are at stake.
    - For example, should neighboring towns be included in an analysis? (E.g. should visitors from nearby towns be considered beneficiaries of a new municipal park?)
    - There is no correct answer to this question – the answer needs to be determined in the political arena.
- The jurisdiction doing the analysis matters.
    - Leads to questions of *standing*: whose benefits and costs matter?
    - Examples:
        - A state is assessing a drug treatment program that would be funded by a federal grant
            - If analysis is limited to state residents, the grant is a benefit
            - If society is defined to include all national residents, then the benefit of the grant to the state is largely offset by the tax payments made by the residents of that and other states to fund the grant
        - The costs of damages from greenhouse gases differ if done for a single country, rather than for the entire world.
        - A proposed national policy to effectively eliminate teenage vaping
            - Is the foregone utility of teenagers who enjoy vaping a cost?
            - Suppose the project only has positive net benefits only if the forgone consumption value of teenage vaping is not considered. Is it worth doing?

2. Estimate the Costs

- Next, we need to consider the cost of the project, in terms of the resources the community will use to carry out the project.
- Types of costs:
    1. Resources purchased for the project
    2. The opportunity cost of resources already owned by the government
        - We need to know the value of these assets in their next most valuable use.
    3. Resources owned or purchased by local residents
    4. External costs
        - These costs can be harder to measure, but their values are important. Later we will talk about ways to value some of these costs.
        - It is best to include monetary values for such costs, so that comparisons are possible.
        - However, if monetary values are not possible, the costs should still be listed, so that they can still be considered in political debate.

- To measure costs, we want to find the shadow price of the input used.
    1. The shadow price of an input or output is its value to the economy as a whole.
    2. For inputs, the shadow price is the marginal opportunity cost – the value of the best alternative use of the input.
    3. Shadow prices are related to the market price, but not exactly the same because of market imperfections.
        - There are two cases where they may differ:
        - If a government purchase is large enough to change the equilibrium price.
            - Here we need to be aware of both the new (higher) price and any change in consumer or producer surplus that results.
                - In the graph below, D represents demand before the government enters the market.

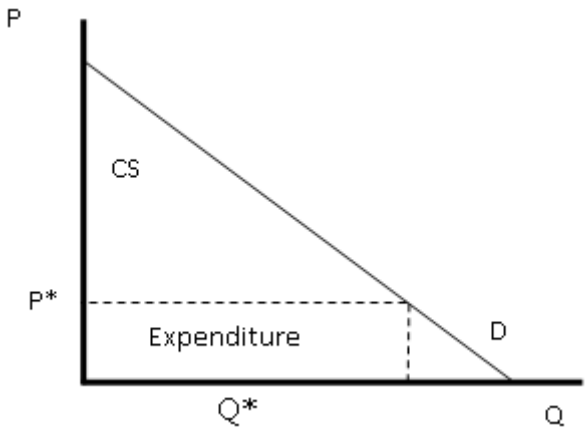


- The government purchases Q' of the good. This shifts demand out to D + Q'.
    - As a result, the price increases to P_1.
- Note that consumers purchase less (Q_1) at the higher price. $Q_2 - Q_1 = Q'$.
- Producers are better off. They sell more product at a higher price.
- The welfare changes are:
    - Lost consumer surplus: AB
    - Gained producer surplus: ABC
    - Net gain: C
- Thus, the true opportunity cost is the expenditure (P_1 x Q') - C

        - When there is a market failure, since price does not equal marginal cost.
            - Consider, for example, inputs produced by a monopolist. In that case, P > MC.
                - If the government's purchase affects the amount available for private consumption, it is the market price, which measures the value to consumers, that matters.
                - However, the opportunity of using the goods is simply the MC. Thus, if the government is producing more of the good, it is the opportunity cost (MC) that matters.
                    - Resources from the community are being taken from other uses. MC represents that opportunity cost.
    - When taxes are used to raise revenue for a project, we should consider the <u>marginal excess tax burden</u>.
        - This accounts for the costs of raising money through taxation, including:
            - inefficiency (deadweight loss)
            - administrative costs
- It is important to distinguish between costs and transfers.
    - When resources are not used up nor created, but just shifted from one set of individuals to another, we say the resources are transferred.
    - A transfer does not change the total amount of resources in a community. It just changes the distribution of the resources.
    - Transfers do have equity implications, but we will consider them later.

3. Estimate the Benefits

- Benefits are new resources made available to the community.
- Economists typically measure benefits by a community's willingness to pay.
    - Willingness to pay – the amount that individuals are willing to pay to receive the benefits (or the costs they are willing to pay to avoid negative effects).
    - The demand curve tells us the marginal willingness to pay for consumers.
    - Total benefits are the area under the demand curve.
        - This is equal to consumer surplus + total expenditures on the good.
        - Note that it includes CS plus a bit more because we are only measuring benefits, not costs. It is the total benefit, not just the benefit above and beyond the cost of producing the good, that we want here.



    - Note that, if there is market power, the price paid by consumers tells us the value of the good to consumers. Therefore, the shadow price of benefits is the price paid by consumers.
- Types of benefits:
    - Resources measurable in monetary terms
        - For goods & services sold in the marketplace, their benefit is the market price of the good.
    - Resources measurable in physical units, but not in monetary terms.
        - We may be able to infer dollar values for these benefits.
        - However, even if we can't place a dollar value on a benefit, information on the amount of benefit is useful. We can ask whether the estimated costs are worth this level of benefit.
            - Note that this requires personal judgments.
    - Resources valued by the community, but not measurable by any means.
        - You should generally be suspicious of these claims.

- Are jobs a benefit?
    - Often, the employment opportunities created by a project are considered benefits.
    - However, isn't employment really a cost of the project?
    - The key thing here is to distinguish between benefits and transfers.
    - If the economy is at full-employment, the opportunity cost of using workers is that they are not used somewhere else.
        - Thus, the new jobs are simply a transfer of workers from one sector to another.
        - Note, for example, how both sides often use jobs gained or lost in their argument (e.g. jobs lost due to environmental regulation vs. "green jobs.")
            - This suggests that the labor market adjusts, with workers moving to new jobs as necessary.
    - At the local level, this could be more difficult.
        - If there is chronic unemployment in a region, a project in that region could provide employment benefits to those in the region, even though there is no change in the national unemployment rate.
        - Thus, the scope of the study is important.
    - A better way to deal with this issue is to adjust the costs of labor.
        - If some of the local workers are drawn from the pool of unemployed workers, the opportunity cost of employing them is less than the opportunity cost of employing other workers.

- Often, benefits or costs to be included in CBA are not traded in the marketplace. How can these be valued?
    - Use information on demand from neighboring communities.
    - Surveys
        - Ask people how much they are willing to pay for services.
        - Problem: what people say (stated preference) and what people do (revealed preference) is not always the same
    - Use information on related markets
        - For example, we can compare property values in neighborhoods with and without the service.
            - Consider two houses with the same features. One is in a neighborhood with clean air, and the other is in a polluted neighborhood.
            - The house in the cleaner neighborhood will sell for a higher price. The difference in prices is the value of the cleaner air.
        - Note use of economic theory here. It allows us to infer values from actual behavior.
            - Example: the value of time
                - Consider labor/leisure theory:
                    - At the optimal point, $MU_{Leisure}/MU_{Income}$ = wage
                    - Therefore, wage equals value placed on leisure time.
    - It is important not to double count benefits.
        - For example, the benefits of a new park are the willingness to pay for the new recreational opportunities. In addition, suppose that the new park increases property values in the neighborhood by $95,000.
        - The increased property values occur because of the additional recreational opportunities. Listing them as an additional benefit would double-count the benefits of increased recreation.
            - However, since there isn't a clear market for recreational opportunities, the $95,000 increase in property values could be used to put a dollar value on those opportunities.