

# COST-BENEFIT ANALYSIS

## HIGHLIGHTS

- Providing optimal levels of public goods requires evaluating the costs and benefits of public projects.
  - The costs of inputs to public projects are appropriately measured by their opportunity cost, or their value in the next best alternative use.
  - If markets are in competitive equilibrium, the opportunity cost of an input is its market price; if markets are not in competitive equilibrium, however, the opportunity cost will differ from the market price, and some of the government spending may simply be transfers of rents.
  - If costs are in the future, we must use a social discount rate to value those costs in present dollars.
- Measuring the benefits*
- (Measuring the benefits of public projects is difficult, and approaches range from using market values (such as wages to value time), to asking individuals about their valuation (contingent valuation), to using real-world behavior to reveal valuations (such as the compensating differentials for risky jobs to value life).
  - Benefits are often in the future as well, which makes valuation very sensitive to the social discount rate chosen.
  - Public project analysis requires considering the distributional implications of the project, the level of uncertainty over costs and benefits, and the budgetary cost of financing the project.

## QUESTIONS AND PROBLEMS

1. A new public works project requires 300,000 hours of labor to complete.
  - a. Suppose that the labor market is perfectly competitive and the market wage is \$20. What is the opportunity cost of the labor employed for the project?
  - b. Suppose that there is currently unemployment among workers, and that there are some workers who would willingly work for \$12 per hour. What is the opportunity cost of the labor employed? Does this vary depending on the fraction of would-be unemployed workers hired for the project?
  - c. If your answers to (a) and (b) differ, explain why.
2. How does the opportunity cost of a government purchase vary depending on whether the market for the purchased good is perfectly competitive or monopolistic?
3. Two city councilors are debating whether to pursue a new project. Councilor Miles says it is "worth it" to society only if suppliers lower their costs to the city for the inputs to the project. Councilor Squeaky disagrees, and says that it doesn't matter—society is no better off with these cost concessions than it would be without the concessions. Where do you stand? Explain.
4. For your senior thesis, you polled your classmates, asking them, "How much would you be willing to pay to double the amount of parking on campus?" Based on their responses, you estimated that your fellow students were collectively willing to pay \$12 million to double the amount of on-campus parking. What are some problems with this type of analysis?
5. Consider the Deacon and Sonstelie (1985) approach to valuing time described in the text on page 228. Imagine that two cars are equivalent to one another in every way (such as gas mileage) except for gas tank size, and car A's tank has twice the gas capacity of car B's tank. Which driver is more likely to patronize a Chevron station mandated to lower prices below those of independent stations? Explain your answer.
6. A city government is considering building a new system of lighted bike paths. A councilor supporting their construction lists the following as potential benefits of the paths: (1) more enjoyable bike rides for current and future bikers, (2) reduction of rush-hour automobile traffic due to increases in bike commuting, (3) the creation of 15 construction-related jobs. Can all of these actually be considered to be benefits? Explain.
7. Suppose that at your current hourly wage you prefer working 40 hours per week to 20 hours, and prefer working 32 hours per week to either 20 or 40 hours. However, you are forced to work either 20 hours or 40 hours per week. Is your




hourly wage rate an accurate reflection of the value of your time? Explain.

8. The city of Metropolita added a new subway station in a neighborhood between two existing stations. After the station was built, the average house price increased by \$10,000 and the average commute time fell by 15 minutes per day. Suppose that there is one commuter per household, that the average commuter works 5 days per week, 50 weeks per year, and that the benefits of reduced commuting time apply to current and

future residents forever. Assume an interest rate of 5%. Produce an estimate of the average value of time for commuters based on this information.

9. One approach to calculating the value of life involves the use of compensating differential studies. What informational problems make these studies difficult to carry out?

The  icon indicates a question that requires students to apply the empirical economics principles discussed in Chapter 3 and the Empirical Evidence boxes.

**ADVANCED QUESTIONS**

10. The city of Gruberville is considering whether to build a new public swimming pool. This pool would have a capacity of 800 swimmers per day, and the proposed admission fee is \$6 per swimmer per day. The estimated cost of the swimming pool, averaged over the life of the pool, is \$4 per swimmer per day.

Gruberville has hired you to assess this project. Fortunately, the neighboring identical town of Figlionia already has a pool, and the town has randomly varied the price of that pool to find how price affects usage. The results from their study follow:

| Swimming Pool Price per Day | Number of Swimmers per Day |
|-----------------------------|----------------------------|
| \$8                         | 500                        |
| \$10                        | 200                        |
| \$4                         | 1,100                      |
| \$6                         | 800                        |
| \$2                         | 1,400                      |

- a. If the swimming pool is built as planned, what would be the net benefit per day from the swimming pool? What is the consumer surplus for swimmers?  
 b. Given this information, is an 800-swimmer pool the optimally sized pool for Gruberville to build? Explain.

1. The U.S. Office of Management and Budget (OMB) recommends that the government use different discount rates for public investments than for the sale of government assets. For public

investments, the OMB suggests a discount rate that reflects the historical pretax rate of return on private investments, while for the sale of government assets, the OMB recommends using the cost of government borrowing as a discount rate. Why might the OMB make this distinction?

12. The city of Animaltown has built a new bridge across the river separating the two halves of the city for use by its residents. It is trying to decide whether to impose a toll and, if so, how much to charge; it would need to collect \$28,000 per hour to finance the bridge, but if it collects less than that, it will finance the remainder of the expense from general tax revenues. City planners estimate a local demand curve for hourly use of the bridge to be  $Q = 2,800 - 100P$ . The bridge will be able to accommodate 2,000 cars per hour without congestion. If the cost of collecting a toll is negligible, is it more efficient to collect a toll or not? If so, how much should Animaltown charge for crossing the bridge?

13. You are trying to decide where to go on vacation. In country A, your risk of death is 1 in 20,000, and you'd pay \$5,000 to go on that vacation. In country B, your risk of death is 1 in 30,000, and you'd pay \$5,600 to go on that vacation. Supposing that you're indifferent between these two destinations, save for the differential risk of death, what does your willingness to pay for these vacations tell you about how much you value your life?

14. Jellystone National Park is located 10 minutes away from city A and 20 minutes away from city B. Cities A and B have 200,000 inhabitants each, and residents