

Chapter 3

1. A benefit-cost ratio is an unsatisfactory way of describing the payoff from a project because benefits can be redefined as cost reductions, making the B/C ratio arbitrary. If there is an alternative project to the Oldman Dam, then the B/C ratio cannot be relied on for choosing between them.

2.
 - a. The appropriate cost is the (estimated) equilibrium wage. Here labour is obtained at the expense (opportunity cost) of leisure. The free market wage measures the value of leisure foregone at the margin.
 - b. Here labour is obtained at the expense of other employers and the sacrifice involved is the value of output in the alternative jobs. Since private firms will hire until the value of marginal product equals the existing (union) wage, this wage measures the appropriate cost of labour.

3. The increased time spent at the inspection must be counted as a cost of the program. One reasonable way to estimate the value of the time would be to use the average wage rate in the province.

4. The present value of $\$25/.10 = \250 .
 The present value of the perpetual annual benefit $= B + B/(1 + r) + B/(1 + r)^2 \dots = B(r + 1 - r)/r = B/r$.

5.
 - a. $1,000 = 80/\rho$
 $\rho = .08$
 - b. If the money comes from consumer spending, use after-tax rate of interest as the discount rate:

$$\frac{80}{.05} - 1,000 = 600 > 0.$$
 The project is admissible.
 If the money comes from investment, use before-tax rate of interest as the discount rate:

$$\frac{80}{.10} - 1,000 = -200 < 0.$$
 The project is not admissible.
 In the “mixed case,” for a discount rate, take a weighted average: $.6 \times 10\% + .4 \times 5\% = 8\%$.

$$\frac{80}{.08} - 1,000 = 0.$$
 There is no net advantage to undertaking the project.
 - c. Benefits $= 80/.04 = 2,000$. Present value of project $= 2,000 - 1,000 = 1,000$.
 - d. Inflation is fully anticipated, and if market interest rates increase by 10 percentage points, nothing changes in real terms.

6.
 - a. Bill is willing to pay 25 cents to save 5 minutes, so he values time at 5 cents per minute. The subway saves him 10 minutes per trip, or 50 cents. The value of 10 trips

Suggested Answers to Exercises

per year is \$5. The cost of each trip is 40 cents, or \$4 per year. The annual net benefit to Bill is therefore \$1. The present value of the benefits = $\$5/.25 = \20 ; the present value of the costs is $\$4/.25 = \16 .

b. Total benefits = $\$20 \times 55,000 = \$1,100,000$.
 Total costs $\$16 \times 55,000 = \$880,000$.
 Net benefits = $\$220,000$.

c. Costs = $\$1.25 \times 55,000 = \$68,750$.
 Benefits = $\frac{62,500}{1.25} + \frac{62,500}{1.25} = \$90,000$
 Net benefit = $\$21,250$.

d. Subway project has a higher present value. If a dollar to the “poor” is valued the same as a dollar to the “middle class,” choose the subway project.

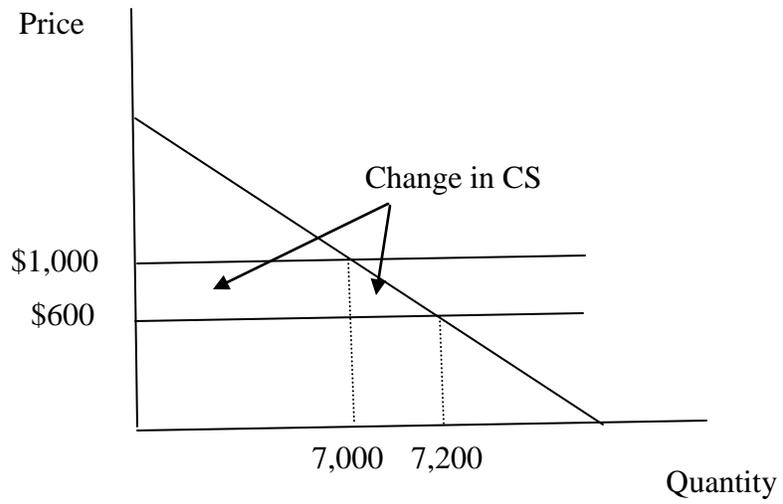
e. Let λ = distributional weight. set

$$220,000 = -68,750 + \lambda \left[\frac{62,500}{1.25} + \frac{62,500}{(1.25)^2} \right]$$

$$\lambda = 3.21$$

7. The “labor game” suggests that jobs and the wages paid to people in those jobs are considered by some to be one benefit of a public project. In fact, the wages are a cost and this cost can only be partially offset if the people were truly unemployed before the project.
8. \$100 billion invested for 100 years at 5 percent per year would generate over \$13 trillion, a little more than twice the \$700 billion in damage caused by the climate change. There might be other considerations offered when evaluating this proposal, but the critic is correct from a financial standpoint.
9. The “labor game” suggests that jobs and the wages paid to people in those jobs are considered by some to be one benefit of a public project. In fact, the wages are a cost and this cost can only be partially offset if the people were truly unemployed before the project. The “green” jobs plays the “chain-reaction” game, because they are secondary profits.
10. At $P=\$1,000$ the equilibrium quantity is 7,000, while at $P=\$600$ the equilibrium quantity is 7,200. The change in consumer surplus is 2.84 million. Yes, it is worth undertaking the project, because the benefits exceed the cost of \$28.1 million.

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