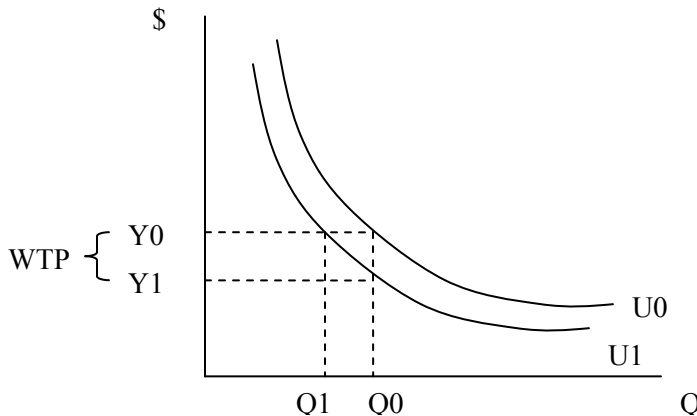


Environmental Economics (AAE / ECON / Env. St. 343)

Practice Exam #2. Suggested Solutions.

1. Recent survey evidence has shown that lakeshore residents in northern Wisconsin prefer to live on quiet lakes with few houses. Suppose a contingent valuation survey is used to ask lakeshore residents the following question: "What is your willingness-to-pay (WTP) to ensure that no other houses are built near your lake?" Use a graph to depict this particular measure of economic value and discuss the allocation of property rights that is implicit in the survey question.

An increase in the number of houses implies a decrease in environmental quality (Q). Since the survey asks WTP to prevent a decrease in quality from Q_0 to Q_1 , the implied property rights of respondents lie with the new level of environmental quality (i.e. Q_1).



2. True, False, Uncertain. Briefly explain your answer: "An economic measure of the benefits derived from lower air pollution will be fully reflected in wage rate differences across regions."

The answer depends on whether pollution is productive, unproductive, or neutral from the firm's point of view. If pollution is productive (firm costs are lower in high pollution areas), benefits will be fully reflected in wages. If pollution is unproductive (firm costs are higher in high pollution areas), land prices rather than wages will reflect benefits. If pollution is neutral to firms, benefits will be reflected in both changes in wages and changes in land prices. Of course, if benefits of cleaner air are enjoyed by people who don't own any land or earn wages, they will not be able to be measured in this model.

3. The government of La Plata is trying to calculate the economic benefits of an increase in the size of a nature reserve. For that, they intend to use a travel cost model where the individual yearly demand for trips to the reserve is given by $T = 20 - (1/4)Pt + R$, where T is the number of trips, P_t is the price of trips, and R is the size of the reserve. The price of trips is known to be 12 dollars and the entrance to the reserve is restricted to 5000 visitors a year. What would be the benefits from an increase in the size of the reserve from 6 to 9 if there are 200 people with the above demand function?

*First, the price that drives demand to zero is solved by $P_t^c = 4*20 + 4*R$, or $P_t^c = \$104$ when $R=6$ and $P_t^c = \$116$ when $R=9$. Second, the number of trips demanded is equal to 23 trips ($20 - (1/4)*\$12 + 6$) when $R=6$ and 26 trips ($20 - (1/4)*\$12 + 9$) when $R=9$. We can calculate the change in consumer surplus from an increase in reserve size as:*

$$\Delta CS = 200[(1/2)(\$116 - \$12)26] - 200[(1/2)(\$104 - \$12)23] = \$58,800.$$

*However, if all 200 people took 26 trips, this would lead to 5200 total trips, exceeding the reserve's capacity of 5000 visitors. So, if we assume that each individual gives up their 26th trip to meet the 5000 visitor limit, then the welfare loss to each individual is $(1/2)(\$16 - \$12)1 = \$2$. Therefore, subtracting $\$2*200$ from total benefits gives us a net benefit of \$58,400.*

4. Identify one benefit of the above ecosystem restoration project and explain how you would quantify this benefit (i.e. technique and data). Carefully justify your answer.

One possible benefit would be to conserve an endangered species, which is a non-market good with a non-use value. The contingent valuation method is capable of measuring non-use values by measuring people's willingness to pay to protect the species. We could start by designing a survey that would ask people's WTP for protecting the species. The survey would be designed such that the public had adequate information about the project and why they were being asked to pay. Since endangered species provide non-use values, the survey would ideally be given to local, state, and nationwide residents.

5. Explain why the project may lead to a Potential Pareto Improvement but not a Pareto Improvement. How could a Pareto Improvement be achieved?

A PPI occurs when benefits exceed costs, while a PI occurs if nobody is worse off and at least one person is better off. In this example, the people associated with the lumber industry will bear the costs of lost income and jobs, while people who don't live near the area may enjoy the benefits because the project creates a public good which is non-excludable. A PI could be achieved by having the gainers compensate the losers such that nobody is worse off.

6. Suppose your estimate of the benefits from the ecosystem restoration project vary with the age of the forest as follows:

Age of the Forest (years)	Estimate of Benefits
0 – 100	\$10 million / year
100 – 200	\$15 million / year
200 +	\$20 million / year

Explain how the choice of a *constant* discount rate could impact the estimated net present value (NPV) of the project. What role could sensitivity analysis play in selecting the discount rate?

Since timber extraction is constant, costs can be assumed to be constant over time. However, since benefits increase over time, a higher discount rate will lower the value of future benefits, and lower the net present value of the project. Sensitivity analysis can be used to examine whether a conclusion of a PPI is contingent on a particularly small discount rate.

7. Consider the following statement: “Few markets exist for assets with maturities exceeding 30 years, making the interest rate beyond that horizon highly uncertain.” What are the implications of this statement for cost-benefit analyses of long-term projects? Explain.

As shown in the class reading, CBAs can incorporate uncertain interest rates by simulating multiple time paths of the discount rate, calculating the present value of costs and benefits for each time path, and averaging the results. This approach will raise estimates of future valuations relative to a constant discount rate because unexpectedly low discount rates will raise future valuations substantially, while unexpectedly high rates will decrease future valuations marginally.