AAE / ECON / Env. St. 343
Environmental Economics

Homework #4
Suggested Answers

Required Readings:

[10] Kaufman, H., Espey, M., and J. Englin. 1998. "No Plane, Big Gain? Airport Noise and Residential Property Values in the Reno-Sparks Area." *Choices*, Third Quarter.

Questions 1 and 2 refer to the Kaufman et al. article.

1. What technique do the authors use to value noise and why is this technique appropriate? The authors mention that they collected data on a house's physical characteristics and the characteristics of its neighborhood. Why is this information useful in estimating the value of noise?

   The authors used a Hedonic price model of the housing market to value noise; this is valid because they have data on noise, prices, and characteristics of homes. So, a statistical regression can isolate the impact of the "noise" variable on the "price" variable. It is important to add the physical characteristics and the characteristics of its neighborhood because they also influence the price of homes.

2. In the Kaufman et al. article it is stated that "our estimates suggest, for example, that a $100,000 home half a mile from the airport in the 60-decibal zone would be worth about $98,500 in the 65-decibal zone and about $97,000 in the 70-decibal zone." Using this information, calculate the value of reducing noise to a $100,000 home from 75-decibals to 30-decibals. Is your estimate likely to be an over-estimate, under-estimate, or neither? Explain.

   *Price is $1500 per 5 decibal decrease => value of reducing noise from 75 to 30 is ($1500 / 5) * (75 – 30) = $13,500. This computation assumes that the marginal value of a decrease in noise is constant at $1500 per 5 decibal decrease. However, we typically assume that marginal value decreases as a good becomes less scarce. Therefore if marginal value decreases as noise gets less scarce then the price of reducing noise from 35 to 30 decibals should be less than the price of reducing noise from 75 to 70 decibals, and we'd expect our estimate of $13,500 to be an over-estimate.*

The following information applies to questions 3 and 4. Suppose we have an agricultural valley 10 miles long by 5 miles wide, with a polluting electricity power plant. The power plant causes pollution problems in a narrow strip of land downwind of the plant, 1 mile in length and ½ mile wide, but no problems outside of that area. The pollution reduces the rate of crop growth.

3. If we were to clean up pollution, what would you expect to happen to land prices and wages? Where?

Since pollution reduces the rate of crop growth in this agricultural valley, it is "unproductive" for the firms. Therefore, a decrease in pollution should be accompanied by an increase in land prices in the strip of land downwind of the plant. Since the strip of land affected by the cleanup is more attractive for both consumers and agricultural firms, land prices will be bid up in this portion of the valley.

4. If we were to clean up pollution, would the changes in land prices and / or wages fully reflect the benefits of cleaning up pollution? Why or why not?

Since pollution is "productive" from the power plant's point of view, lower pollution levels will force the power plant to reduce wages in order to keep costs down. So, the benefits of cleaning up pollution will potentially be found in higher land prices on the strip of downwind land, and lower wages valley-wide.

The following information applies to 5 through 7. Suppose a hiker's annual demand for trips to an outdoor recreation site is given by the following equation:

Demand for trips = 6 – 0.5TC + 0.0001Y + Q

Trips demanded are zero whenever the equation predicts negative trips. TC is the hiker's travel cost (price), Y is the hiker's annual income, and Q is environmental quality, measured in acres of open space. Assume TC is $10, income is $40,000, and the site has 10 acres of open space.

5. At what price (travel cost) will demand for trips fall to zero if the site has 10 acres of open space? At what price (travel cost) will demand for trips fall to zero if urban expansion has reduced the site's open space to 8 acres?

Open space = 10 acres: D = 0 = 6 – 0.5TC + 0.0001($40,000) + 10 => TC = $40.
Open space = 8 acres: D = 0 = 6 – 0.5TC + 0.0001($40,000) + 8 => TC = $36.

6. If the price (travel cost) per trip is $10, how many trips are demanded annually and what is the hiker's consumer surplus if the site has 10 acres of open space? What if the site has 8 acres?

Open space = 10 acres:
D = 6 – 0.5($10) + 0.0001($40,000) + 10 = 15 trips.
*Consumer surplus: 0.5($40 - $10)*15 trips = $225.*
Open space = 8 acres:
D = 6 – 0.5($10) + 0.0001($40,000) + 8 = 13 trips.
*Consumer surplus: 0.5($36 - $10)*13 trips = $169.*

7. What is the impact on the hiker's benefits (lost consumer surplus) from reducing open space acreage from 10 to 8? What is the total benefit loss from urban expansion if 10,000 hikers have this demand function?

*The impact from reducing open space is the difference in consumer surplus $225 - $169 = $56. With 10,000 hikers, the total benefit loss would be 10,000*$56 = $560,000.*