Problem Set 3
Zerbe'
Benefit-Cost Analysis
PA 518
2006

Problem Set 3

1.. Total social cost for using I-5 between here and Tacoma during rush hour are given by TSC = \$100 + .0025X^2, where X is traffic volume in cars per lane per hour. The marginal cost including social congestion costs of traffic volume will then be \$.005X. People can take the bus instead at a trip time of 30 minutes at any traffic level. [Special bus lanes]. The average value of time is \$10/hr. During rush hour trip time is now the same by bus and car.

a. How can one in principle determine the optimal split in traffic between cars and bus passengers (number of cars per hour during rush hour). (Assume one passenger per car. Assume that during rush hour there are more than 1000 cars per lane per hour using the roadway.)

b. What is the figure for the number of passengers that should be going by car during rush hour given the optimal volume? Show work.

c. How do you find the current non-optimal, unpriced volume of traffic?.

d. What is the cost saving from moving from the current volume of traffic to the optimal level? (If you do not know the current volume assume 2,000 cars/ (one hour)

e.) Explain the nature of the externality involved in traffic congestion.

II. Concepts of Benefits and Costs

2. The head waters grove contains Redwoods. The logging company that owns it wishes to log it. The value of the timber is \$30 million. The environmental groups have so far only come up with \$20 million to prevent logging. Nevertheless these groups object strongly to the grove being logged.

Problem Set 3
Zerbe'
Benefit-Cost Analysis
PA 518
2006

a. Give an explanation that explains the extent of their opposition on the grounds that the WTA and WTP are divergent.

b. Suppose that income effects are not important since the $30 million is not a large amount of money when spread over many relevant people. Explain how and why the uniqueness of the grove may contribute to a greater divergence between the WTP and the WTA.

3. You are traveling on a train with a stranger (l'etranger). The stranger wishes to smoke. You hope that he does not. The following indicates the willingness to pay and by you and the stranger.

YOU		**STRANGER**	
WTP [for no smoking]	50	WTA [no smoking]	90
WTA [smoking]	100	WTP [to smoke]	80

a. What is the net benefit (CV)for the project 'No Smoking', given that the status quo is smoking?
b.What is the CV for the project 'Smoking', given that the status quo is no smoking?

c. From the above can you determine what is the EV for the project 'Smoking', given that the status quo is no smoking?

d. It is determined that you are rich and the smoker is poor. Assuming the opportunity cost of income redistribution is 20% of the funds transferred, is smoking a desirable project by the Harberger criteria?

e. A consulting firm is hired to decide whether or not there should be a right to smoke on the train given no legal starting point. They wish to make a decision based on benefit-cost analysis that uses the basis of the above information. Can they do it? Why or why not?

Problem Set 3
Zerbe'
Benefit-Cost Analysis
PA 518
2006

4. A project will levy taxes on Bill of $1000. The dead weight loss is $100. The $1000 will be paid to Paul at a rate of $10 per hour for 100 hours for digging up and then filling potholes.

a. What will be the benefits and costs of the project if the value of Paul's time is zero? Explain.

b. What will be the benefits and costs if the opportunity cost of Paul's time is $10 per hour? Explain.

c. What will be the benefits and costs if the opportunity cost of Paul's time is $4.00 per hour? Explain.

d. Suppose instead that Paul is paid by the government for doing productive labor and that he produces 100 widgets per hour that sell for $.30 each. The average costs of producing the widgets including the wage paid to Paul is 20 cents per widget. Now calculate the cost and benefits of the tax and widget program.

5. You are asked to undertake a study assessing the benefits and costs of child abuse programs. As a first step list out as many of the possible benefits as you can and explain why the item may be a benefit.

6. The state using its powers of eminent domain, condemns some land to be used for a baseball stadium? The state is required to pay market value for the land. The last remaining holdout is a little old lady who refuses to sell at any "reasonable price"
If the state takes her land and gives her market value--
a. Is this a Pareto optimal exchange?

c. What practical problems if any might arise in general if state pays the "holdout" seller more than market value?

Problem Set 3
Zerbe'
Benefit-Cost Analysis
PA 518
2006

7. A company was set up to four years ago (t= -4) to _produce titanium. The company is privately owned by shareholders and owns exclusive rights to a potential producing mine. The shareholders subscribed 10 million dollars originally that was spent in buying rights and equipment. So far no dividends have been paid and no titanium has been mined. On the basis of extensive research, it is expected that next year, year one, dividends of $2,95 million per year will be paid every year for 30 years. Beyond this date, it is expected the supply will be exhausted.

It can be calculated that, if these dividends are paid, the internal rate of return on the shareholders original investment will be approximately 16% per year. This is well in excess of the market rate of 8%, and reflects the fact that the mine appears much more productive than was expected in year –4.

The government wishes to acquire a 50% interest in the mine. They propose to pay (year 1) a sum to shareholders that will fully compensate them for the share value. The government proposes to use eminent domain to acquire this share but says that it will fully compensate shareholders-that is that the shareholders will not be worse off as a result of the government action. They are prepared to pay 9.1 million for the 50% ownership.

This implies that the shareholders have paid 10 million in year –4 and will receive payments of 9.1 million in year 0 plus 30 years of dividends starting in year 1 of 1.475 million. This stream of outlays and returns has a internal rate of return of about 16%.

Should the shareholders consider themselves as fully compensated. Why or why not. If not what payment would exactly compensate them?