

Econ 325: Environmental and Natural Resource Economics
Fall 2007
Problem Set 2

Due in class: Tuesday October 2, 2007

17 total points

Instructions: Answer all 6 questions. Feel free to use Microsoft Excel wherever necessary. Please show your work, and be sure to label all graphs accordingly.

1. Within a market, since demand is assumed to reflect private benefits and supply reflects private costs, equilibrium reflects maximizing net private benefits. When does this equilibrium also reflect maximizing social benefits?

MPC = MSC and MPB = MSB

1 point

When does it NOT reflect maximizing social benefits?

When one of the above conditions does not hold

1 point

In the cases where it does not, elucidate the problem.

**Market failure due to: externalities, public goods, imperfect info,
inappropriate gov't intervention, imperfect competition**

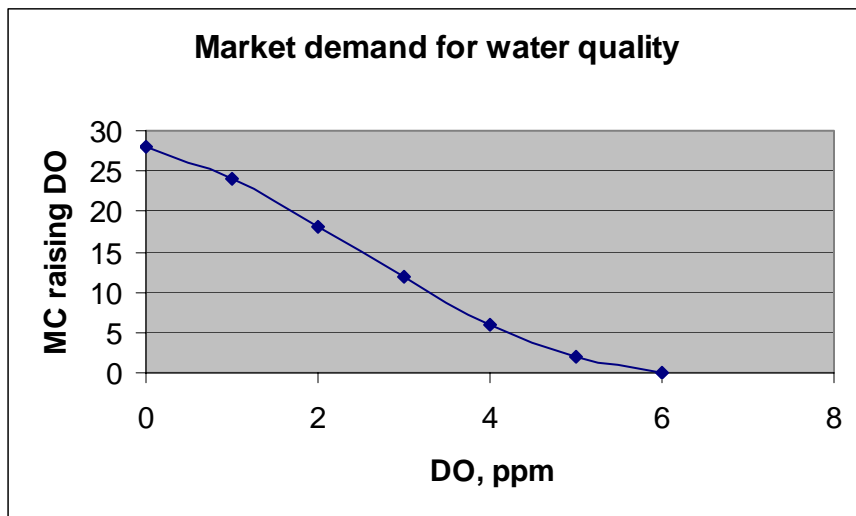
1 point

2. Below are portions of the demand curves of three individuals for the water quality in Lake Union. The water quality is expressed in terms of the parts per million (ppm) of dissolved oxygen (DO). Water quality improves at higher DO levels. The demand curve shows the desired water quality of each individual in relation to the marginal costs of water quality improvements (the MC of raising the DO level in the lake).

MC of raising DO level (dollars per ppm)	Desired DO level (ppm)		
	A	B	C
10	0	0	1
8	0	1	2
6	1	2	3
4	2	3	4
2	3	4	5
0	4	5	6

- A. Graph the market willingness to pay curve for these three people. *Hint: water quality is a public good!*
 Vertically sum 3 demand curves since good is indivisible. See worksheet #3

- What is total MC of 0 ppm DO? 28
 What is total MC of 1 ppm DO? 24
 What is total MC of 2 ppm DO? 18
 What is total MC of 3 ppm DO? 12 = q^*
 What is total MC of 4 ppm DO? 6
 What is total MC of 5 ppm DO? 2
 What is total MC of 6 ppm DO? 0



1 point

B. If the actual MC of increasing DO is \$12, what is the socially efficient level of DO in the lake, assuming these three people are the only ones involved?

$$q^* = 3$$

1 point

3. Define and explain. Illustrate graphically and/or give examples where appropriate.

A. Marginal benefit

1 point

Measures the value of benefit associated with the consumption of an additional unit of a good or service. Within a perfectly competitive market, this is represented by the demand curve, which reflects marginal willingness to pay.

B. Public Goods

1 point

Goods that are distinguished by two primary characteristics: nonrivalry and nonexclusivity. One person's consumption of a pure public good does not diminish the quantity available for another consumer. Nor is it possible, with a pure public good, to prevent consumption by one consumer when it has been made available.

C. Pecuniary externality

1 point

Unintended price change in a market. Pecuniary externalities are not "real" externalities.

D. Dynamic efficiency

1 point

Optimal allocation of resources will be dependent upon the net benefits through time. Intertemporal considerations require the comparison the present value of net benefits. Net benefits equals marginal benefit minus marginal cost. Dynamic efficiency would equate the present value of net benefits across all time periods.

E. Present value of net benefits

1 point

Net benefits adjusted for the decreased value of future dollars. Net benefits received in the future are adjusted by a discount rate, which reflects the opportunity cost of allocating dollars today in return for future benefits.

4. Assume that the demand curve for the threatened but delicious sea bass is fully coincidental with the marginal social benefit function and can be described as $MSB = MPB = 24 - 2q$, where q refers to the quantity of the good. Assume that the marginal private cost function can be described by $MPC = q$, and that marginal social costs are always double the marginal private cost.

A. Determine an equation for the marginal social costs (MSC).

$$MSC = 2q$$

1 point

B. Graph the functions and algebraically determine

i. the market level of output

$$MPC = MPB \text{ so } 24 - 2q = q \text{ and } q = 8.$$

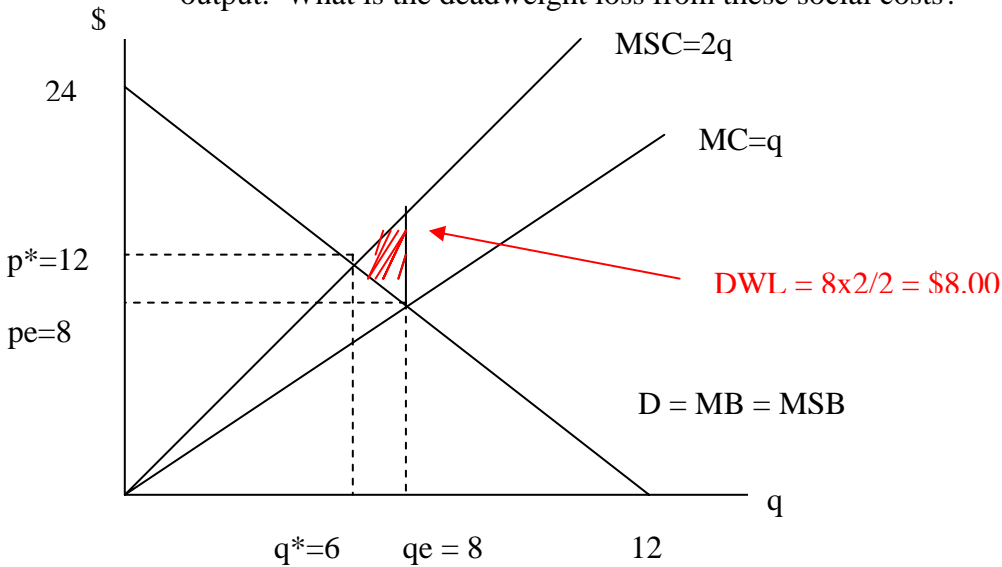
1 point

ii. the optimal level of output

$$MSC = MSB \text{ so } 24 - 2q = 2q \text{ and } q = 6.$$

1 point

C. Calculate the social welfare at the market level of output, at the optimal level of output. What is the deadweight loss from these social costs?

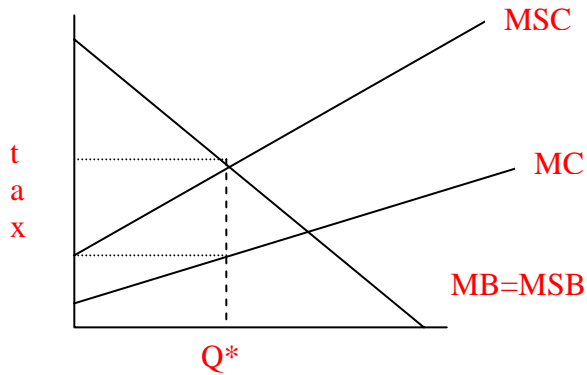


$$\text{Efficient social welfare} = (24 - 0) \times (6) / 2 = \$72.00$$

$$\text{Market equilibrium SW} = (24 - 0) \times (8) / 2 = \$96.00$$

5. A.C. Pigou was among the first to recognize the existence of externalities. Illustrate (1 point) and discuss (1 point) Pigou's approach to correcting market externalities.

Pigou argued that it would be possible to change behavior within the market through the imposition of taxes. Set tax = difference btw. MB/MC and MSB/MSC at the optimum quantity, consumer/producer will equate private value with social value, efficient quantity will be reached. Internalizes the externality. For example, if $MC \neq MSC$:



6. Consider a crowded room with an equal number of smokers and non-smokers. Each smoker would be willing to pay \$1.00 to have the right to smoke. Each non-smoker would be willing to pay \$0.50 to have the room free from smoke. Assume there is a rule that says no smoking is allowed. Could everyone be made better off if smoking is allowed? How? **1 point** If property rights to clean air are assigned to the non-smokers, how might the efficient outcome be attained? What difference does it make to the outcome whether there is initially a rule that smoking is allowed or smoking is not allowed? **1 point** What problems might you envision occurring if no smoking is allowed unless all the non-smokers agree to allow smoking?

Yes, everyone could be made better off if smoking were allowed. The smokers could pay the non-smokers between 51 and 99 cents each for the right to smoke, and all are better off. If the non-smokers have the property rights, then the efficient outcome could be attained through simple bargaining. The main difference is who gets paid for the transfer of their property rights. However, if the rights are given to the non-smokers, there may be difficulty in bargaining if there are a large number of people involved because negotiations might break down, with a single individual able to stop the bargaining, they might try to hold out for a larger portion of the payments.