

IKT3620: Introduction to Environmental Economics
Study Questions
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The Inefficiency of Competition with Externalities

1. Why isn't zero pollution the best solution for society? Can society have too little pollution? Why or why not?
2. In the figure on the welfare effects of pollution in a competitive market, explain why area D+E+H is the externality cost difference between the social optimum and the private equilibrium.
3. Let $x = \bar{P} - P$ where x is abatement and P and \bar{P} are pollution and competitive level of pollution, respectively. The benefit of reducing pollution is $B(x) = A \log(x)$ where A is a positive constant/parameter. The cost of abatement is $C(x) = x^2$.
 - a- Use calculus to determine the optimal level of x . Call this x^* .
 - b- Show the effect of an increase in A on x^* . Interpret your result.
 - c- For $A=8$, solve for questions 3a and 3b.

Regulating Externalities

4. In the paper mill example that we looked at in the class, what is the optimal fee on emissions (or pollution) or the optimal tax on output?
5. Suppose that the inverse market demand curve for a good is $P = 350 - 2Q$. Let the private marginal cost (unregulated competitive market supply) be $MC_p = 50 + Q$. Producing the good causes pollution. The private marginal damage from pollution is $MC_d = Q$.
 - a- What is the unregulated competitive equilibrium quantity and price?
 - b- What is the social marginal cost of production and social equilibrium quantity and price?
 - c- Use a figure to show the results.
 - d- By putting labels to the the areas in the figure, show the consumer surplus, producer surplus, cost of externality, total welfare for both the social optimum and the unregulated case. Indicate also the change in welfare.
6. Suppose that the inverse market demand curve for cloth is $p = 150 - 2Q$, the private marginal cost (unregulated competitive market supply) is $MC_p = 75 + Q$, and the private marginal damage from pollution is $MC_d = 2Q$.
 - a- What is the unregulated competitive equilibrium quantity and price?
 - b- What is the social marginal cost of production and social equilibrium quantity and price?
 - c- What specific tax t (per unit) would result in the social optimum?

7. Suppose that the government knows the marginal cost, MC, curve of reducing pollution but is uncertain about the marginal benefit, MB, curve. With equal probability, the government faces a relatively high or a relatively low MB curve, so its expected MB curve is the same as the one in Figure 17.4. Should the government use an emissions fee or an emissions standard to maximize expected welfare? Explain. (Hint: Use an analysis similar to the one we employed in the class)
8. Consider the market for gasoline. Due to the use of gasoline, and therefore, the pollution this causes, there are marginal external costs to health and environment in addition to the private marginal costs of producing and consuming it. For simplicity suppose that the marginal external cost is constant at 1TL per liter of gasoline: $MC_d = 1\text{TL}$. Let the private marginal cost be $MC_p = \frac{1.25}{3} + \frac{1}{300}Q$.
 - a- Calculate the equilibrium price and level of gasoline in the absence of government intervention.
 - b- Calculate the price and level of gasoline in the presence of government intervention (Hint: start by calculating the social marginal cost of producing gasoline).
 - c- The government can remedy the situation by setting an excise tax (in TL/liter) on the gasoline sellers. What would be this level of tax such that the new equilibrium would be the same as in the previous equilibrium.

Market Structure and Externalities

9. Suppose that the only way to reduce pollution from paper production is to reduce output. The government imposes a tax on the monopoly producer that is equal to the marginal harm from the pollution. Show that the tax may raise welfare. (Hint: see the monopoly problem that we solved in the class.)
10. In the following, use the model in Problem 6.
 - a- What is the unregulated monopoly equilibrium?
 - b- How could you optimally regulate the monopoly? What is the resulting (socially optimal) equilibrium? (Hint: see the monopoly problem that we solved in the class.)

Allocating Property Rights to Reduce Externalities

Kemal is going on holiday with his infant daughter and has a first class air ticket. He values being in first class instead of coach at 1800TL. A CEO has the seat adjacent to him and is considering offering to pay Kemal to move to one of the empty seats in coach.

- a- The CEO values quiet at 3600TL. Can Kemal and the CEO reach a mutually agreeable price for Kemal to move to coach?
- b- If instead the CEO values quiet at 1200TL, can Kemal and the CEO reach a mutually agreeable price for Kemal to move to coach?
- c- Assuming efficient bargaining, for what range of the CEO's value of quiet will Kemal move to coach?