

## Homework I

[due date](#)

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1. Suppose the demand for automobile tires in the US is:  $Q_d = 112 - 2.10P$  where  $Q_d$  is quantity demanded in millions of tires and  $P$  is the price per tire.
  - A. If the private marginal cost (PMC) of producing tires is a constant \$20, calculate the market equilibrium quantity.
  - B. Explain what a constant marginal cost implies. Does that mean the total opportunity cost of producing tires is unrelated to how many are produced?
  - C. At the equilibrium, what is the private marginal benefit (PMB) of tires? Explain how, if tires have no consumption externalities, the PMB would equal the social marginal benefit.
  - D. The production of tires involves the processing of rubber. Let's assume the manufacturing process emits toxic fumes that affect those living around the manufacturing plants. The marginal damage (MD) of tire production is \$10/tire. Calculate the socially efficient output of tires.
  - E. Calculate the total social cost and benefit of tire production at the efficient level. Calculate the net benefits to society of tire production.
  - F. Go back and calculate the net benefits to society at the market equilibrium calculated in part A. Explain why the market solution generates less net benefits to society than the efficient solution calculated in part D.
  - G. What is the dollar value of the deadweight loss generated by the market?
  
2. Suppose there is a standard defensive driving course in California. Assume the demand for the course is  $Q_d = 10 - .06P$ , where  $Q_d$  is yearly quantity demanded in California (in 1000's) and  $P$  is the price of the course. The supply of the service is  $Q_s = .1P$ .
  - A. Calculate the market equilibrium.

Suppose that the external marginal benefit of the defensive driving course is \$5.

  - B. Why would this service generate external benefits? Discuss the possible benefits to those who did not take the course.
  - C. Calculate the socially efficient equilibrium.
  - D. Calculate the increase in net benefits to society in moving from the market determined result to the efficient equilibrium.

- E. Explain the inefficiency of a law requiring all drivers to take the defensive driving course.
3. Suppose 5 people live in a community and are considering acquiring fire protection. The table below illustrates the marginal benefits to each resident at various levels of fire protection.

<b>Firefighters Employed</b>				
<b>Resident</b>	1	2	3	4
John	100	75	70	25
May	75	50	30	0
Joseph	45	25	0	0
Margaret	25	20	0	0
Mike	0	0	0	0

- A. Calculate the social marginal benefit (SMB) for each firefighter employed in the community.

Suppose the cost per firefighter is \$165 and each resident agrees to cooperate and reveal his/her marginal willingness to pay.

- B. How many firefighters will be hired?
- C. Is Mike upset at the number of firefighters hired by the group? Explain.
- D. Calculate the net total benefit to the group if 3 firefighters were hired. If there is a positive net total benefit to hiring 3 firefighters, why aren't three firefighters the equilibrium?
- E. Suppose Joseph lies and claims that he receives no benefit at all from fire protection (he tries to act like Mike). Would that change the answer you calculated in part B? If so, what is the new allocation?
- F. Is Joseph better off lying? What are his private net benefits in the alternative circumstances in which he lied and did not lie?

Suppose the cooperative scheme was done away with (the group got tired of Joseph's lies). A proportional tax scheme replaced it.

- G. What would be the proportional tax rate,  $t_i$ ?

Suppose a referendum took place in which successively larger numbers of firefighters were voted on.

- H. Identify the largest number of firefighters that would generate a majority.

- I. Is Mike now upset at the allocation established in part *H*? Explain.
- J. Explain why the political equilibrium is not the efficient level calculated in part *B*.
- 4. Suppose the Environmental Protection Agency (EPA) initiates pollution regulations impacting two tire producing firms, Goodyear and Firestone. Suppose the demand curve for emitting pollutants by each firm is as follows:

<b>Firm</b>	<b>Demand</b>
Goodyear	$Q_1 = 1000 - 2 \cdot P$
Firestone	$Q_2 = 1000 - 3 \cdot P$

where  $Q$  is the number of pounds of pollution emitted per month and  $P$  is the dollar cost per pound of emitting pollutants.

- A. Illustrate the two demand curves on the same diagram.
- B. If the EPA charged each firm \$100 per pound of pollutants, how many pounds of pollution would each firm emit?
- C. Assume \$100 is the correct estimate of the external cost of each pound of pollution. Discuss the efficiency of the equilibrium emissions calculated for each firm.
- D. Which firm apparently finds it easier (less costly) to abate pollution? What are some possible reasons for this?

Suppose, instead of charging each firm the marginal cost of emissions, the EPA imposes a rule stating each firm could emit no more than 750 pounds per year.

- E. Explain the possible inefficiency of this quantity regulation even assuming the total allowed pollution is the efficient quantity.
- F. Explain the possible social efficiency gains that could be made if the firms were instead given 750 "rights" to pollution that could be traded between them.