

Intermediate Microeconomics

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Homework 9

Due Wednesday, 20th April

Question 1 (Quantity Taxes) The government is hoping to raise revenue, and has decided to do so by placing a quantity tax on leisurewear. Demand for leisurewear is given by

$$D(p) = a - bp$$

Where p is the price of leisure wear, while supply is given by

$$S(p) = c + dp$$

1. Before the tax is implemented, what is the equilibrium price for leisurewear? How much leisurewear is traded? What is the Consumer and Producer surplus from the leisurewear industry? (notice that all your answers will depend on the parameters a, b, c, d)
2. Say that a sales tax t is imposed on leisurewear. Sketch a graph to show what happens to the market/ How does your answer to the above questions change? What is the incidence of taxation? How does the incidence depend on the parameters of the model?
3. How do you your answers to question 2 change if the government instead imposes an excise tax?

Question 2 (Externalities with Firms) Sandy's Fish Market produces fish (f) which she sells at \$6 and has costs equal to $c(f) = f^3$. For every fish she produces, there is a smell $s = f$ John's Herbalists next door produces herbs h , which he sells for \$4. His costs are equal to $c(h, s) = h^2 + 4s$.

1. What is the level of fish production that would maximize the total profit of Sandy and John? What is their maximum joint profit?
2. If John produces at his profit maximizing level and Sandy at hers, how much fish will be produced? What will their total profits be?
3. Imagine that the government sets up a market where John can pay sandy to stop the smell. So for a price p_s Sandy can pay John to stop producing one unit of smell. Write down John's new profit function. How much smell would he buy if p_s was less than 4? What if it was more than 4?
4. Say Sandy has the right to sell 10 units of smell, which he can either use in producing fish, or sell at a price p_s . Show that Sandy's profit function is now

$$(6 - p_s) f - f^3 + 10p_s$$

5. What is Sandy's profit maximizing output now? Imagine that the price of smell is \$4. How much would Sandy choose to produce? How does this relate to the amount that would maximize total profit? How many units of smell would he sell? Would Sandy be happy buying this number of units of smell?
6. Why is \$4 special? What does it represent

Question 3 (Robinson Crusoe) Tom Hanks has thankfully been marooned on an island again.

Knowing the story of Robinson Crusoe, he decides to go mad, and split himself into two: TH the person and THI the company. TH the person buys hammocks (h) and sells labor (l), and has preferences over hammocks and leisure given by $u(h, 24 - l) = \min(h, 24 - l)$. THI the company buys labor from TH and sells hammocks. It has a production function $h = l^{\frac{1}{2}}$

1. Sketch the production function of THI and the indifference curves of TH on the same graph. Imagine that you are the social planner, and are going to pick a feasible combination of hammocks and labor to maximize the utility of TH. Find the optimal bundle
2. Say that the wage rate is fixed at 1, and the price of hammocks is given by p . Calculate the profit maximizing amount of labor for THI as a function of p , and the profits that THI make at this level of output (also as a function of p)
3. TH gets money from selling his labor, and is also the sole owner of THI (and so gets all the profits). Write down TH's budget constraint. Calculate his supply of labor and demand for coconuts as a function of p

4. Find the price p at which the demand for labor is equal to the supply of labor. At this p is the demand for coconuts equal to the supply of coconuts? Is the competitive equilibrium efficient?