Economics 101
Fall 2013
Homework #6
Due Tuesday, Dec 10, 2013

Directions: The homework will be collected in a box **before** the lecture. Please place your name, TA name and section number on top of the homework (legibly). Make sure you write your name as it appears on your ID so that you can receive the correct grade. Late homework will not be accepted so make plans ahead of time. **Please show your work.** Good luck!

1. **(Price Discrimination)**

    Suppose Sundance Cinema is the only theater in Madison. The cinema owners know that there are three kinds of people in Madison: Students, Professors and Movie buffs. Their demand curves for movie areas follows:

    Demand of Students: $P = 10 - 2Q_s$
    Demand of Professors: $P = 20 - 2Q_p$
    Demand of Movie Buffs: $P = 30 - Q_{mb}$

    The Total Cost for Sundance Cinema is given as $TC = 10 + 2Q$ and their Marginal Cost is given as $MC = 2$.
    In this problem initially assume that Sundance Cinema can distinguish whether a person is a student, a professor or a movie buff.

    a. Given the above information, at what price will they sell movie tickets to students?

    b. Given the above information, at what price will they sell movie tickets to professors? To movie buffs?

    c. In this case, what is the profit of Sundance Cinema? (Hint: You should add the amount of tickets purchased by each group to find the total amount of movie tickets supplied.)

    d. Now, let's assume that the movie buffs really look like professors, and that Sundance Cinema cannot distinguish movie buffs from professors. In this case, they can set two prices: the normal price (for movie buffs and professors) and the student price. What will be the student discount (the gap between the normal price and the student price)?

    e. The mayor of Madison thinks price discrimination is socially inefficient so he prohibits it by law. Given this prohibition, will there be any change in the normal price of a movie ticket? With this prohibition on price discrimination, how many tickets will students buy? Is this policy more socially efficient then the result we got with price discrimination?

    f. Are professors and movie buffs better or worse off under the policy described in (e) than the policy described in (d)? Is this policy prohibiting price discrimination more socially efficient than a policy that allows price discrimination?

2. **(Common resources)**

Fisherwomen in Madison can choose between fishing in Lake Mendota or in Lake Monona. The total number of fish caught in each lake depends on the number of the fisherwomen who chose to fish in each lake.

Mendota

$A = 5L_A$, where A is the total number of fish caught in Lake Mendota if there were L_A fisherwomen who chose Mendota for fishing. For example, if 5 fisherwomen chose Mendota, then the total number of fish caught in Mendota is $A = 5 \cdot 5 = 25$. The marginal productivity of a fisherwoman fishing in Mendota is 5 $(MPL_A = 5)$, that is, each fisherwoman adds 5 fish to the total number of fish caught!

Monona

$B = 25L_B - L_B^2$, where B is the total number of fish caught in Lake Monona if there were L_B fisherwomen who chose Monona for fishing. For example, if 5 fisherwomen chose Monona, then the total number of fish caught in Monona is $B = 25 \cdot 5 - 5^2 = 100$. The marginal productivity of a fisherwoman fishing in Monona is $MPL_B = 25 - 2L_B$, Note that the marginal productivity of a fisherwoman fishing in Monona does depend on the number of fisherwomen fishing at this lake!

For example, if $L_B = 1 \Rightarrow MPL_B = 25 - 2 = 23$ *but for* $L_B = 2 \Rightarrow MPL_B = 25 - 4 = 21$.

Finally suppose that there are **50 fisherwomen** in Madison, and fisherwomen in each lake divide equally the total number of fish caught in the same lake! For example, suppose that $A = 200$ *and* $L_A = 40$, $B = 150$ *and* $L_B = 10$, then each fisherwoman who chose Mendota will get $\frac{200}{40} = 5$ fish and those who chose Monona will get $\frac{150}{10} = 15$ fish.

a. Find the average number of fish caught in each lake? Draw them in the same graph (where you have the average number of fish on the Y axis and L (number of fisherwomen) on the X axis.

b. Suppose one of the fisherwomen, Sia, chooses to fish in Mendota. Does her decision to fish in Mendota affect the number of fish that other fisherwomen who choose to fish in Mendota will catch? Suppose that Sia decides to fish in Monona. Does her decision to fish in Monona affect the number of fish that other fisherwomen who choose to fish in Monona will catch? Explain your answer.

c. If each fisherwoman is free to choose between the two lakes, how many will choose Mendota? How many will choose Monona?

d. What is the total number of fish caught in each lake? What is the total number of fish caught in Madison? Do you think this is a socially optimal amount of fish to catch in Madison? Why or why not? In other words is that the maximum number of fish they can catch (in both lakes)? Compare the answer you found in (c) to what you would find if the number of fisherwomen in Mendota and Monona were respectively
$$L_A = 35 , \qquad L_B = 15$$

e. Now suppose that the fisherwomen in Madison have decided in their yearly meeting that they want to be more efficient (increase the number of fish caught in both lakes), and that each fisherwoman will now get the average of the total number of fish caught in both lakes. How can they achieve this stated outcome? That is, how many fisherwomen will need to fish in each lake? What is the total number of fish caught now? How much fish will each fisherwomen catch on average with this policy change?

f. Suppose now that the fisherwomen canceled their agreement in (e) and they are back to their previous arrangement where each fisherwoman makes her fishing choice individually and therefore gets the average number of fish caught in the lake she has chosen. The municipality is not satisfied with their decision and has decided to interfere. The municipality has decided that now fisherwomen who want to fish in Lake Monona must pay a fee of Z fish. Suppose the municipality wants to set the fee so that when each fisherwoman makes her fishing decision the overall outcome is the socially optimal allocation they achieved in (e). What level should the fee be set at in order to achieve this goal?

3. **(Public Good)**

The municipality of Madison is considering an increase in the number of bus stations in the city, but its tight budget doesn't allow Madison to simply erect another bus station. Suppose that the people of Madison are generally willing to cover the cost of this project but that within the population of Madison there are two types of people with regard to their degree of support for additional bus stations: Group A and Group B. both types support the idea and they are willing to help, but their demands for "new bus stations" are different:
Demand of Group A is $P^A = 100 - 4Q$
Demand of Group B is $P^B = 40 - Q$
where P is the price of people are willing to pay for a new bus station and Q is the number of bus stations demanded. Suppose that the marginal cost of construction of new bus stations is constant and equal to 20 (MC = 20).

a. In three separate graphs vertically oriented to one another draw the demand curve of Group A (in the top graph), the demand curve for Group B (in the middle graph) and the market demand in the bottom graph. Label each graph carefully and completely. Provide an equation(s) for the market demand curve as well as the range or domain for each portion of the market demand curve.

b. Suppose that no one in Madison acts as a free rider in this market. Given this assumption what will be the number of new bus stations in Madison? How much will each Group contribute to the construction of each bus station? Show how you found your answer.

c. How will your answer to (b) change if the marginal cost is $150?   Or $5?

d. Suppose now that the marginal cost has changed to a new, but constant level. We also know that when the market for new bus stations is in equilibrium the two groups pays the same price. Given this information, how many new bus stations will be constructed in Madison? How much will each group contribute for the construction of each new

bus station? What is the implied marginal cost of new bus stations?

4. **(Externalities)**

Suppose that the demand for paper is given by the equation $P = 1000 - 5Q$ where P is the price per unit of paper and Q is the quantity of paper. Furthermore, suppose the private marginal cost of producing paper is 100+5Q (MPC=100+5Q). We also know that producing paper has an environmental cost of 5Q (paper production requires cutting down trees and this affects the overall environment)!

   a. Draw a graph depicting the market demand for paper and the marginal private cost of producing paper. Label this graph clearly and completely.

   b. What is the output and the price of paper if the market for paper is unregulated and the environmental cost of paper production is not accounted for in the market? Is this the socially optimal amount of paper? Explain your answer.

   c. What is the marginal social cost (MSC) of paper production? Draw the MSC of paper in the graph you provided in (a). Make sure you label this clearly and completely.

   d. What is the socially optimal output and price of paper given the information you have?

   e. Now suppose that the government wants this market to produce the socially optimal amount of output. What is the excise tax (T) or subsidy (S) per unit the government should impose on the producers of paper in order to achieve this socially optimal level of production?

   f. In a graph illustrate the MPC, the MSC, the MSB and the excise tax or subsidy you proposed in (e). In addition identify the market outcome as well as the socially optimal outcome in this market. Label your graph clearly and completely.

5. **(Game Theory)**

Professor Kelly has 100 chocolates that she plans to distribute in a game to be played by Moheb and Wooyoung. The game rules are as follows: Moheb and Wooyoung must select a number between 2 and 100: the person who selects the lower number will get the same number of chocolates as his number and the other person will get no chocolates. If Moheb and Wooyoung pick the same number then each of them will get half of that number of chocolates.

   a. If Moheb and Wooyoung agree to cooperate in the selection of the numbers they choose, what is the maximum number of chocolates they can together get?

b. If Moheb and Wooyoung do not cooperate, and Moheb selects 100 as his number, will Wooyoung select 100 or 99 as his number? Is selecting 100 the dominant strategy for Wooyoung?

c. If Wooyoung selects a number I that is greater than 2, what is the best strategy for Moheb given that Moheb and Wooyoung are not cooperating?

d. Suppose you know that either Moheb or Wooyoung plan to select 2 as their number. Is it possible that the other individual will have a dominant strategy of selecting a number greater than 2? Explain your answer.

e. What will happen in this game if Moheb and Wooyoung do not cooperate? What will be the outcome? |

f. Based on previous results, complete the table below. Will they cooperate or not?

		Moheb	
		Cooperate	Do not cooperate
Wooyoung	Cooperate	(,)	(0 chocolates, 99 chocolates)
	Do not cooperate	(,)	(,)