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Economics 154
Fall 2007

Homework 1
Due Wednesday October3

Watson, Chapter 2, Q. 1, 2
Watson Chapter 3, Q. 2, 3
Watson Chapter 7, Q. 3
Watson Chapter 10, Q. 3 (Don't do part (d). In part (c) calculate the socially optimal tariff.)

Gibbons, Problems 1.2, 1.3, 1.7, 1.8, 1.12, 1.13

I) The following problem is based on a version of the tragedy of the commons.

There is a common grazing ground in the middle of a town. Each individual has to decide how much grass to let his goats eat in the commons.

His utility function (if there are *n* total players) is as follows:

$$U_i = B(g_i) - C(g_1, g_2, g_3, .., g_i, .. g_n)$$

where g_1 is the amount of grass grazed by the player 1's goat.

There are private benefits but the costs are interdependent.

A specific functional form is

$$B(g_i) = g_i$$
$$C(g_1, g_2, g_3, .., g_i, .. g_n) = (1/2)[g_i + (1/2)(g_1 + g_2 + g_3 + .. + g_{i-1} + g_{i+1} + .. + g_n)]^2$$

so that

$$U_i = g_i - (1/2)[g_i + (1/2)(g_1 + g_2 + g_3 + .. + g_{i-1} + g_{i+1} + .. + g_n)]^2$$

The first term is the benefit to the individual of the grazing. The second term (the squared one) is the costs to the individual of the grazing. Each individual faces his direct cost of grazing, and half of the other persons' grazing costs. The costs are nonlinear.

The particular functional specification: i. e the squared costs, and why the other guys grazing imposes half a cost on the first person is done for guaranteeing a solution, algebraic ease, and stability of the model.

For a two player game, this translates to

$$U_i = g_1 - (1/2)[g_1 + (1/2)(g_2)]^2$$

i) Specify the best responses for the *n*-players game.
ii) Solve for the private and the social optimum in the *n*-player game.
iii) Comment on the nature of the externality as *n* varies.

II) A. What is the unique Nash equilibrium in the game where two player simultaneously have to choose a number

i) in the space [0,N]and the payoffs to each are number of dollars equal to the product of the two numbers?

ii) in the space $[0,\infty)$ and the payoffs to each are number of dollars equal to the product of the two numbers?

B. What is the Nash equilibrium in a game where one is supposed to:

i) Guess the average of what everybody else in the class is guessing. (The range is 0 to 100)

ii) Guess 1/3 the average of what everybody else in the class is guessing. (The range is 0 to 100)

III) Economist Ignacio Palacios-Huerta analyzed 1,417 penalty kicks from five years of professional soccer matches among European clubs. The success rates of penalty kickers given the decision by both the goalie and the kicker to kick or dive to the left or the right are as follows:

		Goalie	
		Left	Right
Kicker	Left	58%	95%
	Right	93%	70%

Find the mixed strategy equilibrium for the goalie and the kicker.

VI) This is a typical labor-leisure problem in economics but now with a game theoretic twist.

Each person has to decide between choosing how to allocate her waking hours between leisure and labor. Labor is tiresome and gives you disutility while leisure has intrinsic positive utility. However, labor earns you wages at some rate with which you can buy stuff that gives you positive utility.

Now the game theoretic twist: Think of a two-person community, in which the utility of one person's leisure depends on how much leisure the other person decides to take. Disutility from work and the wages earned is independent of the other person's decision.

i) How would you formalize this decision-making problem for each person?

What do you think is the nature of the interdependence here. Think both in terms of spillovers and strategic interdependence.

Try out some functional forms for the interdependence.

ii) Now suppose the wage rate for one of the persons goes up. i. e. opportunity cost for his labor goes up. What happens to the leisure taken by the other person?