

Economics 4650 - John L. Turner

Homework 2.

1. Pewlett-Hackard (PH) makes personal computers, and is vertically integrated. Specifically, Division I makes central processing units (CPUs), while Division II buys CPUs from Division I, combines them with other component parts purchased from outside suppliers, and assembles computers.

a. Which PH division is “upstream”?

b. Suppose Division II’s Marginal Revenue Product is given as:

$$MRP = 12,000 - y$$

where y is the number of central processing units bought and number of computers assembled. It is correct to think of this function as describing Division II’s demand for CPUs (given consumer demand and Division II’s other costs, which we do not explicitly model here). Division I makes CPUs according to the marginal cost function:

$$MC = \frac{y}{5}$$

Suppose there exists an outside market for CPUs that is purely competitive. Division II is free to buy CPUs from Division I and/or the outside suppliers and Division I is free to sell CPUs to Division II and/or outside computer assemblers. The prevailing market price for CPUs is \$1,000. What is PH’s optimal CPU transfer price? How many CPUs does Div. II buy from Div. I? How many CPUs does Div. II buy from outside suppliers? How many CPUs does Div. I sell to outside computer assemblers?

2. Robinson Crusoe is the monopoly owner of a goat, while Friday is the potential purchaser. The goat is characterized by M , the amount of milk it can produce. Robinson has a surplus of $10M$ if he keeps the goat and P if he sells it at price P . Friday has a surplus of $15M - P$ if he buys at price P and zero otherwise. For technical reasons, milk cannot be traded. Only the animal can. Both people are risk-neutral and there are no wealth effects.

a. Is exchange of the goat (from Robinson to Friday) efficient? If so, why? If both people know M perfectly, what do you expect the outcome of bargaining to be? (Assume bargaining does not require any transactions costs)

b. In fact, there is asymmetric information about M . Robinson has experience with the goat and knows M perfectly. Friday knows only that M is uniformly distributed between 0 and 1. For what prices will Robinson be willing to sell? Given that Robinson charges a price P such that he is at least as well off selling the goat as he is keeping it, what is the minimum average amount of milk, M^* , that the goat produces?

- c. As a function of M^* , when will Friday wish to purchase the goat
- d. Will the market achieve the efficient outcome? (Hint: Think of this question as "is there a price that would induce voluntary exchange of the goat?") Would your answer change if Friday's surplus when buying the goat is $25M - P$? Explain.

3. Page 164, Milgrom and Roberts, mathematical exercises 3, 4 and 5.

4. Two friends, Amy and Beatrice, meet to explore the possibility of forming an organization to raise money for the victims of Hurricane Katrina. They know each other fairly well, but Amy does not know whether Beatrice's heart will be in this fundraising endeavor and, likewise, Beatrice does not know whether Amy's heart will be in it, either. Here's what they do know. Amy knows whether her own heart is in it and knows that Beatrice's heart is in it with probability .5. Beatrice knows whether her own heart is in it and knows that Amy's heart is in it with probability .5.

There are two key decisions that must be made. First, Amy and Beatrice must decide whether to form the organization. Second, one of them must serve as "fundraiser," while the other serves as "secretary/treasurer." If Amy's heart is in it, she will raise \$20,000 as "fundraiser," with an effort cost of \$100. If her heart is not in it, she will raise \$10,000 as "fundraiser," with an effort cost of \$100. If Beatrice's heart is in it, she will raise \$15,000 as "fundraiser," with an effort cost of \$100. If her heart is not in it, she will raise \$5,000 as "fundraiser," with an effort cost of \$100. The secretary/treasurer adds nothing to the total amount raised and suffers no cost of effort.

Each person's utility function is given by:

$$U(R, E) = I + \alpha R - E,$$

where I is the initial level of income, R denotes the funds raised for tsunami victims, and E denotes effort cost. If the organization is not formed, each person's utility is I .

- a. To solve this problem completely, you must apply both the value maximization principle and the Coase Theorem. What key assumption is necessary in order for application of both of these to be sensible?
- b. Assume Amy and Beatrice decide to form the organization. The next step is to decide who serves as fundraiser and who serves as secretary/treasurer. Describe the efficient pattern of organization conditional on all possible realizations of Amy's and Beatrice's private information.
- c. They decide who fills which role using the following mechanism. Each person writes down whether her heart is in it on a slip of paper at the same time, and the slips of paper are then read aloud. These reports are treated as the truth (even if they are in fact false), and decisions based on the analysis of part (b) above are implemented. Write down

Amy's incentive compatibility constraint (i.e. the condition that says she reports the state of her heart truthfully) for BOTH states of her heart.

d. Write down Beatrice's incentive compatibility constraint (i.e. the condition that says she reports the state of her heart truthfully) for BOTH states of her heart.

e. Now consider the decision to form the organization in the first place. Using what you found in parts (b-d), along with some minor additional calculations to be done below, show that whenever Amy and Beatrice would willingly reveal the states of their hearts truthfully (if the organization were to be formed), they will in fact choose to form the organization.