

## Term Exam (Nov 9, 2016)

Please answer all of the questions below.

### Problem 1 (4 points)

What does the Coase Theorem say? Explain its main message. Under which conditions does it hold?

### Problem 2 (8 points)

Consider two agents  $A$  and  $B$ , and *one* asset  $K$ . If the agents work together, they can generate a joint profit of  $V = 2(2a + b)$ . Prior to this production stage, agents make a relationship specific investments  $a$  and  $b$  in physical capital, at personal costs  $\phi(a) = a^2/2$  and  $\psi(b) = b^2/2$ , respectively. If the agents do not work together, agent  $j$ 's default payoff is  $V^j = 2a + b$  if  $j$  is asset owner, and  $V^j = 0$  if  $j$  is not asset owner.

- a) Write down a time line. Then, find the efficient ('first best') outcome, and explain.
- b) Which outcome will the agents achieve if the initial contract is incomplete, and specifies only property rights over the asset  $K$ ? (develop the equilibrium carefully, using backwards induction). Which property rights structure (either  $A$ -ownership or  $B$  ownership) will they choose in their initial contract? Explain the intuition behind your findings!

### Problem 3 (8 points)

A firm is characterized by an output and (gross-of-wages) profit function  $q = 6e + \epsilon$ , where  $e$  indicates the effort of its only worker, and  $\epsilon$  is noise with mean zero. The worker's utility function is  $U = w - \psi(e)$  where  $\psi(e) = e^2/2$  represents his personal disutility from providing effort. His reservation utility is  $\bar{U} = 10$ . The firm owner  $P$  offers linear salary contracts,  $w = \alpha + \beta q$ .

- a) Which salary contract  $(\alpha, \beta)$  will  $P$  offer? (explain your steps, and don't forget verbal explanations). Is the outcome efficient? Why or why not?
- b) Suppose now the firm employs two identical workers,  $i = 1, 2$  with effort cost functions  $\psi(e_i) = e_i^2/2$ .
- (1) Suppose an enforcing party (the court) observes individual output levels  $q_i = 6e_i + \epsilon$ . Which contracts  $(\alpha_i, \beta_i)$  will the firm propose to each worker? Is the outcome efficient?
  - (2) Suppose the court only observe the total output  $q = q_1 + q_2 = 6e_1 + 6e_2 + \epsilon$ . Which contracts  $(\alpha_i, \beta_i)$  will it offer? Is the outcome efficient? Explain precisely why or why not.

Problem 4 (8 points)

- a) (4 points) Two firms hire from a large pool of workers with unobserved abilities  $a$  (drawn from some interval; output per worker is  $q = a$ ). Firm  $A$  offers workers a fixed wage  $w_A = \alpha_A$ , while firm  $B$  offers an output-dependent wage  $w_B = \alpha_B + \beta_B q$ . Using VERBAL arguments and a GRAPH, explain PRECISELY why firm  $B$  always hires the more able workers, and commands a profit for any wage  $w_A$  that allows firm  $A$  to break even. Can such a situation where one of the two firms offers fixed wage contracts emerge as a labor market equilibrium? Argue why or why not.
- b) (4 points) Explain verbally why 'backloading' wages can help a firm to attract more able workers, and to deter less able workers. (you don't have to write down the entire model here – just provide the basic elements, and the intuition for the results).