Exam

Incentives in Organizations and Innovation

Winter term 2014/2015

Please answer ***either*** Question 1 ***or*** Question 2. If you answer both questions, we will only consider ***Question 1***!

Question 1

(1) The risk neutral investor Rudi Reibach has the opportunity to finance an innovative project in the field of gene technology. Therefore he has to invest an amount of $I = 32$. As Rudi Reibach is not familiar with gene technology, he has to employ the manager Lutz Luschig. Rudi Reibach has full bargaining power when designing the employment contract. Lutz Luschig does not provide any additional capital. The utility function of Lutz Luschig is $U(w) = w$, where w is his wage. Both parties have a reservation utility of zero. If Lutz Luschig uses the invested funds as intended, the probability of success of the project is $p_H = 1/2$. If he uses the funds for private purposes such as buying a car for his girlfriend Lisa Lieblich, he will gain an additional private utility of $B = 20$. In this case the probability of success of the project will be $p_L = 0$. Rudi Reibach cannot observe the use of funds of his manager. He can only see the success or failure of the project. In case of success the profit is $R = 100$ and in case of failure the profit is $R = 0$. The profit can be observed by both parties.

(1.1) Will the investor conduct the project if the manager is not protected by limited liability?

(1.2) Will the investor conduct the project if the manager is protected by limited liability ($w \geq 0$)?

(1.3) In case of limited liability of the manager ($w \geq 0$), does it pay off for the investor to reduce the potential private utility of the manager by extended monitoring to $B = 10$? Assume a monitoring cost of $C = 3$.

Please note that No. 2 of Question 1 is on the next page.

(2) Consider an oligopoly with two firms (i = 1, 2). The quantity of firm i is given by q_i and the price is given by p_i. The inverse demand function for firm i is: $p_i = a - q_i - bq_j$, where $0 < b < 1$. The corresponding demand function is $q_i = h - dp_i + kp_j$, where $d > k > 0$. The marginal costs of production for each firm equal c.

(2.1) Derive the response function for Bertrand competition when both firms are managed by profit-maximizing owners. Show graphically the resulting Nash equilibrium.

(2.1) The owner of firm 1 delegates business decisions to an income-maximizing manager. How does the owner determine the wage of the manager under Bertrand competition?

(2.3) How does the situation change under Cournot competition?

Time (total): 120 minutes

Question 2

(1) The workers in a national economy differ in their productivity q. The density function is given by $f(q) = (\bar{q} - \underline{q})^{-1}$ where $\underline{q} = 0$ and $\bar{q} = 4$. There are two sectors. Firms in sector 1 cannot observe the individual productivity of their workers. Each worker is paid by time wage which equals the expected productivity in the sector. In contrast, workers' wage in sector 2 equals their individual productivity. For that purpose a measure of individual performance is required, where for each worker monitoring costs of $\theta = 1$ arise. The profit in both sectors is zero. The monitoring costs in sector 2 are passed to the workers.

At which productivity is a worker indifferent between employment in sector 1 and employment in sector 2?

(2) A principal hires an agent, who produces an output of $q = e + \varepsilon$. The effort of the agent is given by e, ε is a random variable with $E[\varepsilon] = 0$ and $Var[\varepsilon] = \sigma^2$. The principal can only observe q, but not e. He sets up the following remuneration for the agent:

$w = \alpha q + ß$. The disutility of the agent is given by $c(e) = 0{,}5e^2$. The principal is risk neutral whereas the agent is risk averse with a constant coefficient of absolute risk aversion of r. The reservation utility of the agent is given by $u = 0$.

How does the principal set the performance-based wage component and the fixed wage component?

Time (total): 120 minutes