

Written Exam for the B.Sc. in Economics 2009-II

Industrial Organization

Final (Resit) Exam

August 14, 2009

(3-hour closed book exam)

Please note that the language used in your exam paper must correspond to the language of the title for which you registered during exam registration. I.e. if you registered for the English title of the course, you must write your exam paper in English. Likewise, if you registered for the Danish title of the course or if you registered for the English title which was followed by “eksamen på dansk” in brackets, you must write your exam paper in Danish.

If you are in doubt about which title you registered for, please see the print of your exam registration from the students’ self-service system.

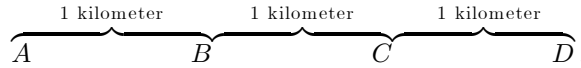
Attempt all three questions

Question 1

- a) In a market there are n firms. The firms produce identical products, and they face the following indirect demand function: $p = a - b(q_1 + q_2 + \dots + q_n)$, where p is market price, q_i is Firm i 's output, and a and b are positive constants.
- (i) Suppose that all firms' marginal cost of producing the product is constant and equal to zero and that there are no fixed costs. Moreover, suppose that the firms compete à la Cournot. Solve for all Cournot-Nash equilibria of this model. Show what happens with the equilibrium price and with total surplus as the number of firms goes to infinity.
- (ii) Suppose that $n = 2$, $a = 16$ and $b = 1$. Also, suppose that Firm 1's cost function is $C_1(q_1) = 8q_1$, and that Firm 2's cost function is $C_2(q_2) = 7 + 8q_2$ for $q_2 > 0$ and $C_2(0) = 0$. All other assumptions are the same as above. Solve for all Cournot-Nash equilibria of this model.
- b) Explain briefly the standard reason why, according to economic theory, a monopoly is bad. Also explain briefly what is meant by "rent seeking".
- c) Consider a market with five firms. The largest of the firms has a market share of one-third, whereas the remaining four firms' market share equals $1/6$ each. Calculate the Herfindahl index for this market.
- d) Give a brief verbal account of Green and Porter's theory of price wars. What are the main ingredients of their model, what is their result, and what is the intuition for the result?
- e) What do economists mean by "strategic substitutes" and "strategic complements"? Give two of examples of how these concepts matter in theories of industrial economics.
- f) Explain briefly the conjectural-variations approach to modelling an oligopoly.

Question 2

Consider the following version of Hotelling's linear city model with two firms that produce and sell a homogeneous good. The firms cannot choose the price of the good; instead this is fixed at DKK 1. The firms can, however, choose where to locate. In particular, the firms can position themselves at one of four different locations. These locations lie on a line, as follows:



All adjacent locations are equidistant from each other, and this distance is assumed to be one kilometer. At location A there are 7,000 costumers; at location B there are 5,000 costumers; at location C there are 4,000 costumers; and at location D there are 2,000 costumers. Each costumer buys either one unit of the good or nothing at all. A costumer's gross surplus from consuming the good equals DKK 5. However, in order to obtain the good the costumer must pay the above mentioned price of DKK 1. In addition, the costumer must incur a travel cost in order to get from where they are to the location where the nearest firm is and back. The travel cost is DKK 0.5 per kilometer. This means that, for example, for a costumer who is at A: travelling to a firm that is also located at A doesn't cost anything; travelling to a firm at B and back costs DKK 1; and so on. A costumer chooses to buy one unit if the gross surplus of DKK 5 exceeds the sum of the price (DKK 1) and the travel cost; otherwise he or she does not buy anything. When choosing from which firm to buy from, each costumer's objective is to maximize his or her net surplus; it is assumed that if a costumer or a number of costumers are indifferent between two firms, the firms share these costumers equally between themselves. The firms can produce the good at a cost of DKK 0.5 per unit.

- a) Assume that the two firms choose their locations simultaneously (and that the consumers thereafter, knowing the locations, make their optimal choices). Identify the Nash equilibrium of the game between the two firms. Explain why any other pair of locations than the ones you have identified cannot be an equilibrium. Also calculate the firms' profits and the consumer surplus for the different categories of costumers as well as aggregate consumer surplus.
- b) Assume that if (and only if) a firm locates at B, this firm must pay a tax of DKK 2000. All other assumptions remain the same as before. Identify the Nash equilibrium of the game between the two firms. Explain why any other pair of locations than the ones you have identified cannot be an equilibrium. Also calculate the firms' profits and the consumer surplus for the different categories of costumers as well as aggregate consumer surplus.
- c) Give an example of one configuration of locations (which is not necessarily a Nash equilibrium) that would yield a total consumer surplus that is

larger than both the one in a) and in b). Explain (in economic terms) why this consumer surplus is larger.

Question 3

Consider the following model of second-degree price discrimination that we studied in class. In a market there is a monopoly firm that produces a single good. The firm has a constant average (and marginal) cost of production, denoted c , where $c > 0$. There is a continuum of consumers, each enjoying the utility $\theta V(q) - T(q)$ if buying the quantity $q > 0$ and the utility 0 if buying nothing, where $V(q)$ is a function satisfying $V' > 0$, $V'' < 0$ and $V(0) = 0$. θ is a taste parameter and $T(q)$ is the amount the consumer must pay the firm if buying a quantity q . A given consumer's taste parameter θ is either high, $\theta = \theta_2$, or low, $\theta = \theta_1$, with $\theta_2 > \theta_1 > 0$. The consumer knows his own θ , but the firm does not know it. The firm only knows that a fraction λ of all consumers are of type θ_1 , and the others (a fraction $1 - \lambda$) are of type θ_2 . The firm offers two price-quantity bundles to the consumers: one, (T_1, q_1) , is directed to the type- θ_1 consumers; and the other, (T_2, q_2) , is directed to the type- θ_2 consumers. The firm wants to choose q_1 , q_2 , T_1 , and T_2 so as to maximize its expected profits.

- a) Write up formally the monopoly firm's maximization problem.
- b) Solve the problem (you may suppose that the incentive compatibility constraint of the low-valuation consumer does not bind). Interpret the optimality conditions that you derive. Explain the economic intuition behind the results.
- c) Explain briefly what first-degree and third-degree price discrimination are.