Written Exam for the M.Sc. in Economics 2010-II

Advanced Industrial Organization

Final Exam
(Re-exam)

August, 2010

(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.

ALL QUESTIONS BELOW SHOULD BE ANSWERED

Problem 1.

this question is based on Armstrong, section

1. Consider a Hotelling market with consumers uniformly distributed on the interval [0,1]. Consumer $x's$ location is x.

There are two firms, A and B located at the end points of the line. Firm A in 0 and firm B in 1. Both firms have constant marginal costs, which are normalized to 0. The firms choose prices and are profit maximizing

A consumer is interested in at most one unit of the (differentiated) good. Consumer $x's$ utility if she buys at the price p_A from firm A is

$$v - p_A - tx$$

and similarly it is

$$v - p_B - t(1 - x)$$

if she buys at the price p_B from firm B. In this exercise, you shall just assume that the consumers' valuation of the good always is sufficiently high so that all consumers buy the good in equilibrium.

a. Find the symmetric equilibrium price.

Find the best responses for the firms, solve for the symmetric Nash eq and the answer is

$$p_A = p_B = p = t$$

b. Now suppose that there are two different types of consumers, so that some have a high valuation v^H and some a lower valuation v^L. There are a continuum of both kinds with different locations x uniformly distributed on the line.

Suppose that that firms are able to identify which consumers have high valuation and which have a low, so if they wish, they can offer different prices to the two types of consumers. Is this ability beneficial for the firms (comparing with the price in a)

no, as we can see from a, on both submarkets the competition implies that firms set

$$p = t$$

which is independent of v

c. Now suppose that all consumers have the same valuation, v. But suppose that the firms are able to observe *the location* of all consumers and charge different prices to the consumers depending on their location. So each firm now chooses a price for each location x, for example firm A chooses p_x^A to consumers located a x. Find the (symmetric) equilibrium. Is price discrimination good or bad for (all/some) consumers, is it beneficial for the firms (again comparing with the price in a) ? Does it affect welfare (compared with the outcome in a).

Each location is now in fact a market, where the firm's compete ala Bertrand. The firm offering the best deal, i.e. the lowest sum of price and transportation cost, gets the demand of the consumer located at x. Consider $x < 1/2$. The lowest price firm B can offer is $p = 0$, giving a total cost to the consumer from buying from B equal to $0 + t(1-x)$. If firm A offers p such that $p + tx = t(1-x)$, then the consumer is indifferent and A gets the demand. (if you dislike this then A can undercut with an abitrarily small ε and get the demand). Hence if A offers

$$p_A = t(1-2x)$$

it gets the demand. Hence at market x the equilibrium involves A setting $p_A = t(1-2x)$, and B setting $p_B = 0$. For $x = 1/2$ both firms offer

$$p = t\left(1 - 2\frac{1}{2}\right) = 0$$

for $x > \frac{1}{2}$, by symmetry we get that $p_A = 0$ and

$$0 + tx = p_B + t(1-x)$$

$$p_B = t(2x-1)$$

We see that the equilibrium is worse for the firms, for all $x \neq 0, 1$ the price the firms sell at is lower than t. The equilibirum on the other hand benefits all consumers $x \neq 0, 1$, the welfare is unaffected, since in both cases all consumers buy one unit

d. Suppose that the firms cannot see the exact location of a consumer but they are able to identify which half of the line a consumer belongs to, i.e. whether $x \geq \frac{1}{2}$ or $x \leq \frac{1}{2}$. This enables them to price discriminate among the two groups of consumers (those with $x \leq \frac{1}{2}$ and those with $x \geq \frac{1}{2}$). Find the symmetric equilibrium with price discrimination.

let $\hat{p}_A$ be the price on A's hometurf, i.e. to consumers with $x \leq 1/2$ and p_A the price to consumers on B's turf ($x \geq 1/2$). Similarly $\hat{p}_B$ is for $x \geq 1/2$ and p_B for $x \leq 1/2$

The indifferent consumer on A's turf is located in

$$x = \frac{1}{2} + \frac{p_B - \hat{p}_A}{2t}$$

A's best reply solves

$$\max_{\hat{p}_A} \left(\frac{1}{2} + \frac{p_B - \hat{p}_A}{2t} \right) \hat{p}_A$$

which gives

$$\hat{p}_A = \frac{1}{2}t + \frac{1}{2}p_B$$

B's best reply solves (recall that we are considering hte left part of the line where $x \leq 1/2$)

$$\left(\frac{1}{2} - \left(\frac{1}{2} + \frac{p_B - \hat{p}_A}{2t} \right) \right) p_B$$

$$p_B = \frac{1}{2}\hat{p}_A$$

so the equilibrium on A's turf becomes

$$\hat{p}_A = \frac{2}{3}t, p_B = \frac{1}{3}t$$

By symmetry, on B's turf we get

$$\hat{p}_B = \frac{2}{3}t, p_A = \frac{1}{3}t$$

Is price discrimination good or bad for (all/some) consumers, is it beneficial for the firms? Does it affect welfare? (again comparing with the outcome in a).

the prices are lower than under no discrimination for all consumers. So it benefits all consumers and hurts firms.

welfare is affected negatively. the indifferent consumer on A's turf is located at

$$x = \frac{1}{2} + \frac{p_B - \hat{p}_A}{2t} = \frac{1}{2} + \frac{\frac{1}{3}t - \frac{2}{3}t}{2t} = \frac{1}{3}$$

so consumers $x \leq 1/3$ buy from firm A, consumers x for which $1/3 < x \leq 1/2$ buy from B. Their transportation cost is therefore larger than if no price disc took place, (in this case all consumers $x \leq 1/2$ buy from A).

By symmetry on B' turf, x for which $1/2 < x < 2/3$ buy from A and $x \geq 2/3$ buy from B. So, price discrimination hurts welfare.

Problem 2:

Denote the monopoly quantity and profit by Q^m and π^m, respectively. "Monopoly" refers here to a vertically integrated monopolist.

1. U maximizes its profit, e.g., by offering the contracts $(Q_1, T_1) = (Q_2, T_2) = (Q_m/2, \pi_m/2) = ((1 - c)/2, (1 - c)^2/4)$, which the downstream firms accepts as they earn zero profits.
2. In equilibrium, U has to make an offer to firm i that maximizes the joint profit of U and i given firm i's (correct) anticipation of the offer made to firm j. Therefore, firm i is offered the quantity that maximizes $(1 - q_i - q_j - c)q_i$. Hence, firm i is offered $q_i = R_i(q_j) = (1 - q_j - c)/2$, where $R_i(q_j)$ is firm i's reaction function under Cournot competition. Solving $q_1 = R_1(q_2)$ and $q_2 = R_2(q_1)$, one obtains $q_1^* = q_2^* = (1 - c)/3$. The contracts offered are $(Q_1, T_1) = (Q_2, T_2) = ((1-c)/3, (1 - c)^2/9)$.
3. If the bottleneck segment of the market is downstream, the monopolist D does not face a commitment problem. It can therefore offer the two upstream firms the contracts $(Q_1, \pi_1) = (Q_2, \pi_2) = (Q_m/2, c\, Q_m/2) = ((1 - c)/2, c\,(1 - c)/2)$. The two upstream firms accept the contracts, because their costs are (exactly) covered. The downstream monopolist earns the monopoly profit – the maximal profit attainable – and has no incentive to deviate by offering different contracts. The reason is that the contract offered to firm i maximizes firm i and D's joint profit, there is no profit to "steal" from firm j by producing more.
4. If Swatch Group Nordic is able to impose RPM in a way that is (a) credible and binding, and (b) observable to the downstream dealers, it can solve the commitment problem that an upstream monopolist faces. In particular, using the above setup, if the resale price is set to the monopoly price P^m, U can offer the contracts $(Q_1, \pi_1) = (Q_2, \pi_2) = (Q_m/2, \pi_m/2)$. With RPM in place, there is no profitable deviation for the coalition U and firm i, because it is not possible to sell a larger total quantity than Q_m at the price P_m.

Problem 3:

An answer could, e.g., include the following considerations:

1. Newspapers are a two-sided market where readers and advertisers meet. There were no predatory intents behind the price cut. Instead, it was a rebalancing of the prices on the two sides of the market: The cover price was decreased in order to increase circulation, thereby allowing The Times to increase advertising tariffs as more readers were reached. This is exactly what Figure 2 and 3 show: The cover price goes down, and the advertising tariff goes up. The rebalancing of the prices was necessary due to a general decline in circulation (Figure 1), hurting both revenues from newspaper sales and advertising. Finally, if the The Times had had predatory intents, it should have dropped both the cover price and the advertising tariff in order to reduce the revenues of The Independent as much as possible.
2. The price cut by The Times allowed it to increase its circulation significantly. The price cut hurt The Independent for several reasons. First, The Independent had to decrease its cover price too in order not to lose too large a market share. However, as the cover price remained higher than that of The Time in order to cover costs, its circulation dropped significantly. Lower price and circulation resulted in a dramatic drop in revenues from newspaper sales for The Independent.

Furthermore, as newspapers are a two-sided market, The Independent became a less attractive platform for advertisers. Therefore, The Independent had to decrease its advertising tariffs too. It was only able to set advertising rates at the pre-price cut levels by the end of the period (i.e. around year 2000) after The Times had increased its advertising tariffs substantially. As the last piece of evidence for predatory pricing, notice that The Times started to increase its cover price after the circulation of The Independent had dropped.