Written Exam for the B.Sc. or M.Sc. in Economics summer 2013

Industrial Organization

Final Exam

August 15, 2013

(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.

This exam paper consists of three pages in total including this page.

Attempt both questions. Make sure that you explain all the steps of your analysis and that you define any new notation that you use.

There is no need to restate model assumptions and/or questions from the exam paper in the your answers (and it will be easier for the examiners to read the answers if you do not do this.)

Question 1 (dynamic monopoly and the Coase conjecture)

This is a model of a monopoly firm that sells its good in two time periods to consumers who are forward-looking. It is identical to a model that we studied in the course, and it is related to the so-called Coase conjecture.

There are two time periods, $t = 1$ and $t = 2$. At each t, a monopoly firm is producing and selling a good. There are a continuum of consumers who differ from each other with respect to the parameter $r \in [0, 1]$, the gross utility from consuming one unit of the good during one time period. The r's are uniformly distributed on $[0, 1]$. A consumer only gets utility from consuming (a single unit of) the good *once*, and therefore never wants to consume the good in both periods. A consumer's net utility from consuming the good in period t equals $r - p_t$, where p_t is the price the firm charges in period t. Not buying the good yields the utility zero. The consumers' (common) discount factor is denoted by $\delta \in [0, 1)$. The timing of events is as follows.

1. The monopoly firm chooses its first-period price p_1.
2. The consumers observe p_1 and then (simultaneously) choose whether to buy or not.
3. The monopoly firm chooses its second-period price p_2.
4. The consumers observe p_2 and then (simultaneously) choose whether to buy or not.

The monopoly firm has a constant marginal cost of production, which is normalized to zero. The objective of the firm is to maximize its profits; however, the firm is myopic, which means that when choosing p_1 at stage 1 it does not take into account the effects on the second-period profit. The consumers maximize their net utilities, appropriately discounted.

a) Solve for a subgame perfect Nash equilibrium of the model in which consumers with $r > \widehat{r}$, for some $\widehat{r} \in (0, 1)$, consume in period 1. Find the equilibrium value of $\widehat{r}$. Also identify the equilibrium values of p_1 and p_2.

b) Explain in words what the Coase conjecture says. Also explain the intuition.

c) Define the "Herfindahl index" and the "3-firm concentration ratio". Also, consider a market with seven firms. Their market shares are 5, 5, 10, 10, 20, 20 and 30 percent. Calculate the Herfindahl index and the 3-firm concentration ratio for this market.

Question 2 (sequential duopoly)

Consider a market in which there are two firms (indexed by $i = 1, 2$) that produce differentiated goods. The demand for firm i's good is given by

$$q_i = \frac{1}{3}(1 - 2p_i + p_j) \qquad \text{for } i, j = 1, 2 \text{ and } i \neq j. \tag{1}$$

One can show (by inverting the equation system in (1)) that firm i's indirect demand is given by

$$p_i = 1 - 2q_i - q_j \qquad \text{for } i, j = 1, 2 \text{ and } i \neq j.$$

Each firm can produce its good at a constant marginal cost c, where $c \in [0, 1)$. Each firm's objective is to try to maximize its profits, $\pi_i = (p_i - c)\, q_i$.

a) Assume that the firms choose prices and they do this sequentially. In particular, first firm 1 chooses p_1; thereafter firm 2 observes p_1 and chooses p_2. Solve for the subgame-perfect Nash equilibrium of this game.

b) Now assume that the firms choose quantities and they do this sequentially. In particular, first firm 1 chooses q_1; thereafter firm 2 observes q_1 and chooses q_2. Solve for the subgame-perfect Nash equilibrium of this game.

c) Denote firm i's equilibrium profits in the price-setting game in a) by π_i^B. Similarly, denote firm i's equilibrium profits in the quantity-setting game in b) by π_i^C. One can show that $\pi_1^B < \pi_2^B$ and $\pi_1^C > \pi_2^C$. That is, in this sense there is a second-mover advantage in the price-setting game and a first-mover advantage in the quantity-setting game. Explain the logic behind this difference between the models.

END OF EXAM