University of Minnesota Department of Economics ECON Spring 2006

Edgar Preugschat

Practice Final Exam 2

Question 1 (25 points)

Consider the market for movies of the type "so bad that they're good" (e.g. Dodgeball, etc.). There are **40** studios producing those movies and **200** consumers initially.

Consumers have an *individual* demand function given by $Q_i^d(P) = 5 - (P/200)$.

Each of the 40 firms has a production function given by $F(K,L) = K^{0.5}L^{0.5}$. The input prices for K and L are **r=10** and **w=40** respectively. Assume that $\overline{K} = 2$ is a fixed capital input.

(a) Write down the Short run cost minimization problem and show that the (short run) Total Cost function for an individual firm is: $STC(Q) = 20 + 20 \cdot Q^2$.

(b) Compute the aggregate (short run) supply function $Q^{\text{agg S}}(P)$ for the market.

(c) Calculate aggregate demand function $Q^{\text{agg D}}(P)$.

(d) Define a Partial competitive equilibrium and compute the equilibrium price and quantity.

(e) Now, consider the *long run* total supply decision for movies. The optimal input demands for the given production function are:

$$K(Q,r,w) = Q\sqrt{\frac{w}{r}} \qquad \text{and} \qquad L(Q,r,w) = Q\sqrt{\frac{r}{w}}.$$

Using the given input prices, compute the Long Run Total Cost function LTC(Q) (simplify your expression) and compute the LR supply function.

(f) What will happen with equilibrium price and quantity in this long run scenario if the number of people with taste for tasteless movies doubles? No computations, but a verbal explanation is expected. A diagram might be helpful. (**NOTE**: if you did not answer (e), answer this question for the short run scenario given in the first part of Question 1).

Question 2 (25 Points) (Island adventures)

David and **M**icky win a trip to a lonely island in the Caribbean far away from any civilization. At first everything looks perfect: sunshine all day, tons of free fruits and no dinosaurs. But after a couple of days both start to be terribly bored. Fortunately, they both brought their gameboys with them. However, David forgot to download any games (**G**), and Micky didn't bring any batteries (**B**). Naturally, they start to trade their endowments. Both act as price takers. **D**avid owns $\omega_B^D = 20$ batteries (**B**), whereas **M**icky has $\omega_G^M = 10$ games (**G**). (Which implies that: $\omega_G^D = 0$, and $\omega_B^M = 0$).

Their preferences are represented by the following utility functions:

David $U^D(B,G) = B^{0.8}G^{1.2}$

Micky $U^M(B,G) = B^{0.4}G^{0.1}$. (note that they are different)

(a) Give a definition of a general equilibrium for this economy and briefly explain the difference to a partial equilibrium model.

(b) Set up the Lagrangian and write down the FOCs which solve *David's* utility maximization problem. (you need **not** to solve anything).

(c) The following expression are the demands for both people (i, j) and both goods (G, B):

Person i: $x_G^i(P) = 0.2\frac{p_B\omega_B^i + p_G\omega_G^i}{p_G}$ and $x_B^i(P) = 0.8\frac{p_B\omega_B^i + p_G\omega_G^i}{p_B}$

Person j: $x_G^j(P) = 0.6\frac{p_B\omega_B^j + p_G\omega_G^j}{p_G}$ and $x_B^j(P) = 0.4\frac{p_B\omega_B^j + p_G\omega_G^j}{p_B}$

State which demand belongs to which agent (e.g. state whether person i is David or Micky).

(d) Based on your conclusion in part (c), compute the equilibrium prices and quantities for the two markets. (Hint: you need to solve for a ratio of prices only. Price normalization is not necessary).

(e) State Walras' law.

(f) Draw a fully labelled Edgeworth box to scale. Indicate the endowment point and the equilibrium allocation. Draw the equilibrium budget line and representative (sketches of) indifference curves for each agent.

(g) Give a (informal) definition of Pareto efficiency and indicate the set of Pareto efficient allocations in your graph of the Edgeworth box (may be it is better to sketch a new box).

(h) What do we know about each agent's MRS at the equilibrium allocation? What does this fact imply for Pareto efficiency of the equilibrium allocation? Explain in 2-4 sentences.

Question 3 (20 Points) (Back to the real world)

A few years ago, the Seattle-based company Starbucks entered the German market. For some reason, Starbucks is regarded as a luxury coffee shop by many German consumers. This implies that Starbucks can (and does) charge higher prices for their drinks in Germany than in the US (and also compared to the average price for coffee in German cafés). Let's suppose the two markets can be characterized by the following demand functions:

$$Q^{US}(P) = 80 - 2P$$

$$Q^{Germany}(P) = 200 - 4P$$

Starbucks' Total cost function is given by:

$$TC(Q) = 5Q.$$

(a) What is third degree price discrimination, and what is an important economic assumption for this strategy to be successful?

(b) Draw a diagram for the price discrimination case (2 graphs). Indicate the optimal (monopoly) prices and quantities, profits, Dead weight loss (DWL), and Consumer Surplus.

(c) Set up the monopolist's profit max problem for the case of (third degree) price discrimination. Write down the FOCs and solve for the optimal prices and quantities in both markets.

(d) Given that the optimal prices and quantities are:

$$Q^{US} = 35,\ P^{US} = 22.5,\ Q^{Germany} = 90, \text{ and } P^{Germany} = 27.5,$$

compute the ***total Consumer Surplus*** .

(e) In 3-5 sentences explain the meaning of consumer surplus and why it is important in the context of monopoly models.

(f) What is the price elasticity of demand in the US market *at the optimal quantity*?

Question 4 (15 Points): Choose ONE of the two parts

Consider the market for passenger airplanes. Suppose there are only two firms, one called "Airbus" (A), the other "Boing" (B). Airbus has a total cost function given by:

$$TC^A(q_A) = 2(q_A)^2,$$

whereas Boing has a total cost function according to:

$$TC^B(q_B) = 4q_B,$$

The inverse market demand for aircrafts is:

$$P(Q) = 100 - 2Q.$$

(4.1) Suppose they both behave as Cournot duopoly players. First, describe the underlying assumptions of the Cournot duopoly. Then compute the optimal quantities for firms, the aggregated quantity and the market price.

Draw a graph with the two reaction functions in a q1-q2-diagram.

Carefully explain why your solution is a Nash equilibrium.

(4.2) In this question, assume that Boing acts as a quantity leader and Airbus takes this quantity as given. What are the underlying behavioural assumptions? Set up the problem and solve for each firm's optimal quantity and the market price.

Question 5 (15 Points)

(a) Define a Nash equilibrium (NE) for a two-player game. Define the notation you use.

(b) In a Bertrand duopoly game, what would the NE be if the MC were different, e.g. $MC_1= 5$ and $MC_2= 7$? Justify your answer

(c) Until the end of the nineties, several chemical companies producing vitamins formed a cartel in the vitamin market. To simplify the situation for our problem, assume that there are only two identical firms who "play" the cartel game for one period.

The payoff matrix for the firm's strategies is given by:

firm 1\firm 2	**cooperate**	**not cooperate**
cooperate	500 \ 500	0 \ 1000
not cooperate	1000 \ 0	0 \ 0

- Find the Nash equilibrium/equilibria.

- Explain why this outcome is sometimes called a dilemma.

- For each of the payoff combinations in the game matrix, briefly explain how to obtain them in general (no computations). Note that the case "cooperate/not cooperate" is equivalent to "not cooperate/cooperate".