Homework 3

AEC 504 - Summer 2007

Fundamentals of Economics

©2007 Alexander Barinov

1 Price Discrimination

Consider a firm with $MC = AC = 2$, which serves two markets with demand functions $Q_1 = 10 - p_1$ and $Q_2 = 15 - 2p_2$.

i. If the firm can price-discriminate (set different prices in different markets), how much it will charge in each market?

ii. Compute the elasticities of demand for both markets at the optimal prices. What is the relationship between the optimal prices and demand elasticities at them? Do you expect this relationship to hold always?

iii. Suppose the firm cannot tell separate the markets and thus views them as one market. What is the demand curve the firm faces in the market?

iv. Compute the optimal price the firm will charge in both markets

v. Compare the total output (sales) of the firm in (i) and in (iv)

vi. Compare social welfare (firm's profit plus the sum of consumer surpluses in both markets) in (i) and (iv). What is better for the society: price discrimination or the absense of such?

vii. Suppose firm's MC=AC jump to 7. How will your answers to (i) and (iv) change?

2 Comprehensive Cournot Analysis

Consider two identical firms with *MC=AC=1* facing demand curve $P = 10 - -Q$ and competing a-lá Cournot under duopoly.

i. Solve for the reaction curves of both firms and the market equilibrium (price, quantities, profits)

Analyze the impact of the following on the equilibrium price, individual and total production, individual and total profit, and social welfare (you need to show both calculations and economic intuition behind the changes you observe):

ii. MC and AC of the second firm increase from 1 to 2

iii. The demand function changes to $P = 10 - 2Q$

iv. The firms collude

v. MC and AC of the second firm increase from 1 to 2 and the firms collude

3 Double Markup

The price of boots ordered online (p) consists of the price of boots charged by Zappos.com (p_1) and the price of shipping charged by UPS (p_2). Assume that there are no other online sales and shipping companies, and Zappos.com and UPS compete a-lá Cournot, but choose prices instead of quantities. The demand for boots ordered online is $20 - p$.

i. Find the equilibrium prices, profits of the firms, and quantity of boots

ii. How will your answer to (i) change if Zappos.com and UPS collude? What is the total loss/gain to the society from the collusion? What is the economic intuition behind the results?

4 Discrete Cournot Duopoly, Collusion and Repeated Interactions

Two hens lay eggs at the cost of 5¢ per egg. Assume they can lay as many eggs as they want and face the demand curve for eggs

$$P = \begin{cases} 35 - Q^2, \ Q < 6 \\ 0, \ Q \geq 6 \end{cases}$$

i. Assuming that hens lay only integer number of eggs, find the equilibrium of the game by eliminating (weakly) dominant strategies

ii. Is the resulting equilibrium Nash equilibrium?

iii. In the discrete version of the problem, how many eggs will each hen lay if they collude?

iv. What would prevent them from colluding in a one-shot interaction?

v. Suppose now that the hens know that in the next period with probability 20% either of them (or both) can be slaughtered irrespective of the number of eggs it lays. Since the interaction between them is now repeated, they have two strategies available – either proceed as in (i), or use tit-for-tat strategy: collude if the other hen colluded in the previous period and proceed as in (i) forever if the other hen did not collude in the next period. Will the hens be able to collude? How high the probability of slaughtering has to be to make them indifferent between colluding and not colluding? Assume that profits in the cartel are shared equally.

vi. Are there any other Nash equilibria?

vii. Recompute the equilibrium in (i) assuming that the hens can lay non-integer number of eggs (that is, the hens can lay 4/3 of an egg or even $\sqrt{2}$ eggs)

5 Bundling for Three

A campus bookstore carries three textbooks: in mathematics, in economics, and in psychology. The bookstore buys the textbooks from its supplier at $50 each. All students take mathematics, economics, and psychology. Each student buys at most one textbook for a course. The students in the problem are freshmen and know nothing about Amazon.com and Half.com, neither they are smart enough to buy a used textbook from older students, so the bookstore is a monopoly.

The value assigned by a student to a textbook depends on his/her major, as shown in the table below:

	Maths textbook	Econ textbook	Psy textbook
Maths major	$100	$80	$65
Econ major	$60	$90	$70
Psy major	$60	$80	$95

The number of mathematics, economics, and psychology majors in the university is 100, 200, and 150, respectively.

i. The current bookstore policy is to sell the economics and psychology textbooks as a bundle and offer the mathematics textbook separately. What prices should the bookstore charge? What will be the profit?

ii. Suppose the bookstore decides to give the students more freedom and begins to sell all textbooks separately. What is the optimal pricing policy and the corresponding profit? Give economic intuition for the change in the profit compared to (i).

iii. The dean of students visits the bookstore and says that what the students need is not the freedom, but a textbook for each course they take. So, the bookstore decides to sell all three textbooks as one bundle. What is the optimal pricing policy and the corresponding profit? Give economic intuition for the change in the profit compared to (i).