Homework 2

AEC 504 - Summer 2007

Fundamentals of Economics

1 Marionette Theater

Pinocchio and Harlequin established their own Marionette Theater and began competing with Fire Eater. At first, the admission fee was $5 in both theaters. After that, Pinocchio and Harlequin decided to undercut Fire Eater and reduced their admission fee to $4. Before the price cut, Fire Eater was selling 10000 tickets a year. He knows that the cross-price *arc elasticity* of demand for his tickets with respect to the admission fee in the competing theater is 1, and own-price *arc elasticity* of the demand is -2.

i. How many tickets a year will Fire Eater sell after the price cut?

ii. By how much will he have to cut his price to sell the same number of tickets as before?

iii. Assuming that Fire Eater's theater is not full and the marginal cost of admitting an additional customer is 0, was Fire Eater right in his decision to sell 10000 tickets a year in the first place? If not, should he cut or increase the ticket price?

iv. You can verify for yourself that as the cross-price elasticity increases, Fire Eater's sales will drop more and more, and he will have to undertake more and more serious price cuts to sell 10000 tickets a year after Pinocchio and Harlequin cut their price. What does the problem tell you about the importance of customer loyalty?

2 Cost Minimization

Consider a firm with production function $Y = K^{1/3}L^{1/3}$, which faces the cost of capital $r = 8$ and the wage of $w = 1$. Assume that the firm plans to produce $Y = 8$.

i. Find the optimal production plan (the cost-minimizing allocation of K and L).

ii. What is the breakeven price of the output, that is, the price of Y at which the firm makes zero profit?

iii. What is the average (marginal) product of labor (L) (APL & MPL) when the input mix is the one in (i)? And the average (marginal) product of capital (K) (APK & MPK)? Clearly and concisely, please explain how you would interpret these four numbers.

iv. What happens to the value of marginal product of labor (MPL) at the optimal production plan as w increases, assuming that r stays constant? What happens with the average product (APL)? What happens to MPK and APK? What is the economic intuition behind the changes?

v. What are the cost shares of labor and capital $\frac{rK}{C}$ and $\frac{wL}{C}$? Do they depend on the relative price of K and/or L?

vi. Find the factor demands and the cost function for this firm

vii. Does this production function has decreasing, constant, or increasing return to scale? Does the firm has increasing or decreasing marginal costs? Would your answer change if its production function was $Y = K^{2/3}L^{2/3}$?

3 Profit Function

Consider a firm, which produces only one output according to the production function $20x - x^2$, where x is the amount of the only input used. The firm gets $\$p$ for each unit of the output it produces and pays $\$w$ for each unit of the input it uses.

i. Set up the profit function for this firm

ii. Find the amount of the input the firm should use to get the maximum possible profit. Under what values of w will the firm produce nothing (that is, the optimal x will be equal to 0)?

iii. Find the factor demand function

iv. Assume $w = 10$ and $p = 1$. Suppose that the government first levied the 32% profit tax. Now it is thinking about replacing the profit tax by the tax on x, which effectively means increasing the price of x from $\$w$ to $\$(w + t)$. What tax rate t will the government have to set to get the same revenue as before? How does social welfare changes after the profit tax is replaced by the tax on x?

Hint #1: The social welfare is the sum of the profit the firm makes and the tax revenue. Do not care about the consumers - they are "absent" in the problem.

Hint #2: The government gets the same revenue from both taxes if $tx_2 = 0.32\Pi_1$, where x_2 is the optimal amount of input after the tax on x is levied, and Π_1 is the maximum profit under the profit tax.

4 Entry and Exit in Competitive Markets

Consider a bunch of firms with the common cost function $TC = 200 + 5Q + Q^2$, which exist in a competitive environment. The price at which they can sell the product is \$25.

i. What is MC for these firms? What are VC and FC? What is AVC?

ii. What is the optimal (profit-maximizing) quantity for each firm?

iii. What profit each firm gets at the optimal quantity? In the short run, will they stay in the business or leave it?

iv. What is the quantity each firm will produce in the long run?

v. What happens to the price, the size of a firm, the number of firms in the industry, and their total production in the long run, compared to the short run?

Hint: You do not have to calculate the exact numbers here, just write down the intuition based on the calculations you did so far.

5 Birthrate and Economic Cynicism

Suppose that both men and women want to have children, and the supply side is taken by Nature, who allows any couple to have as many children as they want at a certain price, determined by the standards of living and the opportunity costs of having a baby. However, both men and women have other interests beyond having children. Discuss the impacts of the following on the birthrate:

i. The increased share of women in the work force (allegedly driven by reduced wage differential between women and men)

ii. The increase in college enrollment (both for males and females)

iii. Economy-wide recession

iv. The stipends for would-be parents

v. Relaxed immigration policy (assume here that immigrants have the same standards of living as natives)

Hint: You should care more about taking into account all possible effects of the above events than about giving an unambiguous answer about where the birthrate goes.