TOPIC 3. ENTRY COSTS AND MARKET STRUCTURE

3.1. - Consider an oligopoly in which all firms have the same size and have the same costs. Suppose that the demand is given by the function *Q=(4-P)810*, and firms' costs are given by *C= 10 + 2Q*. Calculate the equilibrium number of firms (free entry equilibrium) of this market. Also, calculate each firm production and market price.

3.2. - Consider the following model of entry in an advertising-intensive industry. To simplify the analysis and to concentrate in the effects of advertising, suppose that the price is given (there is no price competition). Specifically, the value of the market, in total sales is given by S. S is therefore a measure of market size.

Each firm must decide whether or not to enter the industry. Entry cost is given by F. If a firm decides to enter, it must also choose how much to invest in advertising; let a_i be the amount chosen by firm i. Finally, firm i´s market share, s_i , is assumed to be equal to its share of the industry total advertising effort (it is proportional to its level of advertising):

$$s_i = \frac{a_i}{A}$$

where (assuming that n is the total number of firms in the industry), A is the total industry advertising

$$A = \sum_{i=1}^{n} a_i$$

a) Show that each firm i's the optimal level of advertising solves

$$\frac{A - a_i}{A^2} S - 1 = 0$$

b) Show that, in a symmetric equilibrium, if a is the advertising investment of each firm,

$$a = \frac{n-1}{n^2} S$$

c) Show that the equilibrium profit is given by

$$\pi = \frac{S}{n^2}$$

d) Show that the equilibrium number of entrants is given by:

$$n^* = \sqrt{\frac{S}{F}}$$

e) Interpret this resulting light of previous discussion on the effects of endogenous entry costs.

3.3.- Consider the following model of entry in an advertising-intensive industry. To simplify the analysis and to concentrate in the effects of advertising, suppose that the price is given (there is no price competition). Specifically, the value of the market, in total sales is given by S=1000. S is therefore a measure of market size.

Each firm must decide whether or not to enter the industry. Entry cost is given by F=10. If a firm decides to enter, it must also choose how much to invest in advertising; let a_i be the amount chosen by firm i. Finally, firm i´s market share, s_i , is assumed to be equal to its share of the industry total advertising effort:

$$s_i = \frac{a_i}{A}$$

where (assuming that n is the total number of firms in the industry), A is the total industry advertising

$$A = \sum_{i=1}^{n} a_i$$

a) Obtain each firm i's the optimal level of advertising.
b) Obtain each firm i's the optimal level of advertising.
c) Obtain each firm profit and number of firms in a symmetric equilibrium.
d) Obtain the equilibrium number of entrants.
e) Obtain the equilibrium number of entrants if S (total market size) increases up to 4000. Interpret this result in light of previous discussion on the effects of endogenous entry costs and compare it to the case of exogenous entry costs.

TOPIC 4. THE ENTRY OF NEW COMPETITORS

4.1 Recall the limit-price model. An industry minimum efficient scale (MES) is given by *q=60*. For productions equal or grater to 60 units, the long-run average cost is constant and equal to 80. The inverse demand function of this industry is given by *p(Q)=2000-4Q*. Suppose that there is only one incumbent firm in the market that produces a quantity larger than the MES. Suppose that this firm has to face the threat of entry of a potential competitor with that the same costs structure (the technology used by the incumbent firm is freely available in the market). The potential entrant only considers entry at a level of production equal or larger to the MES. Finally, the potential entrant that the incumbent firm maintains its level of production unchanged once entrance has happened (Sylos' postulate).

a) Determine both using figures and analytically which is the maximum price that a firm can set to prevent entrance (limit-price)
b) What happens with the limit-price if the MES increase from 60 to 80?
c) Briefly comment the main critiques to the limit-pricing theory.

4.2.- Consider the following model of investment in capital. Suppose an industry with two firms and the following two-stage game: in the first stage, firm 1 (the incumbent firm) chooses a level of capital K_1; in the second stage, firm 2 (the entrant firm) observes the

level of capital chosen by firm 1 and chooses its capital level. We assume that the investment in capital is associated to sunk costs (as the technology is industry specific). Finally, assume that the firms 1 and 2 profit functions are given by:

$$\pi_1 = K_1(1 - K_1 - K_2)$$
$$\pi_2 = K_2(1 - K_1 - K_2)$$

a) Determine the equilibrium levels of K_1 y K_2 and each firm equilibrium profits.
b) Suppose that both firms choose their capital levels simultaneously, would it affect their capital choices. If there is any change in capital choices explain the causes behind the changes.
c) Consider again the two-stage game. Is it profitable for firm 1 to deter completely the entrance of firm 1?
d) Suppose that to enter in the industry firm 2 has to incur a sunk cost f such that $1/185<f<1/16$. Is it profitable for firm 1 to completely deter the entrance of firm 2?

4.3.- Consider the following three-stage game between an incumbent firm and a potential entrant. The incumbent can incur in a sunk cost and use it as a threat of price predation if the entrant decides to enter the market (the incumbent aim is that the simple threat of predatory pricing were a barrier to entry). The sequence of the game is as follows. In the first stage the incumbent firm, has to decide whether or not to carry out F=5, this implies a sunk costs for the incumbent firm. In the second stage, the potential entrant has to decide whether or not to enter the market. Finally, in the third stage, and if entry happens, the incumbent firm has to decide whether to accommodate the entrance (this implies profits π_D=3 for both firms) or to set predatory prices, price-war (this implies losses of π_G=-1, both for the entrant and the incumbent firm). If the potential entrant does not enter the market, the incumbent firm acts as a monopolist and obtain profits of π_M= 10.

a) Draw the game in tree-form and determine the perfect equilibrium, is the threat of predation credible?
b) What would happen with the equilibrium if F were equal to 3, would the threat of predation be credible?
c) In light of the previous example explain how the incumbent firm can prevent (deter) the entrance of other firms in the market (i.e. explain the possibilities that the incumbent firm has to make the threat of predation credible). Is there any other possibility that can use the incumbent firm to give credibility to the threat of predation?

4.4. - Consider the following three stage game between an incumbent firm and a potential entrant. The potential entrant can sign a contract before the potential entrant decides whether to enter the market. Signing this contract it will have to pay a fine (F) if when facing potential entrance it does not set predatory prices (the incumbent firm aims to make credible the threat of predation by signing the former contract). The sequence of the game is as follows. In the first stage the entrant has to decide whether or not to sign the contract. In the second stage the potential entrant has to decide whether or not to enter the market. Finally, in the third stage and if entry happens, the incumbent firm has to decide between accommodating (this implies profits of π_D=20 for both firms) the entrance and setting predatory prices (this implies profits of π_G=-10 for both firms If the potential entrant does not enter the market, the incumbent firm acts as a monopolist and obtains

profits of π_M= 50.

Draw the game in tree-form. Which is the minimum value of F that would make the threat of predation credible?

4.5. Consider the following three-stage game between an incumbent firm and a potential entrant. The incumbent can incur in a sunk cost and use it as a threat of predation if the entrant decides to enter the market (the incumbent aim is that the simple threat of predatory pricing were a barrier to entry). The sequence of the game is as follows. In the first stage the incumbent firm, has to decide whether or not to carry out F=20, this implies a sunk costs for the incumbent firm. In the second stage, the potential entrant has to decide whether or not to enter the market. Finally, in the third stage, and if entry happens, the incumbent firm has to decide whether to accommodate the entrance (this implies profits π_D=22 for both firms) or to set predatory prices, price-war (this implies losses of π_G=-3, both for the entrant and the incumbent firm). If the potential entrant does not enter the market, the incumbent firm acts as a monopolist and obtain profits of π_M= 50.

a) Draw the game in tree-form. The game in tree-form and determine the perfect equilibrium, is credible the threat of predation?
b) Which is the range of F for which the threat of predation is credible? Explain your answer.
c) Consider that part of the game in which F=0 (then we have a simple two-stage game). Consider a finite repetition of the game, which is the rate of preference for the future of the incumbent such that entrance does not happen?