**MANAGERIAL ECONOMICS AND INDUSTRIAL ORGANIZATION**

**September 2022**

1) Two identical firms are evaluating the opportunity to enter a market with homogeneous goods. Entry implies to bear fixed costs equal to K. Marginal costs are equal to c. If both firms enter, there will be a Bertrand-type game. Represent the above problem as a game:

- Which is the equilibrium in case of simultaneous choices?

- Which is the equilibrium in the case of sequential choices?

|  |  |  |
| --- | --- | --- |
| 1\2 | Enter | Do not Enter |
| Enter | -K,-K | **ΠM-K,0** |
| Do not Enter | **0, ΠM-K** | 0,0 |

In the simultaneous game there are two Nash equilibria, and in both equilibria one firm enters and the other stays out of the market.

Enter Firm 2 Enter -K,-K

Firm 1 Does not enter **ΠM-K,0**

Enter 0, ΠM-K

Does not enter Firm 2

Does not enter 0,0

If the game becomes sequential, the first mover (for example firm 1) enters and the second mover is driven out of the market (first mover advantage).

1. Consider an industry with three identical firms each selling a homogeneous good. Marginal cost is equal to 6. Industry demand is given by P = 10-Q. Assuming that firms compete in quantities

- Find the initial equilibrium

- Find the new equilibrium after two firms merge and the new firm resulting from the merger is able to reduce the marginal cost from 6 to 2.

- Is the merger paradox emerging in this case?

From P=10–q1-q2-q3, profits of firm 1 are equal to π1 =(4-q1-q2-q3) q1. By making the first derivative with respect to q1 and setting it equal to zero: 4-2q1-q2-q3=0. By symmetry: q1=q2=q3=1; P=7 and profits are equal to π1=π2=π3=(7-6)x1=1. After the merger, we have an asymmetric duopoly, with one firm (let’s say, firm 1) exhibiting marginal cost equal to 6 and one firm (firm 2) exhibiting marginal cost equal to 2.

π1 =(4-q1-q2) q1 and π2 =(8-q1-q2) q2. The two reactions functions are obtained as follows:

4-2q1-q2=0 and 8-2q2-q1=0 from which one gets: q1=2-1/2q2 and q2=4-1/2q1.

By solving the system of two equations in two unknown variables: q1=0 and q2=4; P=6; π1=0 and π2=16. The firms resulting from the merger becomes a monopolist and increases its profits from 2 to 16. Therefore, the merger paradox does not apply here.

1. Ferrero is monopolist in the production of Nutella, with the following demand function: QN = 9 – pN. Knowing the marginal cost is constant and equal to 1, compute the quantity of Nutella, the price and the profit of Ferrero. Ferrero starts also to produce cookies and is monopolist in this market, too. The demands are now QN=9–pN-0.5pC and QC=9–pC-0.5pN, marginal costs are equal to 1 for both Nutella and cookies, and fixed costs of joint production are equal to 2 Compute the optimal quantities of QN and QC, prices and profits.

The monopolist equates marginal revenue and marginal cost: From the inverse demand function: pN = 9 – QN, marginal revenue is equal to MRN= 9–2QN. Equating marginal revenue and marginal cost: 9–2QN=1, from which QN=4 pN=5 and profits π = (5-1)·4=16.

In the case of multiproduct monopoly with interdependent demand:

π = (9 – pN -0.5 pC)·( pN - 1)+(9 – pC - 0.5 pN)·( pC - 1). Maximizing profits with respect to pN and pC one gets the first order conditions: dπ/dpN = 0 and dπ/dpC = 0:

9 – 2pN +1 - 0.5 pC - 0.5 pN+0.5 = 0 and 9 – 2pC +1 - 0.5 pN - 0.5 pN+0.5 = 0 from which one gets:

QN= QC= 3.75; pN= pC=3.5 and profits π = (3.5-1)·3.75+(3.5-1)·3.75-2=16.75.

Since the goods are complementary goods, the price reduces in order to stimulate demand. Considering the fact that there are fixed costs, profits only slightly increase.

4) The following table shows the costs of two single product firms specialized in gas and electricity distribution, as well as the costs of firms diversified in both activities. The costs of a big firm specialized in gas (3000 cubic meters) and of a big firm specialized in electricity (3000 kwh) are given. Fill the other cases of the table, considering that:

- there are constant returns to scale in gas distribution

- there are scale diseconomies in electricity distribution

- there are scope economies only for small and medium-sized firms

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| *Gas*  Elect | *0* | *1000 mc* | *2000 mc* | *3000 mc* |
| 0 | - | 500 | 1000 | **1500** |
| 1000 kwh | 300 | 750 | 1250 | 1800 |
| 2000 kwh | 620 | 1100 | 1500 | 2200 |
| 3000 kwh | **1000** | 1500 | 2100 | 2600 |

1. A firm sell cars in Italy and in France. The demand for the Italian market is qi=80-2pi and the demand for the French market is qf=40-4pf. Marginal cost is constant and equal to 4 in both markets.

- If the cars must be sold at the same price across Europe, which will be the prices, quantities and profits?

- If different prices can be applied in Italy and France, which will be the optimal choice of the monopolist?

If the monopolist sells at the same price in both countries, the demand function becomes qi+qf= Q=120-6p, and the associated inverse demand is p = (120-Q)/6. Equating marginal revenue to marginal cost, one gets 20- 1/3 Q = 4, from which Q=48, p=12 and π =384.

**NB. This solution has been accepted at the exam but is wrong, because if p=12, qf= - 8! The aggregate demand Q=120-6p is valid only for prices below 10. Therefore, the optimal solution is to set a price equal to 22, cars will be sold only in Italy and profits will be equal to 648.**

By allowing for third-degree price discrimination, the profit function becomes: π = (40-0.5qi)qi+(10-0.25qf)qf-4qi-4qf. The first order conditions in the two markets are: 40-qi=4 e 10-0.5qf=4 from which one gets qi=36 and qf=12. Prices are equal to pi=22 and pf=7 and profits are equal to πi = 648 and πf = 36. With third-degree price discrimination, profits increase by 36.

1. The optimal length and breadth of a patent.