**MANAGERIAL ECONOMICS AND INDUSTRIAL ORGANIZATION**

**June 2023**

1. Imagine a situation in which firm 1 can choose if producing good A, good B, neither A nor B, or both A and B, and firm 2 can decide if manufacture good C or doing nothing. Profits in the different scenarios are shown in the following table:

|  |  |  |
| --- | --- | --- |
| **Goods produced** | **Profits Firm 1** | **Profits Firm 2** |
| **A** | 20 | 0 |
| **A, B** | 18 | 0 |
| **A, B, C** | 2 | -2 |
| **B, C** | -3 | -3 |
| **C** | 0 | 10 |
| **A, C** | 8 | 8 |
| **B** | 11 | 0 |

Imagine that firm 1 is choosing before firm 2. Represent the sequential game and find the subgame perfect equilibrium. Is there a first mover advantage for Firm 1?

C 8,8

I2 Nothing 20,0

A C 2,-2

Firm 1 A,B I2 Nothing

**18,0**

B C -3,-3

Nothing I2 Nothing

11,0

I2 C

0,10

Nothing

0,0

The subgame perfect equilibrium is [(A,B) , Nothing] and payoffs are equal to (18,0). Firm 1 has a first mover advantage, since in the simultaneous game the Nash Equilibrium would be [A, C] with payoffs equal to 8 for both firms.

1. A producer of wine has two type of consumers: restaurants and individuals. There are 15000 bottles of wine in stock. The demand functions of the two categories of consumers are qr=1000-10p and qi=50-p. There are 20 restaurants and 100 individuals. Assuming that the marginal cost of production is equal to zero, find the optimal solution in case of third-degree price discrimination and in the case in which discrimination is not possible. How your answer changes if there are 10000 bottles on stock?

If it is possible to discriminate, marginal revenue is set equal to the marginal cost in both submarkets. Considering the 20 restaurants, the demand is Qr=20000-200pr, therefore the inverse demand function is pr=100-1/200 Qr. From the first order condition 100-1/100 Qr=0 one gets Qr=10000 and pr=50. Similarly, considering the 100 individuals, Qi=5000-100pi, and the inverse demand function is pi=50-1/100 qi. From 50-1/50 Qi =0 one gets Qi=2500 and pi=25. Profits are equal to (10000x50)+(2500x25)=562500 and 2500 bottles are unsold.

In the case of no discrimination, we have to sum the two demands: Q=25000-300p. The inverse demand function is p= 83.333 – 1/300 Q. From the first order condition: 83.33-1/150Q=0 from which one gets Q=12500 and p=41.6666. Profits are equal to 520.833. Again, 2500 bottles are unsold.

If the number of bottles in stock is only 10000, without price discrimination P=50 and profit will be equal to 500.000. With price discrimination the situation does not change. All the bottles will be sold at the restaurants only.

1. Consider one sector with 10 firms with the following market shares: 25, 15, 12,

10, 10, 8, 7, 5, 5, e 3. Compute the CR4 ratio and the Herfindahl index. How the two indices change if the fifth largest firm merges with the sixth largest firm?

CR4 is 62% and after the merger becomes 70%. HHI is obtained by summing the squares of market shares. Before the merger is equal to 1366 (or, using percentage shares, 0.1366) and after the merger it raises to 1526 (or 0.1526), assuming that the quantities will not change after the merger (in the real world this is not at all guaranteed!!).

1. Suppose that there are two firms competing à la Cournot and investing in advertising. The demand functions are, respectively: p1= 10+z1-q1-0.5q2 and p2=10+z2-q2-0.5q1. Marginal cost of production is constant and equal to 2, while the total cost of advertising is 2z2.

Find the equilibrium (quantities, prices, profits).

We have to write down the profit and make the first derivative with respect to q and to z, respectively.

d π1/dq1=0🡪 10-2q1+z1-0.5q2=2

dπ1/ dz1=0🡪 q1=4z1

d π2/dq2=0🡪10-2q2+z2-0.5q1=2

d π2/dz2=0🡪 q2=4z2

By symmetry: q1=q2 and z1=z2, therefore 8-2.5q+z=0🡪8-10z+z=0🡪 z=0.888, q=3.555, p=5.555 and profits are equal to (5.555-2)3.555-2.0.88882=11.05.

1. The production of frozen pasta requires two ingredients: pasta and sauce. There is a monopolist that produces the sauce (firm A) and a monopolist that produces pasta (firm B). They both sell pasta and sauce to a food processing monopolist (firm C) that sells the frozen pasta in supermarkets. The final demand for frozen pasta is P = 50 – Q. The marginal cost for processing the food is equal to 5. The marginal cost of producing pasta is equal to 5 and the marginal cost of producing sauce is equal to 2.5. Find the equilibrium (quantities, final price of frozen pasta, profits of the three firms). Imagine that firm C merges with firm A. Compute the new equilibrium.

Starting from the downstream stage, firm C profits are πC = (50-Q)Q- PpQ – PsQ – 5Q. By making the first derivative with respect to Q we get the inverse demand functions for firms A and B: 50-2Q-5-Pp-Ps=0, therefore Q = (45 – Pp – Ps)/2. From the above expression we get

Pp= 45-2Q – Ps and Ps =45 – 2Q – Pp. Equating marginal revenues with marginal costs:

45-4Q-Ps=2.5 and 45-4Q-Pp=5. From this we obtain Ps + Pp = 82.5-8Q. Substituting in Q = (45 – Pp – Ps)/2 one gets Q=(45-82.5+8Q)/2🡪 6Q=37.5 and Q=6.25; P=43.75, Pp=17.5 and Ps=15. Therefore, sauces are sold at 15, pasta at 17.5 and the frozen pasta at 43.75.

Profits are, respectively:

πC=(43.75-5-15-17.5)x6.25=39.06, πB=(17.5-5)x6.25=78.1 and πA=(15-2.5)x6.25=78.1

If firm C merges with firm A we have two successive monopolies. Profits of the merged firms are :πC+A = (50-Q) Q– PsQ – 7.5 Q. By making the first derivative with respect to Q one gets the demand function for firm B: 50-2Q-7.5-Ps=0 🡪 Ps = 42.5 – 2Q. Equating marginal revenue with marginal cost: 42.5-4Q= 5 from which Q=9.375, Ps= 23.75 and P=40.625. Profits of the merged firm are equal to (40.625-7.5-23.75)x9.375=87.9 and profits of firm B to (23.75-5)x9.375=175.78.

6) Which are the main problems that can emerge in sectors that exhibit network effects?