**MANAGERIAL ECONOMICS AND INDUSTRIAL ORGANIZATION**

**June 2022**

1. Lidl and Aldi are two big supermarkets considering reducing their prices. The following table shows the payoffs associated to the different possible strategies

|  |  |  |  |
| --- | --- | --- | --- |
| **If Lidl decides to ..** | **And Aldi decides to ….** | **Then, Lidl’s profits are..** | **and Aldi’s profits are …** |
| Keep the same prices | Keep the same prices | 200 | 250 |
| Keep the same prices | Reduce prices | 150 | 210 |
| Reduce prices | Keep the same prices | 230 | 190 |
| Reduce prices | Reduce prices | 190 | 220 |

Describe the game as a simultaneous game and find the Nash equilibrium. Then transform the game into a sequential game. How much would Lidl be willing to spend in order to have the right being the first mover?

In the following simultaneous game, the unique Nash equilibrium is (Low price, Low price) with profits equal to 190 for Lidl and 220 for Aldi. This is because for Lidl the dominating strategy is charging a low price.

**Aldi**

|  |  |  |
| --- | --- | --- |
|  | Same price | Low price |
|  |  |  |
| Same price | 200,**250** | 150,**210** |
| Low price | 230,**190** | 190,**220** |

Lidl

If the game becomes sequential, when Lidl moves as first the subgame perfect equilibrium foresees that Lidl keeps the same price, Aldi reacts by charging the same price, and profits are 200 and 250, respectively. If Aldi moves as first, instead, the subgame perfect equilibrium foresees Aldi charging a low price and Lidl reacting by changing a low price. Therefore, Lidl is willing to spend up to 10 in order to be the first mover, since its profits would increase from 190 to 200.

Same price 200, **250**

Same price **Aldi** Low price 150, **210**

Lidl Low Price **Aldi** Same price

230, **190**

Low price

190,**220**

Same price 250, **200**

Same price **Lidl** Low price 190, **230**

Aldi Low Price **Lidl** Same price

210, **150**

Low price

220,**190**

1. Firm A and B compete in price. The demand functions are respectively QA =60 – 4 PA+2.5 PB and QB=50-5PB+2PA. Firm A has a marginal cost of 5 and firm B has a marginal cost of 4. Find the equilibrium (prices, quantities, profits).

Firstly, one has to derive the profit functions of the two firms, and make the first derivative with respect to price, obtaining two best response functions.

πA= (PA -5)[60 – 4 PA + 2.5 PB] and πB= (PB -4)[50 – 5 PB + 2 PA]

By setting the first derivatives equal to zero:

60-8PA + 2.5 PB +20 =0 🡪 PA= 10+0.3125 PB

50-10PB + 2 PA +20 =0 🡪 PB= 7+0.2 PA

By equating the two reaction function, one gets PA=13 PB=9.6, QA=32 QB=28 and profits equal to πA=256 and πB=156.8

1. Ryanair has a total demand given by Q = 600 – 4P where Q is the number of passengers per year, and P is the fare. In the peak season the demand is given by Qh = 320 – 1.5 Ph and in the off-season the demand is given by Ql=280-2.5 Pl. The total cost function is C = 6000 + 60 Q.

Find the optimal choice in the case of no price discrimination

Find the optimal choice with third degree price discrimination

Compute the demand elasticities in each segment.

In the case of no discrimination, the inverse demand function is: P = 150 – ¼ Q. Equating marginal revenue with marginal cost one gets 150 -1/2Q=60. Q= 180, P=105 and profit are equal to 2100.

In the case of discrimination, profits are πh= (Ph-60)(320-1.5Ph) in the peak season and

πl= (Pl-60)(280-2.5Pl) in the low demand season.

By making the first derivatives with respect to Ph and Pl, respectively:

320-3Ph+90=0 and 280-5Pl+150=0, from which one gets Ph=136.666 and Pl=86. Quantities are equal to Qh=115 and Ql=65 and profits are equal to 4507.

The demand elasticities are respectively εh=-1.5x136.66/115= - 1.78 and εl =-2.5x86/65=-3.3

1. Four firms operate in a market with the following market shares: Qu1t=0.5, Qu2t=0.2, Qu3t=0.2 and Qu4t=0.1.  Compute the CR3 ratio and the Herfindahl index. Suppose now that firms 2, 3 and 4 merge and that two new firms enter the market with the same size of firm 1. Compute the new CR3 ratio and the Herfindahl index. Is collusion more likely now or in the previous situation?

The CR3 ratio is 0.9, while the Herfindahl concentration index is 0.34. After the merger and the entry of new firms, we have four firms of the same size. Therefore, the CR3 ratio reduces to 0.75 and the Herfindahl index becomes 0.252+0.252+0.252+0.252=0.25. In spite of the fact that concentration reduces, symmetry between firms increases, so it is relatively easier to make collusive agreements.

1. A and B are two upstream firms that manufacture a homogenous good and sell it to firm C. Firm C sells the final good to the consumers, according to the following demand function:

P = 20 -Q. Marginal cost of A and B are equal to 4, and the additional marginal cost that firm C has to bear to distribute the product is equal to 1.

Find the initial equilibrium in the case of Bertrand competition and in the case of Cournot competition. In both cases, who is gaining from a merger between A and B?

We solve by considering firstly the downstream stage. The price at which firms A and B sell to firm C is w, and the marginal cost of firm C is therefore w+1. By equating marginal revenue and marginal cost: 20-2Q=w+1. The inverse demand function for the upstream firms is therefore w = 19 -2Q.

In the case of Bertrand competition, price is equal to the marginal cost, therefore w=4, Q=7.5, p=12.5 and profits are πA= πB=0 and πC=(12.5-5)x7.5=56.25.

In the case of Cournot competition: w = 19 – 2q1 – 2q2. The profit functions of the upstream firms are πA= (19-2qA-2qB)qA – 4qA and πB= (19-2qB-2qA)qB – 4qB.

By making the first derivative with respect to the quantity, one gets the following reaction functions: qA=3.75-1/2qB and qB=3.75-1/2qA. By symmetry, qA=qB=2.5, w=9 p=15 and πA= πB=12.5 and πC=(15-10)x5=25.

If firms A and B merge, we have the classical double monopoly mark-up. Marginal revenue in the upstream stage is 19-4Q. Equating it to the marginal cost 4 one gets Q=3.75, w=11.5 p=16.25 and πA+πB=28.125 and πC=(16.25-12.5)x3.75=14.0625.

In both cases, a merger reduces the welfare of consumers (who pay a higher price) and of firm C (that reduces profits). The only gainers are firm A and B, the merging firms, especially if the initial situation is Bertrand competition (because they are making zero profits).

1. Referring to industries with network effects, what are the main problems in a context of a monopoly and in a context of an oligopoly?