**MANAGERIAL ECONOMICS AND INDUSTRIAL ORGANIZATION**

**May 2022**

1. Firm 1 and 2 are competing in a market, and firm 2 is evaluating the opportunity to enter in a second market. With reference to the following sequential game (where, after the decision to enter or not, the two firms play a simultaneous game), find the Nash equilibrium in the two simultaneous games and tell if firm 2 will enter or not.

 **Firm 2**

|  |  |  |
| --- | --- | --- |
|  | High price | Low price |
| High price | 5,**5** | 1,**6** |
| Low price | 4,**3** | 2,**2** |

 Enter Firm 1

**Firm 2**

 Does not enter **Firm 2**

|  |  |  |
| --- | --- | --- |
|  | High price | Low price |
| High price | 4,**2** | 2,**5** |
| Low price | 3,**3** | 2,**2** |

 Firm 1

If firm 2 enters, in the subsequent simultaneous game there is not a Nash equilibrium. If firm 2 does not enter, in the subsequent simultaneous game there is a unique Nash equilibrium: High price/Low price with payoffs 2 and 5. Since firm 2 is gaining 5, we can expect that she will decide not to enter. It is true that firm 2 could gain 5 or even 6 by entering, but the absence of the Nash equilibrium make the entry choice much more riskier than staying out of the market.

1. PK Corp estimates that its demand function is as follows:

Q = 150 – 5.4 P + 0.8 A + 2.8 Y -1.2 Pj

where Q is the quantity demanded per month (thousands of units), P is the product price, A is the firm’s advertising expenditures (in thousands of euros). Y is per capita income (thousands of euros) and Pj is the price of BJ Corp.

- if income increases by 2500, how will the firm’s quantity increase?

- if PK wants to raise its price by offset the effect of the increase in income, by how much must it raise its price?

- next year PK intends to charge a price equal to 15, to spend 10000 in advertising, while it believes that income will be 12000 and Pj will be 3. Compute the income elasticity of demand. What does it tell about the nature of PK’s product?

- what effect would an increase in advertising of 1000 have on profitability, if each additional unit costs 10 to produce?

If income increases by 2500, Q increases by 2.8x2.5 = 7, therefore by 7000 units.

If PK wants to offset the effect of the increase in income, it must increase the price by 7/5.4=1.3 euros.

By substituting the corresponding values, Q = 107 (thousands). The income elasticity of demand is therefore equal to 2.8x12/107=0.31, so the good manufactured by PK appears to be a necessary and normal good.

If advertising expenditures raise by 1000, quantity increases by 800, which means that sales increase by 12000. Since unit costs are 10 and advertising costs increase by 1000, profits increase by 12000-8000-1000=3000.

1. Depict in the two graphs below two duopoly equilibria with symmetric firms, one relative to the case of simultaneous quantity choices with differentiated products and the other with simultaneous price choices with differentiated products. Show in the graphs the two new equilibria after that firm 1 experiences a decrease in marginal cost.

 P2

 Q2

 B A

 A B

 Q1 P1

4) Consider the following table that reports the willingness to pay for the programs Word and Excel by 100 consumers. The marginal cost of production is 5 for both Word and Excel.

- If the monopolist can operate a first-degree price discrimination, how much will be profits?

- Compute the profits in case of separate sale of the two programs

- Compute the profits in case of mixed bundling

|  |  |  |  |
| --- | --- | --- | --- |
|  | Number of Users | WORD | EXCEL |
| Professor | 40 | 50 | 10 |
| Accountant | 40 | 10 | 50 |
| Generalist | 20 | 35 | 35 |

In the case of first degree price discrimination, the firm will sell at a price corresponding to the willingness to pay of individuals. Therefore, Word will be sold at 50 to Professors, at 10 to Accountants and at 35 to Generalists and Excel will be sold at 10 to Professors, at 50 to Accountants and at 35 to Generalists. Profits will therefore be 2400+2400+1400-5x200=**5200**.

In the case of separate sales, there are two best options: to sell Word at 35 and Excel at 35 or, equivalently, to sell Word at 50 and Excel at 50. Profits will be 35x60+35x60-5x120=**3600** or 50x40+50x40-5x80=**3600**. In the case of mixed bundling, the programs could be sold at a price of 50 and the package at a price of 70, totaling profits equal to 50x40+50x40+70x20-5x120=**4800**. However, it is better to sell the package at 60, and selecting high separate prices for the two programs (for example, 51 or 52). In this case, profits will be equal to 60x100-5x200=**5000** (pure bundling).

5)There are two identical firms with marginal cost equal to 6. The inverse demand function is: P=10-Q. Imagine that one firm is innovating and is reducing its marginal cost from 6 to 4. Find the initial and the new equilibrium in the case of price competition.

Find the initial and the new equilibrium in the case of quantity competition. Answer to the same questions in the case of a drastic innovation.

In the case of price competition, the initial price is 6 and both firms are making zero profits. After the incremental innovation, the firm that reduced marginal cost is able to charge a price slightly lower than 6, so it will sell 4 units and will earn profits equal to 8. In the case of a drastic innovation, marginal cost has to reduce from 6 to 2 (at least, of course it can reduce also more than that…). Only if marginal cost is 2 or below 2 the innovator can charge the monopoly price (or a price slightly lower than that) and keep out of the market the rival. If marginal cost is 2, profits will be (6-2)x4=16.

In the case of quantity competition, we have to solve a Cournot model. Profits of both firms are: πi= (10-qi-qj)qi – 6qi. By making the first derivative with respect to quantity, one gets the reaction functions: 10-2qi-qj=6 🡪 qi = 2 – ½ qj. By symmetry: qi=qj=1.333, p=7.333 and πi= πj=1.777.

After incremental innovation, we have to solve an asymmetric Cournot model. The innovator changes its reaction function to qi = 3 – ½ qj, while the other reaction function remains qj = 2 – ½ qi. By solving the system of two equations one gets qi=2.666, qj=0.666, p=6.6666 and πi=7.11 and πj=0.444.

Finally, after drastic innovation with new marginal cost equal to 2, we have the same results as the Bertrand model: the innovator will be a monopolist producing 4. The price will be 6 and profits will be 16. The rival stays out of the market (i.e., if firm j produces 4, firm j’s reaction is to produce zero).

6) Choose two vertical restraints and describe the potential advantages as well as the potential anticompetitive effects.