

Economics of Business and Markets

International MSc. in Business Administration

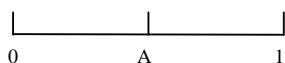
Problem Set 2

Exercise 1

a)

In this particular case, transportation costs must be interpreted as the desutility faced by the consumer forced to consume a product with different features than the ones he preferred.

b)



The optimal location for firm A is the center of the market. Assuming that firms will cover the entire market, the profit maximizing price is such that the total price paid by the consumer located on the market extremes is equal to the reservation price.

$$P_A + (1 - 0,5)^2 \leq 4$$

$$P_A = 4 - 0,5^2$$

$$P_A = 3,75$$

$$\pi = 3,75 \times N$$

c) Firm B can choose either 0 or 1.



From the principle of maximum differentiation firm B will choose to locate either on 0 or 1.

$$P_A + (x - 0,5)^2 = P_B + (1 - x)^2$$

$$P_A + x^2 - x + 0,25 = P_B + 1 - 2x + x^2$$

$$x = P_B - P_A + 1 - 0,25$$

$$x^* = P_B - P_A + 0,75$$

$$\text{Max}_{P_A} \pi_A = P_A \times D_A \times N =$$

$$= (P_B - P_A + 0,75) \times P_A \times N$$

$$\frac{\partial \pi_B}{\partial P_B} = 0 \Leftrightarrow 0,75 - 2P_A + P_B = 0$$

$$P_A = \frac{0,75 + P_B}{2}$$

$$\text{Max}_{P_B} \pi_B = P_B \times D_B \times N =$$

$$= (1 - P_B + P_A - 0,75) \times P_B \times N$$

$$\frac{\partial \pi_B}{\partial P_B} = 0 \Leftrightarrow 0,25 - 2P_B + P_A = 0$$

$$P_B = \frac{0,25 + P_A}{2}$$

Equilibrium:

$$\begin{cases} P_A = \frac{0,75 + P_B}{2} \\ P_B = \frac{0,25 + P_A}{2} \end{cases} \Leftrightarrow 2P_A = \frac{0,25 + P_A}{2} + 0,75 \Leftrightarrow 4P_A = 0,25 + P_A + 1,5 \Leftrightarrow$$

$$\Leftrightarrow 3P_A = 1,75 \Leftrightarrow P_A^* = 0,583; P_B^* = 0,416$$

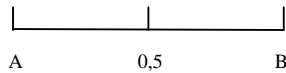
$$x^* = P_B - P_A + 0,75 \Leftrightarrow x^* = 0,416 - 0,583 + 0,75 \Leftrightarrow x^* = 0,583$$

$$\pi_A = P_A \times x^* \times N = 0,583^2 \times N = 0,3399N$$

$$\pi_B = P_B \times (1 - x^*) \times N = 0,416 \times 0,417 \times N = 0,1738N$$

d) Knowing that firm B is going to enter the market, firm A will produce a good as different as possible from the firm's B good in order to relax price competition.

However, since changing product variety implies a fixed cost, firm A will change its "location" if and only if the increase in profits after re-location covers the fixed cost of changing "location".



$$\begin{aligned} \text{Max}_{P_A} \pi_A &= P_A \times x^* \times N = \\ &= P_A \times \left(\frac{P_B - P_A}{2} + \frac{1}{2} \right) \times N \\ P_A + x^2 &= P_B + (1 - x)^2 \\ P_A &= P_B + 1 - 2x \\ 2x &= P_B - P_A + 1 \\ x &= \frac{P_B - P_A}{2} + \frac{1}{2} \\ \frac{\partial \pi_A}{\partial P_A} &= 0 \Leftrightarrow \frac{P_B - 2P_A}{2} + \frac{1}{2} = 0 \\ 2P_A &= P_B + 1 \\ P_A^* &= P_B^* = 1 \\ x^* &= \frac{1}{2} \\ \pi_A &= \pi_B = 0,5N \end{aligned}$$

$$\pi_A \Big|_{A=0} - \pi_A \Big|_{A=0,5} = 0,5N - 0,3398N = 0,161N > 0,1N$$

d)

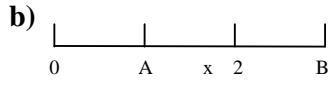
Firm A would prefer to stay in location 0,5 (market center) if w is such that firm B's profit ($\pi_B = 0,1738N$) is not enough to cover w : $w > 0,1738N$, in this case firm A could deter firm B's entry.

Exercise 2

a)

$$P_A + (3 - 1)^2 \leq 12 \Leftrightarrow P_A \leq 12 - 4$$

$$P_A = 8$$



$$P_A + (x-1)^2 = P_B + (3-x)^2$$

$$P_A + x^2 - 2x + 1 = P_B + 9 - 6x + x^2$$

$$4x = P_B - P_A + 8$$

$$x = \frac{P_B - P_A}{4} + 2$$

$$\pi_A = P_A \left(\frac{P_B - P_A}{4} + 2 \right)$$

$$\pi_B = P_B \left(3 - \frac{P_B - P_A}{4} - 2 \right)$$

$$\frac{\partial \pi_A}{\partial P_A} = 0 \Leftrightarrow \frac{P_B - 2P_A}{4} + 2 = 0$$

$$\frac{\partial \pi_B}{\partial P_B} = 0 \Leftrightarrow 1 - \frac{2P_B - P_A}{4} = 0$$

$$P_A = \frac{P_B + 8}{2}$$

$$P_B = \frac{P_A + 4}{2}$$

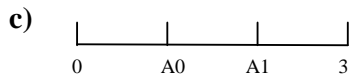
Equilibrium:

$$\begin{cases} P_A = \frac{P_B + 8}{2} \\ P_B = \frac{P_A + 4}{2} \end{cases} \Leftrightarrow 2P_A = \frac{4 + P_A}{2} + 8 \Leftrightarrow 4P_A = 4 + P_A + 16 \Leftrightarrow 3P_A = 20 \Leftrightarrow P_A = \frac{20}{3} \approx 6,6$$

$$P_B = \frac{10,6}{2} = 5,3$$

$$x^* = \frac{-1,3 + 8}{4} = \frac{6,7}{4} = 1,6$$

$$\pi_A = 6,6 \times 1,6 \times \frac{N}{3} = 10,56 \times \frac{N}{3}; \pi_B = 5,3 \times (3 - 1,6) \times \frac{N}{3} = 5,3 \times 1,4 \times \frac{N}{3} = 7,42 \times \frac{N}{3}$$



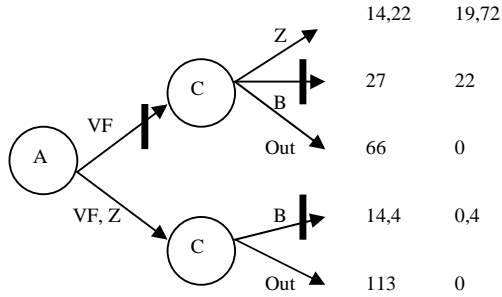
By introducing a new product firm A increases price competition therefore firm B's profits will be lower than in the previous case. Firm A wants to deter firm's B entry and it succeeds if $\pi_B|_{post-entry}$ is lower than $F = S$, the sunk cost.

Exercise 3

If there is no price competition in the second stage, the equilibrium in locations in the first stage is the one where both firms are located in the center of the market.

Exercise 4

a)



Nash Eq°: A \longrightarrow VF
C \longrightarrow B

b)

$$P_A + 2(x-0)^2 = P_B + 2(3-x)^2$$

$$P_A + 2x^2 = P_B + 2 \times 9 - 2 \times 6x + 2x^2$$

$$12x = P_B - P_A + 18$$

$$x = \frac{P_B - P_A}{12} + \frac{3}{2}$$

$$\pi_A = P_A \times x^* \times \frac{3000}{3}$$

$$\frac{\partial \pi_A}{\partial P_A} = 0 \Leftrightarrow \frac{P_B - 2P_A}{2} + \frac{3}{2} = 0$$

$$P_A = \frac{P_B + 18}{2}$$

$$\pi_B = P_B \times (3-x^*) \times \frac{3000}{3}$$

$$\frac{\partial \pi_B}{\partial P_B} = 0 \Leftrightarrow 36 - 2P_B + P_A = 0$$

$$P_B = \frac{P_A + 18}{2}$$

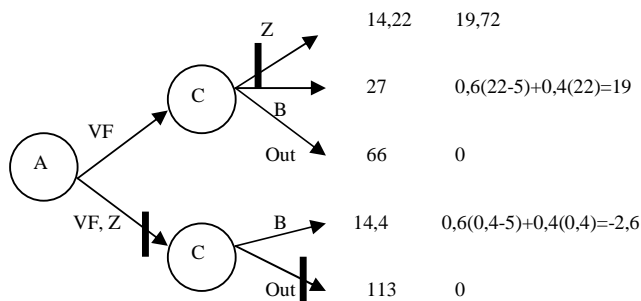
Equilibrium:

$$P_A^* = P_B^* = 18$$

$$x^* = 1,5$$

$$\pi_A^* = \pi_B^* = 27$$

c)



Now firm A will open a storehouse in Zaragoza in order to deter B's entry.

Exercise 5

Lower price dispersion may result from two factors:

- It is easier to obtain information about online store prices than to obtain prices about conventional retailers
- Online stores have one less dimension or differentiation with respect to traditional stores: geographic location.

Exercise 6

- a) Limit pricing. It was also a signal that they would fight entry in the US market, once the patent expires.
- b) It was a successful strategy to defend the US market.
- c) Coke and Pepsi

Exercise 7

In order to deter entry the incumbent firm must invest in highly specialized machinery because it is a sunk cost and therefore expanding its capacity is a credible strategy to deter entry.

Investments in equipment that can be resold do not have commitment value.