ECO 650: Firms' Strategies and Markets

Innovation

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Exercise 1:

Assumptions:

- Consider that consumers are uniformly distributed along the Hotelling line $[0, 1]$.
- Two firms 1 and 2 are located at the extreme.
- Consumers incurs a quadratic transportation cost and the utility is of the form : $V - td^2 - p$ where $d = |x_i - x|$ is the distance to firm i.
- We apply the model of Federico, Angus & Valletti (2017) and thus look for the profit that firms obtain in all cases, i.e. Π_1, π_2 and Π_2.

Questions:

1. Determine Π_1, i.e. the profit when only firm is active, firm 1 say.
   a) Determine the demand of firm 1 for $V > 3t$.
   b) Write down the profit of firm 1 and determine its optimal price and the value of Π_1.
2. Determine the profit π_2 when the two firms are active on the market.
3. Determine the profit Π_2 that a merged entity would get from a second innovation.
4. Is there more or less innovation after the merger?

1. Determine Π_1, i.e. the profit when only firm is active , firm 1 say for $V > 3t$.

a) Determine the demand of firm 1.

The address of the consumer indifferent between buying the product or not is $V - tx^2 - p \geq 0 \Leftrightarrow \hat{x} = (\frac{V-P}{t})^{1/2}$

b) Write down the profit of firm 1 and determine its optimal price and the value of Π_1.

The profit of firm 1 is $p(\frac{V-P}{t})^{1/2}$. It is maximized for $p_1 = \frac{2V}{3}$ and the corresponding demand is $(\frac{V}{3t})^{1/2}$. However, for $V > 3t$ it means that the demand is larger than 1 which is not possible.

This implies that in equilibrium the market is covered, all consumers are served and the price is the largest such that it serves all consumers, i.e. $p_1 = V - t$, and $\Pi_1 = V - t$.

Exercice 1: Solution

2. Determine the profit π_2 when the two firms are active on the market.

Here, we determine the address of the consumer indifferent between the two firms.

$$V - tx^2 - p = V - t(1-x)^2 - p \Leftrightarrow \tilde{x} = \frac{1}{2} - \frac{(p_1 - p_2)}{2t}.$$

Thus firm 1 maximizes

$$p_1(\frac{1}{2} - \frac{(p_1 - p_2)}{2t})$$

with respect to p_1. The FOC is :

$$\frac{1}{2} - \frac{p_1}{t} + \frac{p_2}{2t} = 0.$$

Using symmetry, we obtain as usual that $p_1 = p_2 = t$ and $\pi_2 = \frac{t}{2}$.

Exercice 1: Solution

3. Determine the profit Π_2 that a merged entity would get from a second innovation.

- If the merged entity has one innovation, it obtains Π_1.
- With two innovations, it can instead of competing coordinate the prices of the two labs.
- Suppose that the merged firm sets the same price p at both labs. It serves all consumers as long as the consumer located at the center, i.e. in $x = \frac{1}{2}$ buys the product, i.e. as long as $p \leq V - \frac{t}{4}$. Therefore, $\Pi_2 = V - \frac{t}{4}$.

4. Is there more or less innovation after the merger?

- We directly apply the condition of Federico, Angus &Valletti (2017)
- $\Pi_2 - \Pi_1 = (V - \frac{t}{4}) - (V - t) = \frac{3t}{4}$.
- $\pi_2 = \frac{t}{2}$ and therefore we have that $\Pi_2 - \Pi_1 \geq \pi_2$ which implies that there is more innovation after the merger.

Conclusion: in presence of strong differentiation among innovations, the merger boosts the incentives to innovate.