

STRATEGY
(Bachelor of Science in Economics and Management)

Midterm exam

Answer each question on a separate sheet of paper. Good luck!

1. [15 minutes; 4 points] The following statement was recently made by a former student of this course:

"In higher education we observe big universities with more than ten thousand students coexisting with smaller universities with a few thousand students and small colleges with barely a thousand. This indicates that scale economies are relatively important compared to other factors in shaping the structure of the higher education market."

Comment in no more than ten lines (graphs, if any, excluded) while agreeing or disagreeing.

2. [15 minutes; 4 points] Jane Theory, the best student in her class, said:

"When production entails a fixed cost, competition can be such that the market may end up as a monopoly."

Comment in no more than ten lines (graphs, if any, excluded) while agreeing or disagreeing.

3. [45 minutes; 6 points] Two firms, denoted 1 and 2, with constant marginal and average costs of $c_1 = 2$ and $c_2 = 4$, respectively, compete in prices in a market whose demand equals $q = 10 - p$. Firm 1 is considering an investment in R&D that would lower its marginal and average cost to 1, i.e., $c_1 = 1$.

(i) Compute the direct effect in terms of profit of this investment.

(ii) Compute the strategic effect in terms of profit of this investment.

(iii) What is the maximum amount that firm 1 is willing to invest in this R&D project?

4. [45 minutes; 6 points] A car showroom sells a single luxury brand. Its monthly quantity demanded at the price that it currently charges for each car, 2, equals 0 units with probability $\frac{1}{3}$, 1 unit with probability $\frac{1}{3}$, and 2 units with probability $\frac{1}{3}$, i.e.

$$q = \begin{cases} 0 & \text{with probability } \frac{1}{3} \\ 1 & \text{with probability } \frac{1}{3} \\ 2 & \text{with probability } \frac{1}{3} \end{cases} \quad (1)$$

↓
demand

The marginal cost of each car is 1.5, and the monthly inventory cost equals 0.25 per car. When a car is not sold in a month, it becomes available for sale in the next month. When a car is sold in a given month, the inventory cost for that month is borne, regardless of the day in which the sale took place. *you always have it*

(i) Should the showroom have more than 2 cars as inventory? Why?

(ii) What is the expected profit when the showroom has no inventory whatsoever? And when it has 1 car as inventory? And 2 cars?

(iii) What is the optimal level of monthly inventory (number of cars) that the car showroom should carry?

(iv) What is the car showroom's expected profit?

Suppose now that the owner of the car showroom buys another showroom in a nearby town such that inventories can be shared. Each showroom can call the other and obtain a car when it has run out of inventories itself and a customer comes by and decides to buy. The transfer cost is negligible. Each showroom's quantity demanded at the current price, 2, still equals 0 units with probability $\frac{1}{3}$, 1 unit with probability $\frac{1}{3}$, and 2 units with probability $\frac{1}{3}$, and demands at the two showrooms are independent. Moreover, marginal and inventory costs are still 1.5 and 0.25 per month, respectively, just as before.

(v) Write the overall quantity-demanded function in a way similar to (1) above, while considering the five possible values that it can take. [Hint: for example, there are two ways in which the two showrooms' total quantity demanded could equal 1, namely, (a) if the quantity demanded at the old showroom is 1 and at the new equals 0, an event that has probability $\frac{1}{3} \times \frac{1}{3} = \frac{1}{9}$, and (b) if the quantity demanded at the old showroom is 0 and at the new equals 1, an event that also has probability $\frac{1}{3} \times \frac{1}{3} = \frac{1}{9}$.]

(vi) What is the optimal level of monthly inventory (number of cars) that the two car showrooms should carry in total?

(vii) What will the monthly profit of the two showrooms be in total?

(viii) Compare the results in (iv) and (vii) and explain the difference intuitively.