

# Nova School of Business and Economics

## Strategy 1207: Exercises

Vasco Santos  
Bernardo de Melo Pimentel  
David Henriques

### 1 Economics Primer

#### 1.1

Suppose a firm's plant produces  $Q$  units in any given year. The plant itself operates with annualized costs of \$10M and other annual fixed expenses totaling \$3M. In addition, the firm's variable costs depend on  $Q$  and are given by the formula  $5Q^2 + 3Q$ .

- What are the firm's average variable and fixed costs?
- What are the formulae for the firm's average and marginal costs?
- In general, if a firm is producing as efficiently as it can, what will the sign of the slope of its cost function be? Does this hold for the total cost function presented above? Explain.

#### 1.2

A vineyard entrepreneur employs 2 workers each earning \$4,000 and pays a \$1,000 yearly rent for the land. The variable production cost is the square of each ton of grapes used as input. Finally, each produced ton gets a \$6,000 subsidy from the Common Agricultural Policy.

- Write down the TC, AC and MC functions.
- What is the most efficient output with the given information?

Assume now that this entrepreneur competes with 99 other entrepreneurs that face exactly the same conditions and total market demand of  $Q = 400 - 50P$ .

- (c) Compute the market equilibrium with price, aggregate quantities and firm level quantity.
- (d) Compute the net profit of each producer.
- (e) Discuss the implications of previous result for industry behaviour in the medium term.

### 1.3

Albert's cinema is always completely sold out on Friday and Saturday, but only half its capacity is filled on the other days of the week. The theater has 100 seats and the operational costs of having the theater open and running amount to \$200 per session. What is the average cost per person on Friday/Saturday and on the other weekdays? How would you advice Albert on what kind of cinema goes he should try to attract, Friday/Saturday night ones or weekday night ones?

### 1.4

Suppose a factory is producing 100 units and the price of each unit is \$10. If raising the price to \$12 per unit results in a drop in sales of 12 units, what is the price elasticity of demand,  $\eta$ ?

### 1.5

If  $\eta = 0.8$  and  $P = \$25$ , what is the marginal revenue?

### 1.6

Fill the gaps on the table below:

Q	TC(Q)	VC(Q)	FC	ATC(Q)	AFC	AVC(Q)	MC(Q)
5						6	10
6	85						
7				15			
8					5		25
9		120					

## 2 Horizontal and Vertical Boundaries of the Firm

### 2.1

A firm produces two products, X and Y.  $C(i, j)$  represents the cost of producing  $i$  units of X and  $j$  units of Y. Knowing the following relationships:

- $C(5, 0) = 150$  and  $C(0, 50) = 100$
- $C(10, 0) = 320$  and  $C(0, 100) = 210$
- $C(10, 100) = 500$  and  $C(5, 50) = 240$

- (a) Does the production technology display economies of scale?
- (b) Does the production technology display economies of scope?
- (c) Distinguish between economies of scale and economies of scope. Why can one be present without the other?

### 2.2

A firm contemplating entering the market would need to invest \$100 million in a production plant (or about \$10 million annually on an amortized basis). Such a plant could produce about 100 million pounds of cereal per year.

- (a) What would be the average fixed costs of this plant if it ran at capacity?

Each year, U.S. breakfast cereal makers sell about 3 billion pounds of cereal.

- (b) What would be the average fixed cost if the cereal maker captured a 2% market share?
- (c) What would be its cost disadvantage if it achieved only a 1% share?

### 2.3

Suppose that two actors A and B start a commercial relationship which creates total value  $v > 0$  if no investment is made (which is shared equally), and value  $V > v$  if actor A makes an investment in machinery with cost  $K < V - v$ .

- (a) Describe shortly the "hold-up problem", and how it could arise in this situation.

Assume now that both actors bargain about the distribution of  $V$  in the following way: If they receive given values  $s_A$  and  $s_B$  in the case of no agreement, actor  $i$  receives  $\Pi_i = s_i + (V - s_A - s_B)/2$  if they arrive at an agreement.<sup>1</sup> Furthermore, assume that in case of no agreement actor A can sell his machine for  $\alpha K$ ,  $\alpha \in [0, 1]$ .

- (b) Which payoffs do players receive in the case of no agreement, given that the investment has been made?
- (c) Given the result in (b), how much does each actor receive after bargaining about the outcome?
- (d) How does the result in (c) depend on  $\alpha$ ? Interpret its meaning.
- (e) For which values of  $\alpha$  will A make the investment? Is this decision always efficient?
- (f) Can efficiency be restored if A's share of  $(V - s_A - s_B)$  is made dependent on  $\alpha$  (through the allocation of "power" in the contract)?

## 2.4

A computer company's cost function, which relates its average cost of production  $AC(Q)$  to its cumulative output in thousands of computers  $CQ$  and its plant size in terms of thousands of computers produced per year  $Q$ , within the production range of 10,000 to 50,000 computers is given by  $AC(Q) = 10 - 0.1CQ + 0.3Q$ .

- (a) Is there a learning curve effect?
- (b) Are there increasing, constant, or decreasing returns to scale?
- (c) During its existence, the firm has produced a total of 40,000 computers and is producing 10,000 computers this year. Next year it plans to increase its production to 12,000 computers. Will its average cost of production increase or decrease? Explain.

---

<sup>1</sup>This is the outcome of the (Nobel-prize-winning) Nash bargaining solution.

## 3 Agency and Coordination

### 3.1

Suppose that a landowner is unable to work on the land by himself. So he tries to hire someone to do the farming for him. Let  $x$  be the amount of effort that the worker expends, and let  $y = f(x)$  be the amount of output produced. The worker finds effort costly such that  $c(x)$  is the cost of effort  $x$ . Assume, for simplicity, that the price of the output is 1. Let  $s(y)$  be the amount that the landowner pays the worker if he produces  $y$ . The worker may have other job alternatives available that give him some utility  $\bar{u}$ .

- (a) What is the worker's participation constraint?
- (b) Formalise the landowner's maximization problem. What is the condition that defines the optimal level of effort? Can the landowner implement the optimal effort with a fixed wage?
- (c) Will the optimal effort be implemented with a rent  $R$ , i.e., defining  $s(f(x)) = f(x) - R$ ? If yes, determine the rent level.
- (d) Let  $w$  denote the wage. Can the landowner implement the optimal effort offering a payment with the form  $s(x) = wx + K$ ?
- (e) In sharecropping the worker and the landowner each get some fixed percentage of the output. Suppose that the worker's share takes the form  $s(x) = \alpha f(x) + F$ , where  $F$  is some constant and  $0 < \alpha < 1$ . Is sharecropping an efficient scheme to implement the efficient level of effort?

### 3.2

Giganticorp, a large conglomerate, has just acquired Nimble, Inc., a small manufacturing concern. Putting yourself in the shoes of Nimble's employees, what concerns do you have about the implicit incentive contracts that had, until the merger, governed your relationship with Nimble? Now place yourself in the position of Giganticorp's merger integration team. How might concern over implicit incentive contracts affect your dealings with Nimble's employees?

### 3.3

A risk neutral investor decides to start a new business. In doing so, the investor hires a manager who can choose between two effort levels  $e : e = e_L$

(low) and  $e = e_H$  (high). Project profitability is random and may assume two values:  $\pi_1$  with probability  $p(e)$  e  $\pi_2$  with probability  $(1 - p(e))$ , where  $\pi_1 < \pi_2$  e  $p(e_H) < p(e_L)$ . The utility of the manager depends on his wage  $w$  and on his effort level so that  $U(w, e) = v(w) - e$ . Assume  $v'(w) > 0$  and that the manager has a reserve utility of  $\underline{u}$ .

- (a) Suppose you are able to observe the effort level exerted by the manager and that this manager is a risk averse agent. Without solving any maximisation problem, determine the compensation scheme  $(w_1, w_2) = (w(\pi_1), w(\pi_2))$  that minimises the expected wage cost with the agent for an effort level of  $e_H$ .
- (b) Assume now that, because of lack of time, the investor is unable to observe the effort level exerted by the manager. Recall the manager is risk neutral and the investor wants him to exert a high effort level  $e_H$ . Further recall that the investor seeks to find a compensation scheme which minimizes the expected cost of the manager's wage. Do you think the compensation scheme  $(w_1, w_2)$  found in (a) may still be a solution in this situation? Explain.
- (c) Formalise the problem to be solved in (b). Argue (with or without computations) that the solution for the problem requires  $w_2 > w_1$ .

### 3.4

Given an employee cost of effort function (where  $e$  is given in hours worked per week and each unit of  $e$  produces an extra \$100 in sales:

$$c(e) = \begin{cases} 0, & e \leq 40 \\ 1/3(e - 40)^2, & e > 40. \end{cases}$$

- (a) What is the cost of effort for a 37 hour week?
- (b) If the firm offers a salary only job of \$500 per week, what is the employees payoff net of effort costs for a 49 hour work week?
- (c) If the firm offers a salary-plus-commission job of \$500 per week plus 20% of sales, how can we write the employees payoff function?
- (d) What is the employees total compensation for working a 46 hour work-week (Note: This is the compensation and not payoff net of effort costs)?

## 4 Concentration and Volatility Measures. Monopolistic competition

### 4.1

In 2000, the diaper industry in Portugal consisted of 5 firms producing identical diapers. However, in 2006, other firm(s) entered the market, obtaining a market share of 11%.

Year	Firms						Concentration Index		
	1	2	3	4	5	Other(s)	$C_4$	$\inf H$	$\max H$
2000	40%	15%	15%	15%	15%	0%			
2006	45%	11%	11%	11%	11%	11%			

- (a) Showing your computations, fill-in the missing items in the table above. Then, according to each concentration measure that you have studied, find out in which year the industry is more concentrated. Explain and calculate the Adelman's equivalent number. Compute the volatility index.
- (b) In 2008, the Portuguese diapers industry is characterized by the existence of 8 firms producing identical diapers. Let  $s_i$  denote the market share of firm  $i$ ,  $i = 1, 2, \dots, 8$ . It has recently been observed that the market shares are given by,

Firm $i$	1	2	3	4	5	6	7	8
$s_i$	60%	10%	5%	5%	5%	5%	5%	5%

- (i) Compute the concentration measures  $C_4$  and  $H$  for this industry.
- (ii) Suppose now that firms 2 and 3 merge and become a single firm labeled  $\overline{23}$ . Compute the post-merger concentration measures  $\hat{C}_4$  and  $\hat{H}$ .
- (iii) Compute the change in concentration resulting from this merger,  $\Delta C_4 = \hat{C}_4 - C_4$  and  $\Delta H = \hat{H} - H$ .
- (iv) Suppose now that the merger between firms 2 and 3 did not work out, such that the firms remain separated. Suppose that firms 6, 7, and 8 now merge. Compute the post-merger values of  $\bar{C}_4$  and  $\bar{H}$ .

- (v) Compute the change in concentration resulting from this merger,  $\Delta C_4 = \bar{C}_4 - C_4$  and  $\Delta H = \bar{H} - H$ .
- (vi) The Portuguese Competition Authority suggests that a merger should *not* be challenged if the post-merger Herfindahl-Hirschman concentration index and its change due to the merger are such that:
- i.  $H < 0,1$ ,
  - ii.  $0,1 \leq H < 0,18$ , and  $\Delta H < 0,01$ , or
  - iii.  $H \geq 0,18$  and  $\Delta H < 0,005$ .
- (vii) Use these guidelines to determine whether any of the above mergers is likely to be challenged by the Portuguese regulator.

## 4.2

Adelman's equivalent number ( $EN$ ) is defined as

$$EN = \frac{1}{H}.$$

Interpret Adelman's equivalent number in plain English.

## 4.3

The following table presents the market shares of the 20 biggest insurance firms operating in the life branch. Calculate the possible variation interval for the Herfindahl index in both years. What is the equivalent number of Adelman? Calculate the variation interval for the instability index.

<b>Firms</b>	<b>1995</b>	<b>1996</b>
Tranquilidade	16,5%	16,7%
Fidelidade	11,6%	11,6%
Ocidental	13,1%	11,6%
BPI	12,1%	11,2%
Mundial Confiança	6,1%	7,4%
Barclays	2,5%	6,25%
Império	5,4%	5,85%
BPA	4,9%	4,7%
Aliança UAP	5,0%	4,2%
BFE	2,5%	2,6%
Victoria	2,4%	2,0%
Bonança	2,3%	1,9%
Europeia	1,8%	1,4%
Alico	1,7%	1,4%
Abeille	1,4%	1,3%
Gan	1,4%	1,3%
Eagle Star	1,4%	1,3%
Portugal Previdente	1,5%	1,3%
Lusitânia	0,4%	1,0%
Génesis	1,2%	0,6%
Others	4,8%	4,5%
Total	100%	100%

#### 4.4

Consumers are uniformly distributed along a boardwalk that is 1 mile long and with unitary demand. Newspapers prices are regulated, so consumers go to the nearest vendor because they dislike walking (assume that at the regulated prices all consumers will purchase one newspaper even if they have to walk a full mile). If more than one vendor is at the same location, they split the business evenly. Suppose the demand is normalized to  $N = 1$ .

- (a) Consider a game in which two newspaper vendors pick their locations simultaneously. Show that there is a unique pure strategy Nash equilibrium.
- (b) Show that with three vendors, no pure strategy Nash equilibrium exists.

## 4.5

Suppose that all firms in a market under a monopolistic competition environment face an individual inverse demand

$$P = 90 + \frac{20}{n} - 4Q,$$

Thus,  $n \geq 1$ . The total cost function of each firm operating in this market is,

$$TC(q) = Q^2 + 414.05.$$

- (a) Assume that in the *short-run* there are only 4 firms in the market, a firm named NOVA and three other similar competitors. Find the optimal quantity and price as well as the profit earned in the short-run by NOVA. What does the sign of the profit level tell you about future market entry (or exit)?
- (b) Monopolistic competition implies zero profits in *long-run* equilibrium. Use this fact to find the number of firms,  $n$ , and NOVA's quantity and price in the long-run. What do you expect will happen in the long-run equilibrium if the fixed cost,  $F = 414.05$ , increases? Justify intuitively and mathematically.
- (c) Compare short-run and long-run consumer surplus (CS).
- (d) Taking into account the computed equilibrium quantities in *a)* and *b)* and given the total cost function, what can you conclude about the productive efficiency of the firms operating in this market?
- (e) Compute the Lerner index when  $n = n_0$  and show that it is independent of the number of firms  $n_0$ . Explain intuitively the reason why NOVA's market power doesn't decrease with the number of competitors even when  $n \rightarrow \infty$ .

## 5 Competitors and Competition

### 5.1

Suppose that demand is  $P = 1050 - 10Q$  and the cost function of each of the three firms is given by  $C = 50Q_i + 200$ .

- (a) Compute the optimal quantities if firms are price-takers.
- (b) Compute the Cournot-Nash equilibrium. If there is free entry, what is the number of firms in equilibrium?
- (c) Compare the results in a) and b). Comment the following statement: "When there is free entry, the firms' profits are zero and therefore the equilibrium solution is efficient."

### 5.2

Consider two firms, 1 and 2, producing a homogeneous product that simultaneously decide how much they want to produce. The market demand is given by  $Q(P) = 100 - P$ . The marginal and average cost of production of both firms is constant and equal to 10. Firm 1 maximises its profit but the manager of the other firm maximises a weighted sum of the profit and the quantity produced, i.e., firm 2 maximises

$$\pi(Q_1, Q_2) + \alpha Q_2.$$

- (a) Represent graphically the best response functions of both firms.
- (b) Find the equilibrium quantities and price.
- (c) Which value of  $\alpha$  maximises the profit of firm 2? Comment the result.

### 5.3

Suppose that two firms, 1 and 2, with constant marginal and average costs,  $c_1$  and  $c_2$ , equal to 10, sell a homogeneous good whose demand is given by  $Q = 100 - P$  by competing in quantities which they choose simultaneously and independently.

- (a) Find the equilibrium price, quantities and profits.

Now, suppose that (only) firm 1 is optimistic about the demand, and so its perception of it is given by  $Q = \lambda 100 - P$ , where  $\lambda > 1$  is a parameter measuring the level of player 1's misperception of the true market demand. Firm 2 accurately observes the actual demand curve.

- (b) Plot the firms' reaction functions when they have an accurate perception of demand. Graphically, what will happen to each of the best-response functions as firm 1 becomes more optimistic ( $\Delta\lambda > 0$ )?
- (c) Considering firm 1's misperception, compute the new equilibrium quantities and price. What's firm 1's expected profit? And its real (actual) profit?

Suppose, from now on, that firm 2 also believes that the demand is given by  $Q = \lambda 100 - P$ .

- (d) Compute the new equilibrium (i.e., price, quantities and actual profits) taking into account both firms' misperception (i.e., that both firms are optimistic).
- (e) Compare the Lerner index and industry profits in (i) and (iv). According to your results, is optimism a good thing for firms? What is optimism doing to this industry relatively to the *status quo* with accurate perceptions? And to consumers?

## 5.4

Consider a Bertrand oligopoly with each firm having a constant marginal cost,  $c_i$ , not necessarily equal for all the firms. The demand for firm  $i$  is given by  $Q(P_i)/n_i$ , where  $n_i$  is the number of firms with price equal to firm  $i$ 's price, if  $P_i$  is the lowest price in the market, otherwise there will be no demand for this company. Find the equilibrium quantities and prices. Hint: assume that price must be integer.

## 5.5

Consider a simple symmetric Bertrand model with product differentiation, in which two firms operate in the market. Firm 1 and firm 2 choose prices simultaneously and independently ( $P_1$  and  $P_2$ , respectively), are subject to the same marginal cost and average cost of 0.2 and face the following demand

functions:

$$Q_1 = 1 - P_1 + \frac{1}{2}P_2,$$
$$Q_2 = 1 - P_2 + \frac{1}{2}P_1,$$

where  $Q_i$  denotes the quantity demanded of firm  $i$ 's product. As can be easily observed from the demand functions, the fact that products are differentiated means that if a firm is undercut it will not lose all of its business.

- (a) Obtain the reaction functions  $P_1 = f(P_2)$  and  $P_2 = f(P_1)$ , draw them on the space  $(P_1, P_2)$  and determine the prevailing prices in equilibrium.
- (b) Compare the slope of the reaction functions with the slope of those of the Cournot model. Intuitively explain the differences.
- (c) Suppose that firm 1's marginal cost is reduced to 0.1. Compute the direct and the strategic effect of this change on the prices of both firms.

## 6 Dynamics of Pricing Rivalry

### 6.1

Consider a market where  $n$  firms compete in prices. They all have the same cost structure, producing at a constant marginal and average cost. These firms have tacitly colluded around the monopoly price. When two or more firms quote the same (lowest) price they all attain the same market share. In case of a deviation from the collusive agreement in a given period, firms revert to quoting a price equal to marginal cost from the next period onwards. Firms discount profits according to the discount factor  $\delta = 1/(1+r)$ . [Note: If you have read “The Economics of Tacit Collusion” (2003) by Mark Ivaldi, Bruno Jullien, Patrick Rey, Paul Seabright and Jean Tirole, this question will be quite easy.]

- (a) Carefully write down each firms’ strategy.
- (b) For which values of the discount factor  $\delta$  is the collusive agreement stable?
- (c) How does the stability of the collusive agreement vary with the number of firms? Answer quantitatively and explain intuitively.

### 6.2

Consider a homogeneous good market with  $n$  symmetric firms competing in prices over an infinite number of periods. The firms have constant marginal cost  $c$ . The demand function at time  $t$  is  $Q_t = \mu^t D(P_t)$ , where  $\mu\delta < 1$  and  $\delta$  is the discount factor. Derive the set of discount factors such that full collusion (i.e., the monopoly solution) is sustainable. What would this model predict about the relative ease of sustaining collusion in expanding and declining industries?

### 6.3

Consider two firms interacting in two identical and independent markets. The markets differ in that in market 1 a firm’s price at time  $t$  is observed at  $t+1$ , whereas in market 2 it is learned only at  $t+2$ . Thus, although each of the markets meets every period, market 2 has longer information lags.

- (a) Derive the set of discount factors such that in the absence of multimarket contact (i.e. firms in market 1 are different from firms in markets 2), collusion in market 2 would be sustainable.

- (b) Compute the minimum threshold value for the discount factor such that under multimarket contact (i.e. firms are the same in both markets), collusion in both markets is sustainable.

## 7 Entry and Exit

### 7.1

Firm 1 is the first firm in a given market. Firm 1 can choose between one of two technologies available, A and B. Technologies A and B have, respectively, the following cost functions:

$$C_A = 60 + 2Q_1 \quad C_B = 10 + 8Q_1$$

The inverse demand curve is  $P = 20 - Q$ , where  $Q$  is total output of industry.

- (a) Which technology firm 1 would choose if monopoly lasts forever?
- (b) Suppose that firm 2 is considering the possibility of entry in this market and it can also adopt any of the aforementioned technologies. If firm 2 enters, firms will compete à la Cournot. Knowing this, which technology should firm 1 choose? In this model, what is the effect in welfare of the existence of a potential competitor?

### 7.2

One firm with marginal and average costs constants and equal to 10 is in a market with demand  $P = 100 - Q$ . Another firm is considering enter in this market with a technology with marginal and average costs constants and equal to 30 (higher than the costs of the other firm because this firm is starting its activity). The new firm can choose between build a plant with capacity 10 or 100. Assume that firms compete à la Cournot and the possibility of installed firm proceeds aggressively (following a strategy of limit pricing).

- (a) What capacity should the new firm choose? Why?
- (b) What is the equilibrium in this market after the entry of the new firm (quantities, prices and profits)?
- (c) If the firm that is considering entering has access to a technology equal to the technology of the firm already installed, how your previous answers change?

### 7.3

Suppose that a potential entrant into a market for an homogeneous product whose demand equals  $Q = 100 - P$  has constant marginal and average cost equal to 40. The incumbent has constant marginal and average cost equal to 20. Firms compete in quantities which they choose simultaneously and independently if entry occurs.

- (a) The entrant is thinking of using a small scale-entry strategy, i.e., to set itself a credible and observable capacity constraint limiting its sales in this market. What capacity constraint should it choose bearing in mind that the incumbent may limit price?
- (b) Suppose that the entrant is hesitating between a small-scale entry strategy and a large-scale one, i.e., not setting itself a capacity constraint. What would you tell him to do?

### 7.4

Consider a market with two firms, 1 and 2, which produce with a marginal and average cost constant and equal to 30. Firms compete à la Cournot and the demand in this market is given by  $P = 330 - Q$ .

- (a) What are the price, quantities produced and profits of each firm in equilibrium?

A more advanced technology is now available to firms. This technology allows firms to produce with a marginal and average cost equal to 10. However, firms have to pay a cost of 6,000 in order to buy the machinery embodying the new technology. Simultaneously, a third firm, 3, is considering entering the market. Only the new technology is available to firm 3.

- (b) Show that firm 3 will enter in the market independently of the technology adopted by installed firms.
- (c) Given that firms already installed choose technology simultaneously and independently, in equilibrium, what is the technology adopted by each one? What is the new market equilibrium?
- (d) Suppose now that firms already installed, knowing that firm 3 wants to enter the market, consider the hypothesis of coordinating production choices with the goal of deterring firm 3's entry. Assume that firm 3 takes

as given that the total quantity produced before its entry will remain the same.

- (e) Will firms already installed choose this coordination policy? Why?

## 8 Industry Analysis, Vertical relations

### 8.1

A wholesaler ( $W$ ) sells a good to a retailer ( $R$ ) who then sells it to consumers whose demand for this good is given by  $P = 100 - Q$ . Each unit of the good is produced by the wholesaler at a constant marginal and average cost of 10. Besides what it pays to the wholesaler for each unit of the good,  $P_w$ , the retailer bears no other cost.

- (a) What is the demand faced by the wholesaler? Quantify.
- (b) What price  $P_w$  will the wholesaler choose?
- (c) Suppose that the retailer buys the wholesaler. How does this change the equilibrium? Quantify.
- (d) Suppose that the wholesaler could charge the retailer a fixed fee independent of the quantity sold,  $A$ , in addition to the per-unit price,  $P_w$ . What values would it choose for  $P_w$  and  $A$ ?

### 8.2

Assume there is one manufacturer and one retailer, with final demand  $D(P, s) = (A - P)s$ , where  $s$  denotes the level of service. The manufacturer has marginal cost  $c$ , and the retailer resells this good at the additional cost of service  $s$  per unit of good sold.

- (a) Calculate the optimal price and service level for an integrated firm. In particular, determine how the level of service is set as a function of  $P$ .
- (b) Now assume that the manufacturer sells the good at linear price  $w$  to the retailer, choosing  $w$  taking into account the reaction of the retailer. Find the equilibrium price and service levels and compare. Find the optimal transfer price  $w$  and interpret.
- (c) What is the retailer's choice of service if the retail price is fixed at the integrated price? When is this a sufficient restriction?

## 9 Competitive Advantages: definition and sustainability

### 9.1

In defending his company against allegations of anticompetitive practices, Bill Gates claimed that if someone developed an operating system for personal computers that was superior to Microsoft's Windows 95 operating system, it would quickly become the market leader, just as Gates' DOS System became the market leader in the early 1980s. Opponents countered that the market situation in the early 2000s was different than in the early 1980s, so that even a markedly superior operating system might fail to capture significant market share. Comment.

### 9.2

Do you agree or disagree with the following statements about sustaining advantage?

- (a) In a market with network externalities, the product that would potentially offer consumers the highest " $B - C$ " inevitably comes to dominate.
- (b) If the sunk costs of entering industry A exceed the sunk cost of entering industry B, then there will certainly be fewer firms in industry A than in industry B.

### 9.3

Two firms are engaged in Bertrand competition. There are 10000 people in the population, each of whom is willing to pay at most 10 for at most one unit of the good. Both firms have a constant marginal cost of 5. Currently, each firm is allocated half the market. It costs a customer  $s$  to switch from one firm to the other. Customers know what prices are being charged. Law or custom restricts the firms to charging whole-dollar amounts (e.g., they can charge 6, but not 6.50).

- (a) Suppose that  $s = 0$ . What are the Nash equilibria of this model? Why does discrete (whole-dollar) pricing result in more equilibria than continuous pricing?
- (b) Suppose that  $s = 2$ . What is (are) the Nash equilibrium (equilibria) of this model?

- (c) Suppose that  $s = 4$ . What is (are) the Nash equilibrium (equilibria) of this model?
- (d) Comparing the expected profits in (b) to those in (c), what is the value of raising customers' switching costs from 2 to 4?

## 9.4

Empirical evidence suggests that, during the 1970s, a firm with an IBM 1400 was as likely as any other firm to purchase an IBM when making a new purchase, while a firm with an IBM 360 was more likely to purchase an IBM than a firm that did not own an IBM 360. Software for the IBM 1400 could not run on the succeeding generations of IBM models (360, 370, 3000, and 4300), while software for the IBM 360 could run on the 370, 3000 and 4300.<sup>2</sup> How do you interpret these results?

---

<sup>2</sup>Greenstein, Shane M. (1993), *Did Installed Base Give an Incumbent Any (Measurable) Advantages in Federal Computer Procurement?*, Rand Journal of Economics 24, 19-39.