

UNIVERSITY OF CALIFORNIA BERKELEY
Haas School of Business

MBA 201A—Economic Analysis for Business Decisions—

FINAL EXAM

Instructions: The number in parentheses (e.g., (5 points)) indicates the points for each question. Total: 150 points. Note that you have 180 minutes to do the exam, so if you spend no more than 1 minute per point, you will have 30 minutes to check your work.

Please Write Legibly. Briefly explain your answers (that is, don't just write "yes" or "no" and don't just write down a numerical answer without showing how you derived it). Write only on this exam and not on other sheets of paper.

Question 1 (50 points total)

China has invested heavily in building capacity to produce solar panels, but Chinese solar panel producers are struggling to survive, as panel prices have fallen sharply over the past several years. More than two-thirds of worldwide solar panel manufacturing capacity is in China.

Suppose that the annual demand for Chinese solar panels is given by $Q_D(P) = 50,000 - P/40$ where Q is the quantity of Chinese solar panels, measured in megawatts, and P is the price per megawatt. Assume this demand is not expected to change. (In case you are wondering, the demand for Chinese solar panels at any given price is equal to the total worldwide demand at that price minus the supply forthcoming from the rest of the world at that price.)

In the short run, there are 200 equally efficient firms manufacturing solar panels in China. Assume that all of these suppliers act as profit-maximizing firms in a perfectly competitive industry. Each supplier operates with the short run cost function of $C_{SR}(q) = 500,000q + 1,000q^2$ where q is the individual supplier's production of solar panels in megawatts.

a) (5 points) What is each individual firm's short-run supply function?

b) (5 points) What is the aggregate short-run supply function for all of the Chinese suppliers?

c) (10 points) Calculate the short-run equilibrium price and total quantity of Chinese solar panels.

d) (5 points) In the short-run equilibrium, how many megawatts of solar panels per year is each Chinese supplier making?

- e) (10 points) Suppose, ***just for this part of the question***, that the Chinese government is concerned about the low rate of return on capital investments in the solar panel industry and decides to exert control over the industry to maximize *industry* profits. Wary of violating World Trade Organization rules by imposing export quotas, the Chinese government instead decides to impose a production quota on each supplier (i.e., a maximum number of panels in megawatts that each supplier can produce per year). What per-supplier quota should they set?

The short-run cost function given above does not, of course, include the sunk costs associated with building these dedicated solar panel manufacturing facilities or with purchasing the specialized capital equipment needed to make the solar panels. In the long run, assume that the most efficient way to make solar panels in China involves fixed costs of \$62,500,000 per year, and thus a long run cost function of $C_{LR}(q) = 62,500,000 + 500,000q + 1000q^2$. Assume that all of the existing firms, and potential entrants, operate with this long-run cost function.

f) (10 points) What is the long-run equilibrium price and quantity of Chinese solar panels? In the long-run equilibrium, how many Chinese firms are producing solar panels?

g) (5 points) What factors govern the speed by which the market will adjust from the short-run equilibrium to the long-run equilibrium?

Question 2 (20 points total)

Your fraternity house is located very close to the Cal football stadium. You and your fellow fraternity members have decided to sell parking spaces in the house parking lot during the football games, and you are the head of the committee in charge of football parking.

During the first home game, you ask several fraternity members to stand on Piedmont Avenue holding signs announcing the price (the same for all vehicles) and directing cars into your lot. At that game, you only sell 38 of the 40 total parking slots in the lot.

At a meeting the following Monday, Andy, the president of the fraternity, is outraged that you did not sell all the slots. "That's ridiculous," he shouts. "Those slots are free to us, so if we leave any of them unsold, we are leaving money on the table."

- a) (10 points) You agree with Andy that there is no cost associated with selling the slots. Members enjoy standing on Piedmont Avenue with the sign, so you had more than enough volunteers to do that, and frat house members can park their cars either on the street or at family members' houses away from the stadium during the games at no real cost to them. You disagree with Andy that you have left money on the table. Using the concepts and terms you have learned in this class, explain why Andy may be **wrong** that you would have made more money had you sold all the slots.

b) (5 points) The first home game was against a weak team and took place on Labor Day Weekend. The next home game is against Oregon, a much stronger, more popular team, so you are planning to raise the price. Andy is puzzled and outraged. Explain using the concepts and terms you have learned in this class why you might want to raise the price for the Oregon game.

c) (5 points) You are considering selling season passes to the lot. That way, car owners could pay an amount for the whole season and then park in your lot for as many or as few games as they want. Explain using the concepts and terms you have learned in this class why and under what conditions this might be a good strategy.

Question 3 (35 points total)

You are in the process of developing a new digital camera, the Omega. You estimate that the demand for the Omega camera will be $Q = 1,000,000 - 2,000P$. Once developed, the marginal cost of producing and selling each Omega camera will be \$200. The total R&D expenses required to develop the Omega are \$50 million, of which you have already spent \$10 million.

- a) (10 points) If you do complete the development of the Omega and decide to sell it for a single price, what price should you charge to maximize profits? How many Omega cameras do you expect to sell at that price?

- b) (5 points) Should you complete development of the Omega?

Suppose you decide to develop the Omega camera. After you have spent another \$5 million of the total \$50 million required to develop the Omega, you acquire a rival firm that sells a competing digital camera, the Gamma. The margin between price and marginal cost for the Gamma digital camera is \$200. (Assume that this figure will not change after the acquisition.) Your marketing team estimates that 25% of the sales of the Omega digital camera will come at the expense of the Gamma digital camera. In other words, for every 100 Omegas you sell, you will forfeit 25 Gamma sales.

c) (15 points) If you complete development of the Omega, now what price should you charge for it, assuming that you are seeking to maximize the combined profits on sales of the Omega and Gamma digital cameras? Hint: Think about opportunity costs.

d) (5 points) Should you complete development of the Omega?

Question 4 (25 points total)

You run a car service in San Francisco County. You offer two types of services: black cars and traditional cabs. You have two types of customers, who you think of as “suits” and “others.” Suits are generally professionals, who mostly work in the financial district or nearby. They prefer the comfort, quiet and spaciousness of your black car service, and so are willing to pay \$2 more per mile for a black car compared to a cab. Others do not care about the type of car they are in as long as you get them where they want to go relatively quickly. The table below summarizes each customer type’s willingness to pay for your service.

Consumers’ Willingness to Pay per Mile	Car Type	
	Black Cars	Cabs
Suits	10	8
Other Riders	5	5

From your perspective, drivers need to be paid more to operate black cars as they are not allowed to listen to the radio, plus the cars themselves are less fuel efficient. Taking both those factors into account, your marginal cost per mile is \$2 for black cars and \$1 for cabs.

You would like to be able to instruct your drivers to charge consumers based on the clothes they are wearing – charging anyone with a suit or professional-looking outfit a higher price than everyone else. Your media and communications department claims that would be a public relations nightmare. Your director of driver relations also thinks it would take too much time to have drivers assessing customer types based on their clothes since suits, for instance, could take off their suit jacket before their ride.

a) (15 points) Assume that you have 50 Suits per day and 100 Other Riders per day and both types of riders take trips of equal length. What are the profit-maximizing prices, assuming you cannot charge different prices based solely on clothes? What are your total profits?

b) (10 points) The Tech Week convention is coming, which will provide an influx of customers whose willingness to pay for rides matches that of the Suits. You anticipate that there will be 150 Suit/Tech-Week-related rides per day. The number of Other Riders will not change. Should you change your pricing policy during Tech Week? If so, what prices should you charge?

Question 5 (20 points total)

Your Firm is ahead of the competition in the race to introduce a 4G smart phone. Your engineers have developed two candidate designs, Big Screen and Trim, and you need to decide which one to introduce. (You cannot bring out both.) Your decision is complicated by two factors. First, you are uncertain about how much consumers value the larger screen versus the lighter weight. Your marketing team has determined that there is a 80% chance that consumers highly value Screen Size, but a 20% chance that consumer highly value Light Weight. Second, there is one other firm close behind you in the race. Your Rival also has its own Big Screen and Trim designs. (Your Rival also cannot introduce both designs). Both firms are risk neutral.

Your Firm will enjoy some advantage in sales by being first to market. However, the profits of Your Firm and those of Your Rival will depend heavily on which pair of products is offered and how those two offerings match consumer demand. If consumers highly value Screen Size, the payoffs to you and Your Rival are as follows:

Consumer Highly Value Screen Size		Your Rival	
		Big Screen	Trim
Your Firm	Big Screen	70	60
	Trim	75	40

- a) (5 points) Suppose, *just for this part*, that Your Firm and Your Rival are simultaneously picking which product design to launch, knowing that consumers highly value Screen Size. Find the Nash Equilibrium, or Nash Equilibria (plural), if any, in that simultaneous-move game.

If consumers highly value Light Weight, the payoffs to you and Your Rival are as follows:

Consumer Highly Value Light Weight		Your Rival	
		Big Screen	Trim
Your Firm	Big Screen	60	50
	Trim	100	70

The timing of your strategic interaction with your Rival is as follows. First, you pick which product design to launch. This decision is visible to Your Rival. Next, consumers begin making purchase decisions. These decisions will reveal to both firms the true state of consumer preferences, either highly valuing Screen Size or Weight. Lastly, Your Rival chooses which of its two designs to launch.

b) (10 points) Draw the game tree that captures the strategic interaction between Your Firm and Your Rival. Solve the game tree. What are the equilibrium strategies and the expected payoffs for the two players?

c) (5 points) Suppose instead that Your Rival had to pick which product design to launch after seeing which design Your Firm has launched, but *before* learning about consumer demand. Would that lead to different strategies and payoffs than in part (b)? Explain.