

Economics 121, spring 2006
Professor Joseph Farrell

Problem set 2 (corrected).

Due at the *beginning of class*, Thursday February 23, **OR** in Jenny's mailbox on the 6th floor of Evans Hall by 4pm Friday February 24.

ANNOUNCEMENT: On February 28, I will hold class as usual, but my office hours will be before class: 9AM to 10:30AM. On March 2, we will have midterm #2, in class. Same logistics as before: closed-book, bring a bluebook, etc.

Questions 2 and 3 in this problem set are considerably more challenging than problem set 1 or the first midterm—they are meant to make you think, as well as checking that you are familiar with the material. Whereas you should be concerned if you had real trouble with the previous assignments, you should be chuffed¹ if you can nail this one. Do as well as you can!

1. Consider a Hotelling duopoly, with firms located at points 0 and 1, and consumers uniformly spread between $[-a]$ and $[1+a]$. (**corrected**²) Firms have constant and equal marginal costs c . Each consumer wants just one unit of the good, and is willing to pay a lot for it if necessary but naturally wants to pay as little as possible. Consumers bear a “transportation cost” td , where d is the distance to the firm patronized, and t is a constant.
 - i. Calculate the equilibrium prices charged by the firms. Explain intuitively why/how the prices depend on t and on a .
 - ii. How would the viability of a central purchasing agency (a commitment to ignore product differentiation) in this model compare to the case discussed in class (i.e., the case $a=0$)?

2. (This question calls for some simple calculations *and* for thinking about the results; don't assume you're done when you've done the calculations!) In Carlton & Perloff Example 6.6 (“Car Wars”),
 - a. Suppose the industry were not cars but airline travel. What would the numbers given suggest about the elasticity of demand?
 - b. If (as we'd expect) profits were lower when “successful tacit collusion fell apart,” what does that, plus the numbers given, indicate about marginal cost as a percentage of price at the time?
 - c. Assuming price is above both average and marginal cost, what does that imply about economies of scale in the industry?
 - d. What basic demand-side difference between cars and airline travel might make one re-think the above? Does it seem to be important, based on the information given?

¹ Chuffed: pleased and happily proud.

² As discussed in class, the hard copies handed out in class had an error here (they said $+a$ rather than $1+a$).

3. Consider a Cournot oligopoly with linear demand $p = A - Q$ and with N firms, and suppose that each firm i has scale-independent (“constant”) unit costs c_i , but the values of c_i may differ across firms (i.e., different firms have different costs). Firms know each other’s costs and compete in Cournot fashion.
- Show that as long as each firm is “active” (producing a positive quantity), the price p depends only on N and on \bar{c} , the simple average value of c_i ($\bar{c} = \frac{1}{N} \sum c_i$). (That is, for a given N , if two industries had different values of all the N variables c_i but the two had the same value for the average \bar{c} , the prices would be the same. For instance, with $N=2$, the price in an industry with $c_1 = 1, c_2 = 3$ is the same as the price in an industry with $c_1 = 2, c_2 = 2$.)
 - Continuing to assume that all firms are active, what is the average cost of production in the Cournot equilibrium? Express your answer using N , \bar{c} and the variance of the c_i , i.e., $\text{var}[c] = \frac{1}{N} \sum (c_i - \bar{c})^2$.
 - Does the fact that firms may shut down (produce zero) imply that your answer to part (b) is an overestimate, or an underestimate, of the true average cost of production in Cournot equilibrium? How inefficient does a Cournot firm have to be, relative to the average of its rivals, before it shuts down?
 - If another industry has the same N and the same values of the c_i , but has undifferentiated Bertrand competition instead of Cournot competition, which industry has the lower average cost of production? Which one has the lower price?