

Economics 121: PROBLEM SET 3

Due: Tuesday, Nov. 9 (in lecture)

TRUE/FALSE/UNCERTAIN and EXPLAIN:

1. According to the Stackelberg model, the dominant firm allows the follower to produce a positive amount because it is not possible to completely exclude him from the market.
2. In a market where firms interact in a repeated context, a monopoly outcome can be sustained as a Nash equilibrium even though many firms operate in the market.
3. The higher the interest rate, the easier it is for firms in the same industry to sustain a collusive outcome.

MULTI-PART QUESTIONS

1. In the mainframe computer industry of the 1970s, IBM was clearly a dominant supplier yet it did face entry threats. To examine its behavior toward competitors, suppose that IBM produces q_1 and it incurs a cost of $c_1(q_1) = 6 q_1$ measured in hundreds of thousands of dollars. IBM faces potential entry by Fujitsu, the Japanese mainframe maker. Fujitsu produces a computer that is a perfect substitute for the IBM machine but its production costs are: $c_2(q_2) = 100 + 12 q_2$ where q_2 is Fujitsu's production level and costs are measured in hundreds of thousands of dollars. Inverse demand for mainframes is given by $p(Q) = 120 - Q$, where $Q = q_1 + q_2$ is the total production by IBM and Fujitsu, and again price is measured in hundreds of thousands of dollars. Initially, suppose that the incumbent, IBM can credibly commit to a quantity to produce, after which Fujitsu will choose its own quantity.
 - a) Find Fujitsu's reaction function.
 - b) If IBM accommodates entry, find IBM's profit-maximizing quantity and its resulting profits.
 - c) Alternatively, IBM can attempt to deter entry by Fujitsu by engaging in "limit pricing." In fact, it would set a quantity so that Fujitsu would not be able to make a profit.
 - d) If IBM produces to limit Fujitsu's entry, verify that $q_1 = 88$ is the quantity that results in the limit price, and find that price and IBM's associated profit.
 - e) Will IBM prefer to deter entry or accommodate entry? Prove it.
2. Do Practice Problem 6.4 in the PRN text (pages 313-314). This problem is good practice and we strongly recommend you work through it without the solutions. Now consider how the Dixit model and how it applies to the "real world," which in this case means the CSG game. Refer to the market profiles under the CSG section of the course web page.
 - a) In the Dixit model, an investment in a capacity q^k lowers marginal costs for all units up to that capacity choice. Rank the markets in terms of how much ex-post marginal costs

- compare to ex-ante marginal costs, which will include your capacity costs. (Hint: in calculating your ex-ante marginal costs, think about the per-period cost of capacity).
- b) How does the “elasticity of marginal costs for output greater than capacity” in each of the CSG market (again, look in the market profiles) compare to the assumptions for production past capacity in the Dixit model? Very generally, how do you think this will change the results of the Dixit model?
 - c) One key feature of Dixit model is that investment in capacity is completely sunk. How does this assumption hold up in each of the markets (hint: consider depreciation)?
 - d) In the Dixit model an incumbent may choose a level of capacity that deters entry. Describe how the entry fees in the different markets affect the limit quantity.
 - e) The Dixit model assumes all goods are homogeneous products. Describe how product differentiation as modeled in the CSG game might change the Dixit model.
 - f) Consider the entry decisions of the 8 teams in period 1. Given random costs, what kind of decision rule might a firm follow in deciding which of the market to enter? Given this decision rule, which firm(s) will be the “first mover” in each market.
 - g) Which of the markets would you expect the Dixit model to apply to?
3. An industry composed of eleven (11) identical firms has decided to form a cartel. Initially, all firms join the cartel. Demand for the product is: $D(p) = 100 - p$. Each firm has total cost function: $C(q) = 4q + q^2$. Firms decide on the quantity to produce, and the market price adjusts to clear the market for the homogeneous product.

- a) Compute the cartel solution for price and the resulting profit of an individual firm.

The firms attempt to achieve the cartel solution for current period. One firm, however, considers “chiseling” on its cartel quantity by producing its profit-maximizing level, assuming that the remaining ten (10) members will produce so as to maintain the cartel price.

- b) Find the optimal quantity the “chiseler” will produce and how much profit it makes from chiseling.

Suppose that all firms expect that after ten (10) years a new product will become available that will make their product obsolete. In the meantime, they attempt to abide by the annual cartel production levels for each of the ten years.

- c) If the relationship is repeated for each of 10 years, will the firms be able to achieve the cartel outcome? Explain why or why not.

Now suppose that it is discovered that a superior product will never be invented so that the firms can continue to supply the market forever.

- d) Can the cartel outcome be sustained in this case? How might the firms attempt to achieve this? Identify key factors that will facilitate collusion in this case.