Economic Analysis – Take Home Exam Component

Due 6:30 pm Wednesday 4-28-2021

Instructions

- ✧ Write a clear analysis and explanation for both questions.
- ✧ Make sure to provide complete, neat, and clearly labeled figures where appropriate.
- ✧ Make sure your equations are neat and easy to follow.
- ✧ Explain your work and intuition.
- ✧ You may use any resource other than talking to anyone else.
- ✧ There will also be an in-class exam component (with more but less involved questions).
- ✧ Submit your answers to the Take-Home Final assignment in Canvas.
- ✧ Include your answers as the last item in your course portfolio.

Question 1

We worked through much of this one in class. Here you will finish the analysis.

Amy and Bob compete in homogeneous product markets. Units are chosen for price and quantity so that the linear approximation of demand is p=1-q. This looks quite special and simplistic. But, by choosing units for price and quantity appropriately, *any* demand curve has a local approximation that can be written this way. So really we have to assume we are conducting this exercise as an approximation in the local area of the solution.

Each must choose technology and quantity. The cost functions have the form C=F+cq. For technology 1, c=0.4 and F=0. For technology 2, c=0.1 and F>0. Amy moves first.

A) Diagram the extensive form of the game.

B) Work out when Bob would or would not choose c=0.1 as a function of F and Amy's quantity.

C) Assume F is so high a monopolist would choose technology 1 with c=0.4. In that case Bob, moving second, definitely chooses technology 1. Why?

D) What is the highest value of F for which Amy chooses technology 2, the low MC technology? At this point, there are two Stackelberg games to analyze, one for each of Amy's choices of technology. To answer this question, you must find Amy's profit in the solution to each, then determine for what values of F she would prefer the second technology.

E) Are there any cases where Amy would produce so much that Bob stays out (his quantity is 0)? To think about this question, since Bob's marginal cost is 0.4 and his fixed cost is 0, what would price have to be if Bob produced 0 to keep him from producing 0? What would Amy have to produce to drive price to that level? What would Amy's profit be if she produced that much? How does that compare with your work from (D)?

F) In the case where Amy chooses technology 2, might society be better off is she was prevented from doing so? Might society be better off if Amy was a monopolist and did not face potential competition from Bob? Why?

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Question 2

Irene and Eddie compete in differentiated products where the differentiation can be modeled as location on a circle of circumference 1. 100 customers are uniformly distributed around the circle. Irene, the incumbent, already has a product at location 0. She moves first and introduces one more product at a location of her choosing. Then Eddie introduces a product at a location of his choosing, having observed Irene's choice.

A) Assume all customers purchase one unit of the nearest product. Where will Irene and Eddie locate the two new products in the pure strategy Nash equilibria? Hint: there are two such equilibria, but they mirror one another. I suggest just drawing a circle and playing with locations to get some intuition. Then posit an intuitive equilibrium and prove it is one, rather than constructing the equilibrium from some maximization process. You can then just point out that there is an alternative mirroring this solution with the same properties.

B) Now suppose each customer buys only one product to maximize their consumer surplus, $S=1-p-d$, where d is their distance from the product they choose and p is the price they pay. Suppose Irene must charge the same price at both of her locations. Prices are announced simultaneously. Holding constant locations corresponding to either of the (mirror) pure strategy Nash equilibria you found in part (a), find the Nash equilibria of the simultaneous move pricing game.

C) Consider a game where locations are chosen as in (a) and then prices are chosen as in (b). Are the locations from (a) an equilibrium in this game? If not, why?