

Assignment 3

Due Date: March 26, 2020, in class [subject to change as appropriate for coronavirus response]. Late assignments will not be accepted.

Question 1: Consider the following sequential version of the game between firms A and B described in question 3 in Assignment 1 and question 2 in Assignment 2. Specifically, assume that firm A chooses q_M first. Both firms observe q_M and then simultaneously decide how much to produce in the duopoly market. That is, firm A chooses q_A and firm B chooses q_B at the same time.

1.1 Treating the last stage of the game as a simultaneous move game, derive the two firms' best response functions in this stage (these may depend on q_M , which at this stage is fixed). For any q_M , what is the equilibrium values of q_A and q_B in the last stage? How do these values depend on q_M ? Explain the intuition.

1.2 Derive firm A's optimal choice of q_M in the first stage. Summarize the equilibrium. What values do q_M , q_A , and q_B take in equilibrium? Are firms better or worse off in this version of the game than in the simultaneous move version in Assignment 1? Explain your answers and relate it to the "first-mover advantage" discussed in class and in the book.

Assume in the remainder of the question that the game entails some exogenous uncertainty concerning whether firms will be allowed to produce in the duopoly market at all. The timing is now the following. Firm A first chooses q_M . Both firms then observe q_M and learn whether they will be allowed to produce in the duopoly market. Either neither firm is allowed to do so, or both firms are allowed. If they are allowed to produce in the duopoly market, then the firms simultaneously choose q_A and q_B , respectively. Otherwise, the game ends. The probability that firms are allowed to produce in the duopoly market is $\frac{1}{2}$. Firm A's objective is to maximize its expected profit.

1.3 Formulate firm A's problem in the first stage. Derive its optimal choice of q_M in the first stage. Summarize the equilibrium. What values do q_M , q_A , and q_B take in equilibrium? Compare these equilibrium values with their counterparts from 1.2. Carefully explain the difference, if any.