

## Exam ECON4820 spring 2023

Instructions: This exam consists of two essay questions and two mathematical problems. They are all weighted equally towards the final grade on the exam. Please answer all questions. Show all your work for the mathematical problems, as partial credit may be awarded.

### Question 1 – Essay, competition authorities

Describe the practice of competition authorities and their role in regulating the economy. Discuss the key principles they follow as well as the tools they use to analyze and enforce competition laws.

### Question 2 – Essay, Bertrand and Cournot competition

Compare and contrast the Cournot (quantity) and Bertrand (price) models of competition. Discuss their underlying assumptions, key differences, and the implications of these differences for market outcomes.

### Question 3 – Model-based, sequential moves

Consider a market where two firms, Firm L and Firm F, produce differentiated goods. The demand functions for both firms are given by:

$$\begin{aligned}q_L &= a - p_L + bp_F \\ q_F &= a - p_F + bp_L\end{aligned}$$

where  $q_L$  and  $q_F$  are the quantities produced by Firm L and Firm F, respectively, and  $p_L$  and  $p_F$  are the prices they charge.

Moves are made sequentially, not simultaneously. Firm L moves first and acts as the leader, and Firm F is the follower. Both firms have a constant marginal cost of production, given by 0. Assume throughout that  $a = 1$  and  $b = \frac{1}{2}$ .

- Determine the reaction functions for Firm L and Firm F. Even if you are unable to solve the problem mathematically, you get partial credit for stating the problems, explaining how you would solve them and what you expect to find.
- Calculate the equilibrium prices, quantities, and profits for both firms with sequential moves. Even if you are unable to solve the problem mathematically, you get partial credit for stating the problem, explaining how you would solve it and what you expect to find.
- Explain the strategic advantage of being the leader. Who sets the higher price? Who sells the most units? Who makes the highest profits?

#### Question 4 – Model-based, network effects

In this problem we consider a market in which there are network effects. This means that (part of) the utility a consumer derives from consuming a good, depends on how many other consumers consume that same good. The network effect is, however, not equally important to all consumers. Assume that consumer  $i$  derives net utility  $u_i = a + b_i n^e - p$  when the good is for sale at price  $p$  and he expects  $n^e$  consumers to buy. The parameter  $b_i$  measures the importance of the network effect to consumer  $i$ . Assume  $b_i \sim U[0,1]$ . In total there are  $N = 1$  consumers. Each consumer buys if and only if  $u_i \geq 0$ . Assume that the consumers all share the same expectations,  $n^e$ . Let  $n$  denote the share of consumers who actually choose to buy the good at price  $p$  and with an ex ante expectation that  $n^e$  consumers would buy it.

- a) Derive the parameter  $b$  of the indifferent consumer and demonstrate that the inverse demand curve is given by  $p = a + n^e - n n^e$ .
- b) Derive the profit-maximizing price the producer of this network good would set when he has a fixed expectation  $n^e$ .
- c) Compute the producer's optimal price for the parameters  $a = \frac{1}{4}, n^e = \frac{1}{2}, c = \frac{1}{8}$ .
- d) Explain the concept of self-fulfilling equilibria.
- e) Derive the equilibrium number of consumers (in terms of  $n$ ) when the consumers expectations are self-fulfilling, for the fixed price derived in answer a). Discuss how it relates to the producer's initial expectations.