

## Final Exam

February 18, 2019

### 1. General information:

- a. Make sure that your final exam is complete. The final exam consists of 3 problems.
- b. Only use the paper provided to you. Write your student ID number immediately and clearly on each page!
- c. Please do not remove the staples from the provided sheet of paper.
- d. Items allowed at your workplace: Student ID, writing utensils, ruler, set square, non-programmable calculator, food and drinks.
- e. Items not allowed at your workplace: Red pen, ink eraser, pencil case.
- f. Use a permanent pen (no pencil).
- g. Mobile phones have to be turned off and removed from your place!

### 2. Hints about doing the exam:

- a. Read each task carefully. The tasks could be extended over several pages.
- b. Please complete all tasks. Begin each one on a new page. Please write your answers in a readable way.
- c. You may write your answers in English or in German.
- d. Label the axes of your illustrations.
- e. The exam must be completed within 90 minutes!

**Good luck and much success!**

## Problem 1 - Competition and Entry

Consider a homogenous goods market in which two firms (firm 1 and firm 2) compete. Market demand can be described by the function  $q(p) = 18 - p$  where  $q$  and  $p$  denote quantities and the market price, respectively. The cost functions are of the form  $C_i(q_i) = c_i \cdot q_i$ ,  $i \in \{1,2\}$ , where  $c_1 = 5$  and  $c_2 = 4$ .

- a) Assume that both firms compete in quantities (Cournot Competition). Determine the equilibrium quantities and profits of both firms as well as the consumer surplus.
- b) Suppose now that firm 1 acts as a Stackelberg-leader. Determine the equilibrium quantities and profits as well as consumer surplus in this case.
- c) Consider a situation where firm 1 is the incumbent firm and firm 2 is a potential entrant. Entry entails sunk investments costs  $F$ . Firm 1 acts as a Stackelberg-leader.
  - i. Determine the quantity for which firm 2 has no incentive to enter the market.
  - ii. Show that for  $F \geq 14.0625$  entry is blockaded.
  - iii. Show that for approximately  $F \geq 1.6584$  the incumbent firm prefers to pursue entry deterrence.
  - iv. Interpret your results in c) economically. Address specifically the market outcomes for the different ranges of entry costs (1)  $F \in [0, 1.6584)$ , (2)  $F \in [1.6584, 14.0625)$  and (3)  $F \geq 14.0625$ . Comment also on the effect of the market structure on consumer welfare, i.e., which market structure –monopoly or duopoly– is the preferred one from the viewpoint of the consumers. You can also support your arguments graphically by means of a diagram.

## Problem 2 - Vertical Product Differentiation

Two firms produce sandwiches and compete in prices. Firm H produces organic sandwiches and firm L produces regular sandwiches. The prices charged by firm H and firm L are denoted  $p_H$  and  $p_L$ , respectively, and the marginal costs of the respective firm are  $c_H = 1$  and  $c_L = 0.2$ . Consumers' perceived quality of organic sandwiches is higher than the perceived quality of regular sandwiches. This is reflected in the quality parameters  $s_H = 2$  and  $s_L = 1$ , which refer to the (perceived) quality of firm H's organic sandwiches and firm L's regular sandwiches, respectively. The consumer's indirect utility function is denoted  $U = \theta s - p$ , where  $s \in \{2,1\}$  and  $p \in \{p_H, p_L\}$  stand for the quality and the market price of the respective sandwich. The parameter  $\theta$  measures a consumer's preference for quality and is uniformly distributed in the interval  $[0,1]$ . There are  $n = 100$  potential consumers in the market.

- a) Determine the demand functions for organic and regular sandwiches.
- b) Calculate the firms' equilibrium prices and profits.
- c) Calculate the values of  $\theta$  for which a consumer is indifferent between purchasing an organic or a regular sandwich as well as the value of  $\theta$  for which a consumer is indifferent between buying a regular sandwich or no sandwich at all.

- d) Determine the share of consumers who buy organic and regular sandwiches. Interpret your results and illustrate them graphically by means of a diagram.

*Hint: If you were not able to calculate the equilibrium prices, you can use the (incorrect) solutions  $p_H = 1.3$  and  $p_L = 0.5$  to solve exercises c) and d).*

### **Problem 3 - Price Discrimination**

Complete the **following two tasks**. Please answer verbally. You can also present graphical illustrations or example calculations to support your arguments.

- a) Describe the different types of price discrimination. Focus on the monopoly case. Give examples of the different kinds of price discrimination and explain which factors limit the monopolist’s ability to practice price discrimination.
- b) Discuss how advertising might affect consumer behavior. Comment also on the relationship between market power and advertising.